SYNTHESIZING THE CHEMICAL SUBJECT: POISON GAS, GAS MASKS, AND COLLECTIVE ARMORING IN GERMANY, 1915-1938

BY

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DISSERTATION

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ABSTRACT

During World War I, German scientists and engineers were the first to develop the modern gas mask as well as many of the weaponized gases that are still stockpiled in the Middle East today. In the wake of their first use on the Ypres battlefields in 1915, German soldiers quickly realized the insidious nature of poison gas, frequently fearing its unseen creeping dangers more than traditional bullets and explosives. This distinct fear carried over into the interwar years when Germans across the societal spectrum dreaded the use of these chemical weapons in a future European conflict that distinctly targeted civilian populations through aero-chemical bombardment. The historical development of modern chemical weapons through the first half of the twentieth century is thus intricately intertwined with the German people. For this reason, the gas mask became a particularly present and significant symbol in early twentieth century German culture and society. The mask was not only present in novels, films, and visual art (both popular and otherwise), but it was also a common item that individuals faced in their everyday visual field between the two world wars.

"Grasping for the Mask" argues that the gas mask, while often seen as a purely protective technological artifact, proved to exacerbate fears of chemical warfare among Germans in the 1920s and 30s. Not only did daily interwar encounters with the mask visibly present the possibility of aero-chemical attack, but the object itself became a symbol of the very nature of German futurity. From 1915 to 1938, however, a select group of German scientists and engineers who referred to themselves as gas specialists insisted that chemical weapons were not an existential threat to soldiers or civilians. Based on their firsthand experience in World War I and their later scientific experiments, they argued that poison gas could not achieve sufficient density to blanket entire urban centers, and that a properly applied gas mask was effective protection

against most chemical weapons. These men believed that technologically-augmented, self-disciplined Germans could live, if not thrive, in a world permeated by poison gas. Thus, they envisioned a "chemical modernity" in which daily life would be defined by the constant concern for the chemical construction of the environment.

Using German-language government and military documents, scientific writings, philosophical texts, novels, art, and gas protection journals, "Grasping for the Mask" narrates the contestations over this vision of the future, and the ways in which the gas specialists' calls for gas mask distribution aligned with the Nazis' appeal to a protected and disciplined Third Reich that extended into each German household. By revealing the ways in which a seemingly protective 20th century technology maintained its own violent politics and existed within a perversely self-justifying technological order, my project underscores the ways in which technological objects exert their own agency and become intertwined in human history. In this way, the dissertation adds to the history and philosophy of technology by resisting the blackboxing (or obfuscating) of twentieth-century technological development. Many early twentieth century German military technologies were not apolitical objects, but rather agents of an imagined human genocide. Given this fact, my project speaks to German historical scholarship by expressing the importance of these interwar technological debates for eventual national rearmament and the employment of chemical technologies in the Holocaust.

"Grasping for the Mask" speaks to broader histories of science, technology, and the environment by employing the concept of "chemical modernity" in two ways. In the first sense, the term is used for the historically-bounded German development and theorization of chemical weapons that was unsurpassed by other industrialized nation states, largely due to Germany's globally dominant chemical industry. However, in its second formulation, "chemical modernity"

refers to the increasing concern for the chemical construction of the human environment since the Industrial Revolutions. In this vain, “Grasping for the Mask” narrates one of the most significant points of escalation in this long historical process of chemical reckoning, thus projecting forward to contemporary concerns such as the atomic bomb, harmful pesticides and fertilizers, advanced biological and chemical weapons, and even the troubling accumulation of greenhouse gases.

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INTRODUCTION

In the March 1930 edition of *Heerstechnik,* a Berlin-based journal discussing military technologies, the so-called gas specialist Hermann Büscher reflected on the renewed political interest in poison gas. Büscher wrote:

> The "poison gases" are haunting the world. The imagination of the poets intoxicates and ignites them. The hands of artists create gruesome images of the effects of toxic gases. There is no escape from them, but only death and destruction…If the future war is beyond imagination, then so too are the fighting gases. The less the human brain is inhibited by expert knowledge, the more romantic the imagination. The whole field of battle gases has become a playground for the literati.[1]

Indeed, cultural and intellectual anxieties over civilian gassing were particularly prevalent in interwar Germany, a period in which the Treaty of Versailles had limited the German air force and prohibited the creation of an aero-chemical defense system. Germans expressed their fears over the possibility of future aero-chemical raids throughout the 1920s, but poison gas truly began to saturate the collective cultural imagination beginning in 1928. As Büscher made clear, newspaper articles, artwork, plays, movies, science-fiction novels, and even many of the classic literary texts of the era began to ruminate on poison gas, either in passing scenes or as the central thematic concern. Such an explosion of cultural production, both popular and otherwise, certainly found a captive audience in the millions of German civilians who began to grip their newly bought gas masks ever tighter, trembling before a world in which chemical technologies made life far more contingent than ever before.

Of course, fears of chemical weapons and advanced warfare technology did have historical antecedents. Technological advancement has long served as a central concern in European thought and culture. For, as historians Melvin Kranzberg and Carroll Pursell stated in one of their foundational essays on the history of science and technology, *Homo spaniens* (or

[1] Vergiftungen durch Gasse 1928 (BArch-B) R/86/ Sig 2350 Ort 51 Mag M 1 08 Reihe 49

Thinking Man) is simultaneously *Homo faber* (or Creating Man).[2] As such, literary allegories abound in the western canon that attempt to grapple with the changes that technologies, from simple stone tools to tiny silicon computer chips, have enacted on human life. Many of the most famous of these stories, warn of the unknown dangers that these material transformations can bring. For instance, in 1797, Johann Wolfgang von Goethe wrote his famous fourteen-stanza poem entitled "The Sorcerer's Apprentice." Inspired by Lucian's *Philopseudes,* Goethe's well-known work describes a young apprentice who performs manual tasks for a sorcerer.[3]

A quick recapitulation of the narrative reminds us that the poem begins with the sorcerer leaving his workshop in the hands of his apprentice. Instructed to fetch water while the sorcerer is absent, the young apprentice eventually grows tired of his task and enchants a broom to take his place. The broom subsequently comes to life and continues to fetch pails of water until the workshop is flooded. Unable to disenchant the broom, the apprentice chops it apart with an axe, only to find that each splinter has become an entirely new broom that now continues to inundate the room with water. When the apprentice nearly drowns beneath the torrents, the old sorcerer reappears and disenchants the broom before all is lost. The poem ends with the apprentice bemoaning the use of spirits in the material world and swearing to leave all magic in the hands of his master.

Goethe's story, passed down in various forms through the ages, serves as a used allegory for the history of German militarized chemistry in the first half of the twentieth century. On the eve of World War I, the German chemical industry stood second to none in sheer size and global reach. The behemoth chemical companies like Bayer, BASF, and Höchst maintained their own

[2] Melvin Kranzberg and Carroll Pursell, *Technology in Western Civilization,* 739.
[3] "The Sorcerer's Apprentice" was made internationally famous through its adaptation in the 1940 Disney film *Fantasia.*

impressive research laboratories as well as significant connections to the groundbreaking chemical research undertaken by chemists at German technical universities. This close industrial-academic relationship proved crucial for Germany once war broke out in 1914. Most significantly, the chemist Fritz Haber, in coordination with BASF laboratories, succeeded in synthesizing nitrogen in order to continue the production of German explosives. Following this invaluable achievement, the German military brought scientific and industrial institutions closer to their own bureaucratic apparatus in the hope that they could provide technical solutions to the stalemate on the Western Front. This created a tripartite bureaucratic structure in which the German military bestowed power and status on businessmen and scientists in return for arms research and production.

Fritz Haber's wartime service most clearly represented this early military-industrial-academic complex. Haber, a German-Jewish chemist and head of the Kaiser Wilhelm Institute for Physical- and Electrochemistry, offered chlorine gas as a method for chasing the Allies from their now entrenched positions. On April 22, 1915, Haber and his hand-selected gas scientists released chlorine gas clouds toward Allied troops, leading to the asphyxiation of hundreds of French soldiers. The German state deemed this a massive success, and Haber was given a military rank with near total control of chemical weapons development.[4]

[4] Fritz Haber's son, the historian L.F. Haber, has produced several broad-ranging histories of the German chemical industry from the beginning of the 19th century through 1930. These economic overviews have stood the test of time as the most detailed accounts of the prerequisites for the German chemical weapons program. Margit Szöllösi-Janze and Dietrich Stoltzenberg have provided the most thorough biographies of Fritz Haber and evaluated his role in forging lasting industrial-academic-military ties. Historian Jeffrey A. Johnson's *The Kaiser's Chemists* has explored the ways in which the German chemistry was especially apt for national mobilization. See: Jeffrey Allan Johnson and Roy Macleod, eds, *Frontline and Factory: Comparative Perspectives on the Chemical Industry at War, 1914-1924* (Dordrecht: Springer, 2006) ; With the chemical industry in mind, Helmuth Trischler and Hans Weinberger have claimed that, "The First World War can thus be interpreted as a historical landmark in the rise of the military–industrial–academic complex… Fritz Haber…stands for the porous barrier that exists between military and civilian technology." Helmuth Trischler and Hans Weinberger, "Engineering Europe: Big Technologies and Military Systems in the Making of 20th Century Europe," 56.

Haber's attack on April 22, 1915 represented a massive escalation of chemical warfare, which had previously been rudimentary in nature.[5] Indeed, the release of 168 tons of chlorine gas and the involvement of academic scientists in direct warfare proved an unmistakable turning point in the war's narrative. According to the Allies, Haber and the Germans had broken the previously accepted rules of warfare and now there was no turning back. While other belligerent nations began to bring the full weight of their national chemical industries into the war, the Germans maintained a head-start that was subsequently augmented by Haber's discovery of new chemical weapons like mustard gas and the German military's adoption of new and improved gas tactics. However, this head start did not quickly or decisively win the war for the Germans. In fact, poison gas did little to help the German military in their early tactical efforts. Rather than providing a technological breakthrough, poison gas regularly bogged down the German troops and entered them into a newly dangerous and insidious form of modern warfare. By 1918, these changes fully expressed themselves on the battlefield through constant gas shell barrages that created a highly toxic world for the average infantrymen.[6]

Beyond proving a major turning point in the developmental histories of the military-industrial-academic complex and of "Big Science," both of which helped to define the remainder of the twentieth century, Fritz Haber's use of poison gas in World War I has been described as the birth of a new historical epoch. Indeed, the use of poison gas on the World War I battlefields introduced many Europeans to the central precepts of atmospheric terrorism. Gas weaponized the very air that supported human life. By insidiously wafting through the atmosphere and

[5] I mostly use poison gas and chemical weapons interchangeably throughout this work. Poison gas, the term most commonly used in World War I, is one of many chemical weapons. However, not all chemical weapons are gaseous. For instance, mustard gas is technically a liquid that can become airborne when fired in an explosive shell.
[6] The best comprehensive accounts of poison gas use in World War I are Olivier Lepick's *La Grande Guerre Chimique, 1914-1918* and L.F. Haber's *The Poisonous Cloud: Chemical Warfare in the First World War*. For studies that specifically focus on Germany's chemical weapons, Dieter Martinetz's work remains the most comprehensive.

suffocating soldiers in surprise attacks, poison gas turned the elements of life against humankind. Describing this phenomenon, the philosopher Peter Sloterdijk has written that:

> The attack on humans in gas warfare is about integrating the most fundamental strata of the biological conditions for life into the attack: the breather, by continuing his elementary habitus, i.e. the necessity to breathe, becomes at once a victim and an unwilling accomplice in his own annihilation.[7]

The unique methods of this new weapon clearly forced humanity to constantly consider both the methods of protection from such an attack and the chemical construction of their very environment. For Sloterdijk, such changes represent the birth of the modern mind, since "aesthetic modernity is a procedure of applying force not against people or things, but against unexplained cultural relations [e.g. the previously ignored atmospheric composition]."[8]

Several historians of the Holocaust have indirectly supported this claim by stressing the importance of industrial science and engineering in the realization of a distinctly modern genocide. Zygmunt Bauman, for instance, claimed the Holocaust as the defining moment in the German enthronement of the modern deity of science, or a realization of the new political and cultural forms of "high modernity."[9] Similarly, Michael Thad Allen has written that "Modernity is about the power of industrial technology to transform civilization," and that, "Only the Germans strove to use 'assembly-line' methods…Only the concentration camps statistically managed murder."[10] While the birth of a strictly delineated "modernity" is difficult to place in 1915, such scholars often make a strong case for the historical beginnings of potentially earth-shattering cultural and social changes during the course of World War I.

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[7] Peter Sloterdijk, *Terror from the Air,* 22-23.
[8] Ibid, 79.
[9] Zygmunt Bauman, Modernity and the Holocaust, 68. See also: Mark Roseman, "National Socialism and the Limits of 'Modernity," in *German Modernities from Wilhelm to Weimar: A Contest of Futures,* 331.
[10] Michael Thad Allen, "Modernity, the Holocaust, and Machines without History," in *Technologies of Power: Essays in Honor of Thomas Parke Hughes,* 176-177.

This study posits the realization of these potential changes among its historical actors as a specifically German "chemical-modernity," denoting the importance of poison gas for the sense of impending and unseen danger in the post-World War I German world. Here, "chemical modernity" refers to a distinct escalation and a greater sense of importance that many Germans afforded chemical weapons between 1915 and 1945. In this way, the distinctly German "chemical modernity" was an envisioned project that was part and parcel of the Nazi "high modernity" regularly discussed by Holocaust scholars. The inherent risks of poison gas made it a central focus for interwar scientists and military men who wished to create rational bureaucratic and technological structures that could harness and control the powers of chemical weapons. This was part of high-modernity's larger attempt to mitigate or control the risks of modern life and it was most substantiated by the Nazis' attempts to protect the German nation from aerial gas attacks while redirecting gas towards their chosen enemies in the 1930s and 40s.[11]

Immediately after World War I, laboratory research conducted under the auspices of Fritz Haber sought peace-time applications for the chemicals of gas warfare like chlorine, phosgene, and hydrocyanic acid. The most prominent reapplication was in pesticides, where a derivative of hydrocyanic acid called Zyklon B proved especially useful in the process of de-lousing granaries and other agricultural buildings. In the 1920s, German scientists conducted pesticide research alongside the clandestine continuation of chemical weapons studies and the continual production of German poison gases in Soviet Russia. At the same time, debates between anti-gas activists and the scientists and engineers who worked in the chemical field brought poison gas production under intense public scrutiny. Indeed, gas metaphorically hung over the German interwar imagination and caustically ate its way deep into the bones of contemporary observers. It was in

[11] For a similar project of high-modernity that attempted to mitigate the inherent risks of modern life, see: Young-Sun Hong, *Welfare, Modernity, and the Weimar State, 1919-1933*, 203.

this moment of heightened fear that a loosely affiliated group of scientists and engineers, described as gas-specialists, took center stage to assure the German people that protection from poison gas was indeed possible. Pulling on the experience of World War I soldiers, these men claimed that Germans could certainly survive in a world permeated by poison gas as long as they maintained the correct technology, knowledge, and personal discipline. Through these modern technologies, the gas specialists envisioned their own "chemical modernity" in which the risks of chemical death could be controlled and possibly redirected.

In his works, *Risk Society* and *World at Risk*, the sociologist Ulrich Beck has asserted that such modern projects of rationalization and industrialization are only possible through a so-called "risk calculus" that grants political power to legal and governmental institutions in order to combat unforeseen risks such as global pollution, newly discovered diseases, urban crime, and industrialized warfare.[12] In this newly modern world, humans are constantly exposed to such large-scale problems, all of which were created or exacerbated by the process of modernization itself. In this ironic sense, humans have manufactured the very crises that they build intricate social structures to counteract.[13] For Beck, this is an ongoing process that has reached a critical point. By the late twentieth century, the risk-mitigating engineering projects of European society became far too large and too dangerous for individuals to undertake on their own. Science and technology have become increasingly necessary to protect humanity from widespread catastrophe, while also slowly losing social credibility due to the ancillary risks that are invariably part of this process.[14] The risk-mitigating experts of the early twentieth century have

[12] Ulrich Beck, *World at Risk*, 26. See also: Frank Furedi, Culture of Fear: Risk-taking and the Morality of Low Expectation (London: Cassell, 1997)
[13] Ulrich Beck, *Risk Society: Towards a New Modernity*, 183.
[14] Ulrich Beck, *Risk Society: Towards a New Modernity*, 156.

been forced to cede ground as "we increasingly live on a high technological frontier which absolutely no one completely understands and which generates a diversity of possible futures."[15]

With the realities of contemporary life in mind, this project pushes Beck's insights back to a moment in which risk-mitigating technocrats who focused on these early twentieth century fears of poison gas reached their apex of institutional power. While German chemists under Fritz Haber developed weaponized gases to quickly and "humanely" win World War I, the infantrymen who experienced the constant gas bombardments of 1918 distinctly expressed their fears of this new weapon in the interwar period, often advocating for an end to chemical warfare. In the political arena, the German government struggled to ensure that poison gas would never be used again due to an international unwillingness to forgo gas' battlefield advantage in a future war. With advances in airplane and bombing technology, the presumed division between the frontline and the home-front had collapsed. According to interwar military theorists, air forces could and would now conduct aero-chemical attacks on both soldiers and civilians alike. Indeed, the very technology that was meant to guarantee victory on the Western Front had now seemingly slipped from German control, now serving to terrorize the nation's citizens. Interwar sentiments of fear and regret over the German introduction of chemical weapon technology now echoed that of Goethe's young apprentice.

In the midst of this problem, the gas specialists presented the clearest and most attractive answer. Since World War I, scientists and engineers under the supervision of Haber had produced gas protection technologies and outlined gas discipline in tandem with production of new battle gases. Combined with a commitment to a martial discipline of the trenches, the gas mask served as the gas specialists' fundamental answer to national gas protection in the years

[15] Jane Franklin, *The Politics of Risk Society*, 25.

following the war. According to this group comprised of chemists, toxicologists, pharmacologists, and gas mask manufacturers, if the government could provide enough gas masks and train its citizens sufficiently, then regular German civilians could survive aerial chemical bombardment. Short of the enormous cost involved in outfitting every German with a gas mask, this solution appeared simple and straight-forward; it allowed the German people a tangible sense of protection and did not rely on the seemingly immaterial agreements of international law. Of course, this prescription was also not without partisan interest since gas mask distribution and air raid training would provide the gas specialists with significant government contracts and substantial institutional power.

The gas specialists' stress on national protection struck resonant chords with nationalist and other right-wing desires for interwar national rearmament. With their rise to power in 1933, the Nazis institutionalized many of the gas specialists' calls to action through the creation of the centralized *Reichsluftschutzbund* (RLB), or Reich Civil Defense League. The eight million German volunteers who joined the *Reichsluftschutzbund* ensured that practically every German received training for aerial attacks. Historian Peter Fritzsche's monograph *Nation of Fliers* and his article "Machine Dreams: Airmindedness and the Reinvention of Germany" have explored the extent to which the *Reichsluftschutzbund's* air protection training exploited citizens' feelings of risk and vulnerability in the creation of an idealized political community. While total protection was assuredly impossible, the attempted universal distribution of gas masks, starting in 1937, provided a material site of comfort for the average German and served as the Nazis' assurance of national readiness. While some gas specialists publicly expressed concerns over civilian mask distribution procedures, most were willing to support any measure that made aero-chemical protection a daily concern. In this way, the gas specialists easily translated their work

under the Nazi regime and briefly thrived in a social world permeated by national defense concerns. As mid-level bureaucrats and administrators, these men were central figures in the creation of a Nazi national air defense community comprised of supposedly pliable German subjects.[16]

Ultimately, the many German precautions against gas attacks came to little use during the Second World War. Nevertheless, they did help to craft the *Volksgemeinschaft* (or people's community) of air and gas protection on both a rhetorical and embodied level.[17] Through the social practice of pulling the gas mask over their heads and conducting gas drills, many Germans entered (if only briefly) into a Nazi social world that defined itself through violent chemical struggle against the perceived enemies of the people. As such, the *Reichsluftschutzbund* came closest to realizing the dream of a German "chemical modernity," in which the constant threat of chemical attack was not just overcome through technological augmentation and steely determination, but also mastered and redirected towards others who had failed to protect themselves from the newly poisoned atmosphere.[18] Thus, while gas was never used on the

[16] This study favors a structuralist approach to the Nazi air raid community that stresses the agency and choices of the gas specialists. For this reason, this study strengthens the arguments of scholars like Ingo Haar, Michael Fahlbusch, Tiago Saraiva, and Michael Thad Allen.

[17] In several scholarly articles and the book *At Home and Under Fire,* Susan Grayzel has revealed a similar process of air protection community building in Great Britain. She argues that air and gas protection played a strong role in codifying new gender roles and creating the "stoic civilian." Bernd Lemke's comparative study of the air protection community in Great Britain and Germany, *Luftschutz in Grossbritannien und Deutschland 1923 bis 1939,* supports Grayzel's differentiation between Britain's "domesticated air raid" and Germany's "militarization of the civilian." This becomes particularly clear when comparing Germany's evacuation policies in relations to those of Britain and France. Julia S. Torrie's *"For their Own Good": Civilian Evacuations in Germany and France, 1939-1945* does just that, revealing the ways in which Nazi Germany denied the possibility of evacuation in the event of an aero-chemical attack. While French citizens could be moved west, Germans would have to rely on their training and personal/community resolve to survive. They would have to pass through the poisoned world in order to become its master.

[18] Florian Schmaltz's *Kampfstoff-Forschung im Nationalsozialismus" Zur Kooperation von Kaiser-Wilhelm Instituten, Militär und Industrie* remains the best account of the Nazi development of nerve gases and the testing of gas on concentration camp inmates.

battlefields of World War II, it appeared a fitting tool for the extermination of those non-citizens described as too weak to enact the necessary discipline in a chemically precarious world.

In the recent historiography on modern Germany, the Holocaust often serves as the defining moment in which the technology of "high modernity" fully broke free from human control. The standard argument claims that the Nazis promoted technologies of death for their own sake, designing assembly-line gas chambers as the arbiters of human life.[19] For instance, the preeminent historians Konrad Jarausch and Michael Geyer write of the Holocaust:

> Modernity was implicated through the scientific guise of racism, which justified the annihilation of inferior life; it was also present through the bureaucratic state, which provided the efficient organization of the killing; and it was instrumental in the use of advanced technology such as poison gas, to implement the mass extermination.[20]

For this reason alone, many students of German history see stories like "The Sorcerer's Apprentice" as self-fulfilling Germanic prophesies. The structures and material creations of German science and technology, which had for so long been the pride of the German nation, subsequently revealed the dark side of modernity through their application in the gas chambers. Indeed, Goethe's poem presents the reader with the potential problems of a human mindset that is overly committed to providing solutions through the practical application of knowledge. The ancient Greeks described this "means to an end" rationality as *technik,* the etymological root of the word "technology." In the decades that followed World War I, several important German intellectuals, including Oswald Spengler, Ernst Jünger, and Martin Heidegger, picked up this idea of *technik* and reevaluated it in the German interwar context, thus feeding into or obliquely critiquing the gas specialists' attempt to harness and control poison gas.

[19] Michael Thad Allen, "Modernity, the Holocaust, and Machines without History," in *Technologies of Power: Essays in Honor of Thomas Parke Hughes*, 177.
[20] Konrad Jarausch and Michael Geyer, *Shattered Past: Reconstructing German Histories,* 99.

However, Goethe's tale also provides the reader with more than just a final allegorical warning. The story also features several distinct technological artifacts that contribute to the apprentice's peril, allowing for broader theoretical thinking about the nature of technology across time. Goethe first introduces us to the apprentice's broom, a concrete example of a simple piece of technology. Normally, the apprentice could employ the broom to manually sweep the floor. But once enchanted, its previously submerged possibilities make it a dangerous foe for its former master. The broom's newfound ability to carry a bucket allows it to fetch water and begin its destructive task. In fact, the broom becomes both "like a whirlwind" and "like an engine," tapping into the powers of both the natural world and human built technology at a demonical pace. The broom, in fact, can be read as a Frankenstein's monster of sorts, taking on the bipedalism of a human and replicating the apprentice's daily chores in a seemingly unnatural way. The pail, as an ancillary piece of technology, becomes tied to the broom in its quest for destruction. Like the pail, the apprentice's hatchet is also implicated in the broom's unholy task. After the apprentice attempts to destroy the broom with his hatchet, he in inadvertently splits the broom into two "infernal" servants. In other words, with the impetus of human *technik,* these three simple technologies operate in a relational web that slips out of human control, now bringing danger back upon its creator.[21]

Several theorists of technology have hit upon the importance of such technological webs in the course of modern history. In his 1954 book, *The Technological Society,* Jacques Ellul argued that the twentieth century was dominated by what he called "technique," or "the totality of methods rationally arrived at and having absolute efficiency…in every field of human

[21] In modern German literature, Franz Kafka's "In the Penal Colony" most clearly explores this technological theme. First published in 1919, Kafka's story reveals the ways in which machines are produced by a particular epistemic order and the ways in which machines can literally inscribe this order back onto humanity.

activity."[22] According to Ellul, humanity's reliance on rational thinking and applied science created social conditions that conformed to the smooth and efficient rhythms of the machine. Consequently, Ellul claims that we have become slaves to the possibility of technological creation, suppressing human freedom and binding ourselves to an increasingly authoritarian technological system. Martin Heidegger developed a similar theme in his well-known 1954 essay "The Question Concerning Technology." For Heidegger, the modern commitment to technology for its own sake has resigned humanity to a "standing reserve," or a pool of raw materials waiting for exploitation.[23]

Ellul and Heidegger's insights should make us at least interrogate the perceived value of technological creations, especially in relation to questions of ethics or morality. Frequently, however, proponents of technological thinking have skirted such questions by claiming that technology is neither inherently good nor evil. Rather, the ethics of technology are decided by the human use of a given object. The German scientists and engineers who created poison gas and its various ancillary technologies frequently employed this line of reasoning to defend their research and development choices. For instance, the gas specialist Rudolf Hanslian wrote in defense of poison gas, "The High Goddess of Science has a double-edged sword. Depending on how man evaluates their achievements in practice, they can serve the good of humanity, but also lead to their ruin."[24] However, theorists like Ellul, Günther Anders, and Langdon Winner have countered these claims. Winner hits at the heart of the issue, writing:

> Is technology a neutral tool to human ends? No longer can an affirmative answer be given without severe qualifications. The most spectacular of our implements often frustrate our ends and intentions for them. Skepticism greets the promise that our

[22] Jacques Ellul, *The Technological Society*, xxv.
[23] Martin Heidegger, *The Question Concerning Technology and Other Essays*, 17.
[24] Rudolf Hanslian, *Vom Gaskrieg zum Atomkrieg: Die Entwicklung der wissenschaftlichen Waffen*, 8.

> transportation crisis will be solved by a bigger plane or a wider road, mental illness with a pill, poverty with a law, slums with a bulldozer, urban conflict with a gas.[25]

For these theorists, the concept of "use" has long been too narrowly defined. Proponents of unrestricted technological thinking have traditionally bracketed the moment of use in space and time. To their minds, a human picks up a tool and then begins to decide how it should be used. But as Winner makes clear, technologies are already interwoven into the cultural fabric of humanity before the moment of praxis. Riffing on the initial insights of Karl Marx, Winner claims that "human beings do make their world, but they are also made by it."[26] Thus, the existence of a given technology presents, if not demands, the very possibilities of its use[27]. The value judgements and ethical positions of these various uses are built into the technology itself. Winner writes, "As [technologies] become woven into the texture of everyday existence, the devices, techniques, and systems we adopt shed their tool-like qualities to become part of our very humanity."[28]

Philosopher Eric Katz and historian Michael Thad Allen have applied these theoretical insights to historical studies of Nazi engineering projects. In this historical case, Katz and Allen argue that the Nazi gas chambers were inherently immoral technologies rather than value-neutral tools used for a clearly immoral purpose. Katz writes, "Technological systems were created, organized, and operated from within a specific Nazi world-view, and thus they actualized the values of Nazi culture to create a New World Order."[29] By revealing the precise details of the means of human genocide, Allen insists that these technologies could not have been created or

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[25] Langdon Winner, Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought, 29.
[26] Ibid, 88.
[27] The sociologist Anthony Giddens has described modern capitalistic society and its tendency toward the technological as a juggernaut, "a runaway engine of enormous power which, collectively as human beings, we can drive to some extent but which also threatens to rush out of control and which could rend itself asunder." Anthony Giddens, *The Consequences of Modernity*, 139.
[28] Langdon Winner, The Whale and the Reactor, 12.
[29] Eric Katz, "On the neutrality of technology: The Holocaust death camps as a counter-example," 420.

used for any other purpose because they were in fact saturated with Nazi ideology.[30] The Zyklon-B gas used in these chambers is included in this technological system, forcing us to reflect on the ethical choices involved in the creation of industrial chemical weapons. When we do, we see that Fritz Haber's decision to use chlorine gas on the battlefield of World War I and his continual insistence on the ethical neutrality of gas in the interwar period were essential for setting the historical stage on which the Nazis attempted chemical genocide. Without the invention of early gasses and the continual search for new and often dubious applications, the gas chambers would not have been such a real possibility. This is not to draw a direct line of causation between Fritz Haber's scientific commitments in World War I to the gas chambers of Auschwitz, but the nationalized and militarized understanding of science and technology that crystallized in the war was essential for later industrialized genocide.

While poison gas inspired varying interpretations that often mixed awe with the fears of regular interwar Germans, its continual production and use required steadfast supporters like Haber and the later gas specialists. These men mixed claims about the ultimately humane nature of chemical weapons with arguments about their inevitable production. It is their story that reveals the importance of dogmatic technocratic thinking for the propagation of these deadly technologies. It was precisely this lack of alternatives to poison gas research that subsumed the scientists' humanistic intentions to the developmental drive of the technology itself; in other words, this was a moment of technological determinism in history. Pulling on Heidegger's technological insights, the philosopher Günther Anders warned of the rise of the technocrat in the twentieth century. For Anders, the technocrat continually promoted technology with no end in mind other than the furtherance of technological creation. Whether this was due to a love of

[30] Michael Thad Allen, "The Devil in the Details: The Gas Chambers of Birkenau, October 1941," 208. See also: Christian Ingrao, *Believe and Destroy*, xi.

scientific study or financial gain, the perpetual advance of technology for its own sake subsumed the will of humanity to that of technology in the unfolding of history.[31] According to Anders, the logical consequence of this supreme valuation of technology was apocalyptic genocide. Thus, for Anders, the story of the twentieth century was (and is) defined by technology's escape from human control, leading to the eventual destruction of all humankind.[32]

Admittedly, the gas specialists were not only quietly peddling the means of destruction in the 1920s and 30s, but also actively promoting protective technologies like the gas mask. But as Günther Anders, Langdon Winner, Bruno Latour, and Goethe's poem all reveal, all technologies exist in expansive networks of interrelation. Unfortunately, as Latour has repeatedly noted, technology is often treated as a "black box," meaning that the discovery and production processes of technological objects is simplified into a convenient narrative focused on the heroic discovery of a technology's intended purpose. Simple historical accounts evoke an abridged scientific method in which a distinct problem is solved by a single inventor's careful testing and application.[33] But the creation of technological objects rather relies on an infinitely complicated series of interactions between countless human and non-human actors. This system of technological relations is part of what Langdon Winner has termed the "technological order" of the modern world.[34] As Ulrich Beck has noted in his sociological studies of late modernity, each technological solution creates a new problem that appears to require a new techno-fix, thus driving forward technological creation at increasingly dangerous speeds. Thus, if we start with

[31] Günther Anders, Die Antiquiertheit des Menschen: Über die Zerstörung des Lebens im Zeitalter der dritten industriellen Revolution, 1.
[32] Paul van Dijk, Anthropology in the Age of Technology: the Philosophical Contributions of Günther Anders, 35.
[33] Bruno Latour, Science in Action: How to Follow Scientists and Engineers Through Society, 137.
[34] Langdon Winner, Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought, 191.

poison gas at the center of one technological web, the gas mask is one of the first ancillary techno-fixes that requires our attention.

In 1915, the chemist Richard Willstätter and other members of Fritz Haber's Kaiser Wilhelm Institute developed the modern military gas mask in order to save German soldiers from chlorine gas inhalation. The success of the gas mask inspired the development of numerous other gas protection technologies, from gas suits to gas sirens. Scientists and engineers described the development of the mask as a humanitarian effort, one that would protect soldiers from the unnecessary suffering of gas asphyxiation. However, the mask's initial successes also encouraged the development of poison gases that could circumvent it. In fact, a large majority of World War I chemical warfare technologies were developed with the intention of breaking the mask. Mustard gas, Lewisite, and arsenic-based gases like Zyklon B are just a few of the chemical technologies created to subvert the gas mask. Both during the war and afterwards, the fallibility of the gas mask was never fully solved. Indeed, it was partly due to the fact that the mask was not perfect, often failing due to technological imprecision and/or improper handling, that German civilians so feared aero-chemical attacks in the 1920s. Thus, the gas specialists and the *Reichsluftschutzbund* proposed a distinctly imperfect technological solution when they attempted to provide gas masks to all German citizens. Not only was the gas mask imperfect when put to use, but it was culturally linked with the gas war and the further development of chemical weapons.

While the gas mask could not completely protect the citizens of the Third Reich, it did prove very useful for several ideological functions. The mask served as a material site for entering civilians into the Nazis' envisioned national community of aero-chemical protection. By pulling on the mask and transforming into chemically resistant cyborgs, civilians gave a certain

level of implicit consent to both a uniquely German "chemical-modernity" in which technological augmentation would lead to the nation's mastery of the natural world and a Nazi state that continued to invest in nerve gas research and production. Thus, the gas mask remained intimately connected to poison gas, both counteracting some of its deadly effects and encouraging its continual development. For this reason, the gas mask maintained a politics of fear and violence that persisted from 1915 to 1945. And while the gas specialists expressed varying levels of commitment to Nazi ideology, their insistence on technocratic solutions for national protection conformed to the Nazi worldview at the most basic level of Social Darwinian geopolitics. This fact should make us consider the many ways in which the most sober technocrats, as well as their proposed technologies, assisted in the grand Nazi project of racialized geopolitical struggle.

Admittedly, one could tell this story solely through a detailed study of poison gas. However, poison gas was and is a uniquely ephemeral technological object. It was both difficult to detect and never actually employed on the battlefield after World War I. The gas mask, on the other hand, both reveals the interconnectedness of numerous chemical technologies and provides a material site for German civilian interactions with the technologies of chemical warfare. Moreover, it is not a stretch to imagine that most contemporary readers would be willing to set aside a value-neutral conception of technology in order to condemn the chemical weapons used in war and genocide. Unfortunately, this same impulse does not always extend to a serious evaluation of seemingly benign or protective technologies that populate our daily lives.[35] By examining lived experience with the gas mask through German ego documents, this project explores how the mask, rather than the gas itself, introduced both soldiers and civilians in post-

[35] This certainly seems to be true of the surgical mask, which exploded in production and use in the spring of 2020.

World War I Germany to the pervasive presence of technological possibility, mediation, and failure.

Complicating contemporary obsessions with the dawn of the nuclear age, poison gas was in fact the first industrialized weapon of atmo-terrorism. Like the atomic bomb, poison gas' ability to weaponize the environment forced Germans to rethink the concept of both individual and national security. The gas mask was the first line of defense against an insidious weapon that could seemingly permeate the atmosphere at any moment. Thus, the gas mask posed a new and unstable relationship between humanity and technology which recast both the experience and the concept of the natural. The very air around one's body could bring a nightmarish death, and the simple act of breathing could no longer be taken for granted.[36] As contemporaries in the postwar period grappled both practically and philosophically with poison gas and the gas mask, they contended with an insistent and newly unstable technological world. In this way, the German story exposes the ways in which the psychological categories of danger, risk, management, and mastery informed the German relationship to technology in the early twentieth century. At the same time, through a narrative that exposes the power of the gas mask to alter these same categories, the study reveals the ability of one particular technology to shape modern subjectivity.

These concerns have massive import for a longer history that affects the entire globe. In its second and broader usage, "chemical modernity" refers to the long epoch in which industrial chemicals and environmental pollutants have come to quietly define modern life. Since the industrial and scientific advances of the Chemical Revolution, work with and among invisible

[36] The American botanist later termed the use of such environmentally destructive weapons "ecocide," or "the willfully and permanent destruction of environment in which a people can live in a manner of their own choosing. Galston coined the term in 1970 as an indictment of the United States' use of the defoliant Agent Orange in the Vietnam War. David Zierler, *The Invention of Ecocide,* 25.

chemicals in both industrial and everyday settings has changed the ways in which humans relate to their environment. With the presence and realization of invisible but potentially life-threatening gasses, humanity can longer assume that its atmosphere will support life. When living in this state of uncertainty, terror and potential death lurk in every breath. It is precisely this fear that allows certain actors to weaponize our own chemically-unstable world against us. Since the German invention of industrialized poison gas, fears over the ability to manipulate the environment for homicidal purposes have beset the modern mind. From "gas psychosis" to "Atomic fear" (and now perhaps environmental dread), dangers lurking anywhere from the microscopic to the astronomic express a fundamental feature of what it means to be human in the 20th and 21st centuries. The German author Jörg Friedrich has made this apparent in his provocative writings on the bombing campaigns during the Second World War:

> Now, through heat, radiation, and toxic gases, the very air was being transformed into something unlivable. The incendiary weapon and the subsequent atomic weapon of World War II introduced the notion of extracting a state of destruction from the workings of general laws of nature. Reality was no longer a place in which to dwell of even do battle. Living space became a death zone.[37]

In this new world, "Mother Earth," or the biomass, is the new ground on which the battles of total war are to be waged. The advance in weapons technology over the last one hundred years, in coordination with the large-scale environmental changes that are already underway, means that this new war will quite possibly be a true struggle for mere existence.[38] We can see the unfolding of this dynamic in everything from the use of poison gas in recent Middle Eastern conflicts to the imagined future wars over clean air and water that the current environmental crisis portends. In these instances, the same questions over danger, risk, management, and mastery that animated early 20th century German debates again take center

[37] Jörg Friedrich, *The Fire*, 84.
[38] Roy Scranton, *Learning to Die in the Anthropocene,* 19.

stage in our minds. Admittedly, destroying dams, burning fields, and reducing cities to rubble have long been part of the practice of warfare. But with the arrival of weapons like poison gas in the early 20th century (even before the development of incendiary bombs and atomic weapons), these threats, at least in the minds of both their presumed masters and victims, took on potentially apocalyptic powers. Thus, atmospheric total war and the questions surrounding human survival will undoubtedly have massive implications for that way in which we narrate our history, our future, and our contemporary moment. Since the era of atmospheric total war is still the era in which we live today, this project refers to this grand "chemical modernity" in order to make diachronic connections between the climactic German case and our more contemporary concerns.[39] Specifically, it asks us to consider the implications of technological fixes for technologically induced problems that now quickly move between the intimately local and the distinctly global.[40] For, as writer Roy Scranton has so provocatively claimed, perhaps it is now that we should "let go of this particular way of life and its ideas of utility, freedom, success, and failure."[41]

The first chapter of the project begins by historicizing the German development of poison gasses during the First World War. As the head of the Kaiser Wilhelm Institute for Physical and Electrochemistry, Fritz Haber posited technology as a harnessing of the powers of nature for service to the state. His commitment to both the value of science and the imperial German state allowed him to justify his constant push for the use of chemical weapons as a national duty. He

[39] While Peter Sloterdijk claims 1915 as the birth of a new modernity, this project only seeks to claim 1915 as the birth of industrialized atmospheric terrorism, thus displacing the grandiose claims about the "birth of the Atomic age." Countering Sloterdijk, I acknowledge that the German story of chemical weapons sits within a much longer history that takes seriously the deaths and illnesses of 18th and 19th century workers who were exposed to poisonous chemicals, smog, and any other atmospheric toxins.
[40] For similar concerns see: Katharina Gerstenberger and Tanja Nusser, *Catastrophe and Catharsis: Perspectives on Disaster and Redemption in German Culture and Beyond*, 14.
[41] Roy Scranton, *Learning to Die in the Anthropocene,* 24.

was convinced that Germany would win the war through technical warfare and that battlefield technologies like poison gas would eventually benefit mankind. Following Haber's suggestion to use chlorine gas as a weapon, the military debate over the use of these chemical weapons prior to their ultimate deployment in 1915 and the eventual public outrage over this use demonstrated an early distrust of unknown technology. Ultimately, due to the Germans' inability to mobilize the Western Front, Haber's proposal won the day. Employing German military archival files and personal papers from various scientists and soldiers, this chapter reveals that the use of chlorine did not accelerate the war, but rather generated a toxic nightmare in which all belligerent nations raced to find the most lethal gasses. This military buildup demanded a massive yet efficient scientific and industrial structure. Haber's skill in building such a bureaucracy serves as one of the earliest instantiations of the military-industrial-academic complex and his government funded projects can be classified as an early prototype for "Big Science."

The second chapter provides a history of the modern gas mask, first produced in 1915 at the Kaiser Wilhelm Institute. The subsequent manufacture of over eight million gas masks was both a resistance to the reality of a "chemical modernity" and an integral factor in the continued attempt at the realization of such an existence. If an airborne weapon of annihilation was to be created, it would now have to be able to break the mask. By intertwining the historical development of gas with that of respirators and gas masks, the moments in which a "chemical modernity" were conceived and pursued fully come into focus. An interrogation of Germany's pursuit for chemical dominance in World War I allows one to evaluate scientists' and engineers' claims to chemical protection. Many insisted that the combination of technological knowledge and personal discipline would allow German soldiers to conquer a toxic environment.

The third chapter utilizes soldiers' writings to indicate that contrary to the developers' assumption that the gas mask would always be seen as a life-saving device, combatants were more frequently frightened of both the image of the gas mask on others and the physical feeling of the gas mask against their own bodies. While soldiers did receive gas training, it often only served to rattle the nerves and demonstrate the many ways in which masks could malfunction. Sitting in the trenches, soldiers feared both the uncoordinated and creeping nature of gas and the smothering feeling of the affixed gas mask. By examining the sensorial and metaphorical language in a wide array of soldier diaries, trench journals, and troop reports, this chapter seeks to construct an embodied experience to reveal how World War I soldiers viewed humanity's precarious role in a modernity seeped with gas. Contrary to Haber's belief in the ability to master the new technology, many soldiers saw it terrorizing and territorializing their lives.

The fourth chapter engages with trauma and memory studies in order to bring a medical perspective to bear on the lived experience of World War I soldiers. Military doctors often downplayed the medical reports of gassed soldiers by claiming that these soldiers had predispositions to pulmonary illness or constitutional weakness. Many physicians saw what was called gas-neurosis as an affront to their concept of German masculinity, which were shaped by broader political understandings of national health. Thus, doctors often dismissed gas symptoms that could develop years after the war (chronic coughing, dizziness, lung inflammation, insomnia, hallucinations). These doctors exposed the limits of interpersonal, professional, and social sympathy for soldier experiences and ultimately silenced the voices of many who had experienced gas first-hand and rejected the technology outright. Much like Haber, the German medical community continued to view gas as something that could be controlled and treated with

the proper application of science and medicine. Tellingly, these WWI medical professionals often became gas specialists or wrote for gas protection journals in the 1930s.

The fifth chapter continues the narrative of German poison gas production in the 1920s. Most of this production and research was either hidden under the guise of pesticide research or conducted in the Soviet Union through secret armament deals. The larger discussion that surrounded rearmament and poison gas production inspired a significant pacifist response in the mid-1920s. Focusing on the female scientist, Gertrud Woker, this chapter reveals the rhetorical methods with which pacifists critiqued poison gas research and use. The anti-gas movement inspired several international disarmament and peace treaties throughout the 1920s. However, the enforcement and popularization of these treaties was difficult in a period defined by fears over national security and visions of future aero-chemical war. A 1928 gas leak at a Hamburg chemical plant stoked these fears and encouraged the swift political rise of the so-called gas specialists. Through their gas protection journals and their public demonstrations, they succeeded in putting pressure on the Weimar government to increase civilian air and gas protection through partial German rearmament.

The sixth chapter traces the genealogy of interwar intellectual writings on warfare technology. Several of the most influential German interwar intellectuals were veterans of World War I, having experienced gas attacks and used gas masks during their wartime service. This lived experience, as part of the individual soldier's history, persisted after the war. Thus, the memories, war representations, and the actions of soldiers-turned-intellectuals during the 1920s and 30s were demonstrably linked to their war experience. Further, the continued contact with relentlessly changing and often dangerous technology (typified by the gas mask) exemplified how the mental uncertainty and instability of early 20th century Germany informed and shaped

various attitudes towards modernity among those who had fought in the war. Arguments over the controllability of poison gas and the viability of gas discipline most clearly played out in the writings of Ernst Jünger, Walter Benjamin, and Martin Heidegger. These men conceived highly theoretical visions of warfare technology that represented various German ideological commitments in the Weimar Republic. The Nazi political takeover in 1933 and their subsequent rearmament denoted the ascendancy of Jünger's belief in modern man's ability to discipline and technologically augment his body in order to survive in a world permeated by gas.

The seventh chapter examines the writings of the self-proclaimed gas specialists in their various gas protection journals. Through these writings, a group of personally and professionally connected scientists and engineers heightened the German public's concern for gas preparedness and called for both increased gas drills and familiarization with gas protection technology. This created a public desire for visible steps toward national protection, most commonly gas mask distribution. The Weimar government's inability to provide such a large quantity of gas masks, coupled with the 1928 Hamburg gas leak, contributed to the Nazis' rise to power through their assurances of visible steps towards national gas protection. Alongside the creation of the National Air Protection League (*Reichsluftschutzbund*), the Nazis intended to provide gas masks as both a mental comfort and a corrective device in the domestic sphere of the average German civilian. In doing so, the gas mask served as a visible object of discipline in Nazi Germany. Civilians were required to keep their masks nearby, ready to pull it onto their faces at a moment's notice. Certain resistance to the mask persisted, but on a national level, the gas mask did work to make regular Germans into complicit accessories of the Nazi regime.

The epilogue considers the ways in which the gas mask maintained a distinct set of politics that encouraged Germans to differentiate friends and enemies, citizens and non-citizens,

masters and victims. While still described as a protective and salutary technology, the gas mask served as one of the many tools involved in the means of genocide employed during the Holocaust. As part of the most infamous tools of the murder, the gas mask sat affixed to the faces of SS-men as they filled the gas chambers with Zyklon-B and consigned other humans to a chemically induced death. Without drawing direct lines of causation between the 1915 German deployment of gas and its reapplication in the gas chambers, the epilogue weaves threads between the technological proposals of the gas specialists, the rhetorical racism of Nazi geopolitics, and chemical genocide. The short conclusion makes broad connections between this German story and the continued modern concern for the chemical construction of the environment. To this day, we can see the ways in which protective technologies are pitched as a quick fix and used to ignore the deeply structural problems of environmental catastrophe. In this way, techno-fixes regularly justify a dangerous and often-violent technological order that spirals ever further from humanity's grasp.

CHAPTER 1: THE STRUCTURES OF VIOLENCE: FRITZ HABER AND THE INSTITUTIONALIZATION OF GAS WARFARE

The Second Battle of Ypres is often cited as the first modern use of chemical weapons.[42] On April 22, 1915, outside the small Belgian town of Ypres, German troops released chlorine gas towards French colonial soldiers. Military reports claim that the French lines dissolved in panic as men ran choking from the eerie yellowish-green gas that crept towards them. Two days later, gas was again used against Canadian troops who bravely stood their ground among the deadly swirling clouds. The British military claimed that the attacks killed 15,000 men and injured another 5,000, while London newspapers published illustrations of French soldiers in their bright blue uniforms falling to the ground and grasping at their throats.[43] Numerous related op-eds decried the perfidious German use of chemical weapons. In response, the Entente powers ordered the manufacture and distribution of thousands of cloth pads saturated with gas neutralizing chemicals, hoping that this stopgap measure would help their boys withstand the sinister German weapon.

While this story certainly creates an emotive image, the realities of the Second Battle of Ypres do not conform to such a stark morality tale. The German chlorine gas was not nearly so effective as the Allied press claimed and far fewer men were injured or killed. Rather, Ypres was a partly-realized fragment in a long process of scientific, industrial, and military collaboration that developed through fits and starts in the 19th and 20th centuries. Certainly, the attack at Ypres had massive implications for the methods of chemical warfare in World War I, the technological development of the gas mask, and the propaganda war that proved exceedingly important during and after the war, but the sheer efficacy of the chlorine attack was dubious at best. Furthermore,

[42] The German gas pioneer Otto Lummitsch even wrote that Ypres was "the first gas attack in military history". Otto Lummitsch, "Meine Erinnerungen an Geheimrat Prof. Dr. Haber" (MPG) Dept. Va, Rep 5, 1480.
[43] See: Rudolf Hanslian, *Der chemische Krieg*, Tafel 2.

contrary to the reports of many politicians, military commanders, and common soldiers, this was not the first use of chemical gasses in World War I, and it was certainly not the first European meditation on chemical weapons.

Ypres serves better as a study of the process by which the German military collaborated with and absorbed both research scientists and industrial firms into its own institutional structures. Certainly, scientists had helped in providing military technologies well before 1915, and national armies had required supplies and armaments from industrial factories throughout the 19th century. But Ypres was a moment when a formerly academic scientist was given a military rank in the hope that his scientific knowledge could win a war. In fact, German military divisions were created and tactics were drafted to conform to the ideas of a man who had no previous training in military strategy. Through this position, this same scientist was able to strengthen his already intimate connections to the leading chemical firms in Germany, thus creating a formal German military bureaucracy that encompassed members of the scientific community and leaders in industrial chemical production. Other industrialized nations copied this same process to some extent, but it was the sheer scale and fluidity of the German institutional hierarchy. and its swifter development, that allowed the Germans to dominate in the design and application of chemical warfare until 1918. This was an important initial step in the realization of both the "Big Science" and the "military-industrial complex" that later helped to define the political, military, and scientific worlds of the mid-twentieth century.

Prophecies of Poison: International Law before the War

In 1908, the British Lord Panmure released a selection of his correspondence, then called the *Panmure Papers.*[44] Letters between Lord Panmure, Lord Palmerston, and Admiral Dundonald revealed that Dundonald had suggested using sulfur fumes to take Sevastapol in the Crimean War.[45] Ultimately the British War Office decided against the use of chemical weapons, stating that they were both contrary to the received rules of war and morally detestable. The British scientist and liberal politician, Lord Playfair, found this rationale hypocritical, pointing out that while "it is considered a legitimate mode of warfare to fill shells with metal which scatters among the enemy, and produces the most frightful modes of death," chemical agents remained taboo.[46] In fact, Playfair thought that chemical agents could reduce the suffering of soldiers who were routinely maimed by bullets and explosives. Thus, in the 1850s, the European debate surrounding the use of industrially produced chemical arms began to redefine the nature of warfare and to imagine the possible military uses for chemistry.

Through most of the 19th century, the major restriction on the production of chemical weapons was the available level of scientific and technological knowledge. During both the Napoleonic Wars and the Franco-Prussian War militaries had considered the use of cyanide on bayonet blades, while several other western armies used smoke to conceal troop movements and to drive sappers out of their mines.[47] However, none of these proposed chemical weapons

[44] George Douglas, The Panmure Papers.
[45] Ian Hogg, "Bolimov and the First Gas Attack", 17. Lord Playfair, a Scottish scientist and the British Secretary of the Department of Science, concurrently suggested that the British forces use cyanide housed in artillery shells. For a deeper study of this event see: Charles Stephenson, *The Admiral's Secret Weapon: Lord Dundonald and the Origins of Chemical Warfare* (Rochester NY: Boydell Press, 2006).
[46] Eric Croddy, Chemical and Biological Warfare, 131.
[47] Ibid, 131-132. The Confederate Colonel William W. Blackford proposed the use of smoke to suffocate Union sappers in the U.S. Civil War. For more on proposed chemical warfare in the U.S. Civil War, see: Guy R. Hasegawa, *Villainous Compounds Chemical Weapons and the American Civil War* (Carbondale: Southern Illinois University Press, 2015).

involved laboratory or factory produced poisons. The development of industrial-scale chemical weapons required substantial advancement in the field of organic chemistry and the expansion of national chemical industries. This process began with 19th century scientists' investigation of the molecular structures of various toxic compounds.[48] Industrial and academic projects in the fields of pharmaceutical drug research and dye manufacturing tended to cross-fertilize one another, leading to surprise discoveries of new compounds.[49] While both British and French scientists made substantial contributions to the field, German chemical concerns dominated international markets in the late 19th century through expansive and effective cooperation between industrial firms, academic institutions, and government agencies.[50]

German companies such as Bayer AG, BASF (*Badische Anilin und Soda Fabrik*) and Hoechst AG rose from small dye works to massive chemical firms in the late 19th century.[51] By 1913, German chemical production was valued at approximately $160 million, out-producing its closest rival, the United States, by more than $60 million. Germany further exported about twenty-eight percent of the world's chemicals, outpacing its nearest rival, Great Britain, by ten percent.[52] The massive growth of these specific companies and the German chemical industry more generally also led to a stockpiling of the chemical resources that were isolated or synthesized. For instance, dye manufacturers like Bayer, BASF, and Hoechst amassed large stores of chlorine, which remained a byproduct of their dye production. The industrial scale of chemical stores encouraged greater consideration of their potential role in any future conflict.

[48] 19th century chemical compound research led to the synthesis of various tear gasses, phosgene, Clark I, and an early form of mustard agent.
[49] Eric Croddy, *Chemical and Biological Warfare*, 134.
[50] See L.F. Haber, *The Chemical Industry During the Nineteenth Century*, 128-136.
[51] Eric Croddy, *Chemical and Biological Warfare*, 134. Smaller firms like AGFA, Cassella, Chemische Fabrik Kalle, Chemische Fabrik Griesheim-Elektron, and Chemische Fabrik vormals Weiler-ter Meer produced more specialized dyes, and together with the big three firms produced about 90% of the world's dyestuffs. Fred Aftalion et. al, *A History of the International Chemical Industry*, 475.
[52] L.F. Haber, *The Chemical Industry, 1900-1930*, 108.

While 19th century Europeans certainly could not foresee the extent of World War I's industrialized combat, they were clearly aware of the potential implications of the German national advantage in chemical production.[53]

Initial European hand-wringing over the potential development and use of chemical weapons turned to international action at the First Hague Peace Conference of 1899. The conference, initiated primarily by Czar Nicholas II of Russia, was aimed at setting an international standard for the rules of warfare and at creating an overarching international body for adjudicating disputes between member states. Twenty-six nations including all major European powers and the United States signed three main treaties and three additional declarations on July 29, 1899. Convention II with Respect to the Law and Customs of War on Land included a prohibition on the employment of "poison or poisoned arms."[54] The second declaration prohibited the "Use of Projectiles the Object of Which is the Diffusion of Asphyxiating or Deleterious Gases."[55] Further regulations prohibited "treacherously" killing or wounding enemies and employing "arms, projectiles, or material calculated to cause unnecessary suffering."[56] This declaration was subsequently ratified by all present nations except the United States, which saw these statutes as attempts to weaken the military ingenuity of newly industrial powers.[57] The conference also created the Permanent Court for Arbitration, intended to mediate

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[53] John J. Beer, "Coal Tar Dye Manufacture and the Origins of the Modern Industrial Research Laboratory," 131.

[54] Convention (II) with Respect to the Laws and Customs of War on Land (Hague, II) (29 Jul 1899), Organisation for the Prohibition of Chemical Weapons, https://www.opcw.org/chemical-weapons-convention/related-international-agreements/chemical-warfare-and-chemical-weapons/hague-convention-of-1899/. "Poison or poisoned arms" were conceived as poisoned supplies such as water or food, or as poisoned hand weapons such as bayonets or arrows. Dieter Martinetz, *Der Gaskrieg 1914-1918*, 9.

[55] The Avalon Project, Laws of War: Declaration on the Use of Projectiles the Object of Which is the Diffusion of Asphyxiating or Deleterious Gases; July 29, 1899, 2008, http://avalon.law.yale.edu/19th_century/dec99-02.asp

[56] Dieter Martinetz, Der Gaskrieg 1914-1918: Entwicklung, Herstellung, und Einsatz chemischer Kampfstoffe, 9.

[57] Captain Alfred T. Mahan of the American delegation argued that the use of poison gas would be no less humane that drowning sailors in naval combat. Mahan was the chief objector to international bans on chemical weapons. Hugh R. Slotten. "Humane Chemistry or Scientific Barbarism? American Responses to World War I Poison Gas, 1915-1930", 478.

and prevent international conflicts between member states. While some nations attempted to make attendance to this court mandatory in the event of international conflict, a contingent led by the Germans succeeded in striking down this proposal and crippling any real power of the court.[58] These conventions and declarations entered force on September 4, 1900.

In 1904, U.S. President Theodore Roosevelt proposed a Second Hague Conference that would work to expand upon preexisting agreements and to create similar settlements for naval warfare. Continued international unrest, especially related to the Russo-Japanese War and the First Moroccan Crisis, delayed the conference until 1907 but also reaffirmed the importance of international legislation and mediation. The prohibition of the use of poison gas remained in the language of the treaty but was moved to Convention IV. Attending states signed the treaties and declarations on October 1907 and enacted them on January 26, 1910. Meanwhile, the British again pushed to create national limitations on armaments and to make the Permanent Court for Arbitration mandatory. But once again, the Germans mustered enough support to defeat these proposals.

In many ways, these diplomatic discussions revealed the growing political struggle between Britain and the newly emerging industrial powers of Germany and the United States. Regardless of their omissions and limitations, the Hague Conventions appeared as successful examples of the way in which international diplomacy could limit the scale and ferocity of future conflicts. In the case of poison gas, the wording of the declaration seemed unequivocal. While Europeans had never experienced widespread chemical warfare, they made it clear that they both suspected its possible deployment in a future war and preferred to proactively prohibit such

[58] In many ways, this proposed Court of Arbitration was an aborted precursor for the League of Nations.

use.[59] However, the ambiguity of the term "humane warfare" and the durability of these international agreements in the heat of battle was of course unknown.

Leviathan Wakes: Chemical Applications in the Early Stages of World War I

At the outbreak of World War I, the major belligerents did indeed mobilize national chemical manufacturers for military production.[60] However, their early intentions were primarily restricted to uniform dye manufacturing and explosives production. Moreover, the large German chemical firms had little desire for war during its initial stages. Industry leaders like Bayer's Carl Duisberg knew that bans on exports would significantly hurt their bottom line, and his strong desire for peace left Bayer unprepared for war in 1914.[61] Nevertheless, the combined industrial force of the large German chemical firms was able to supply the War Ministry with almost all its initially required materials. The same could not be said for the Allied nations who realized the unsatisfactory state of their own chemical industries after losing access to German products.[62]

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[59] For articles related to 19th century European conceptions of a future war see: Roger Chickering, Stig Förster, and Manfred Boemeke, eds. *Anticipating Total War: The German and American Experience, 1871-1914* (Cambridge: Cambridge University Press, 1999). This collection largely argues that few 19th century Europeans had a great grasp on the nature or impact of industrial warfare technologies prior to World War I. Military minds and diplomats more commonly argued for man's moral ability to overcome violent technologies, which was evident in the optimism of the Hague Conventions.

[60] For an overview of the major chemical research pursuits during World War I see: Michael Freemantle, *The Chemists' War, 1914-1918* (Cambridge: The Royal Society of Chemistry, 2015)

[61] Carl Duisberg. *Meine Lebenserinnerungen*. 98. Duisberg retrospectively wrote in his memoirs: "We lost all our business through the war, foreign countries set up factories, the patents were no longer valid, and these coercive measures brought us together." See also: Werner Plumpe, *Carl Duisberg 1861-1935: Anatomie eines Industriellen*, 441-466. ; Werner Plumpe, *German Economic and Business History in the 19th and 20th Centuries*, 309.

[62] The success of the German chemical industry in its war efforts can be ascribed to the cooperation between various firms before the war and the centralization of war production by the German government. Agfa, BASF, and Bayer had already formed a loose cooperative group in 1904 referred to as the "little I.G." In the same year, Hoechst, Casella, and Kalle formed a Frankfurt am Main regional alliance. In late 1915 and early 1916 the I.G. group expanded to include more firms and to share knowledge and methods that were beneficial to war production. On August 9, 1914, the German Minister of War Erich von Falkenhayn placed Walter Rathenau, the head of the electronics giant AEG, in charge of the KRA, or War Material Department. While Rathenau's tenure ended quickly, the KRA did serve to centralize the chemical industry's war effort until the institution of the Hindenburg Program in the summer of 1916. German firms were subsequently set up for "dual-use production", meaning that they would always be ready to switch from industrial to military-use production. See: Jeffrey Allan Johnson, "Technological

Both Britain and France scrambled to import dyes from Switzerland while concurrently setting up government supply boards and kick-starting newly nationalized dyeworks.[63]

The supply of nitrogen, an essential component for explosives, was a different story for the Germans. Prior to the war, German firms imported about one-half of their required nitrogen.[64] The war's trade embargos and the British naval blockade now cut these firms off from their foreign nitrogen sources. This left Germany with slightly less than 140,000 tons of nitrogen at the start of the war, essentially setting a limit on the nation's ability to produce artillery shells and bullets.[65] In September 1914, the academic chemists Emil Fischer and Fritz Haber made the German War Ministry painfully aware of this shortage and pointed to the BASF plant at Oppau and its Haber-Bosch Process as a solution to German deficiencies.[66]

In 1909, Haber and his assistant Robert Le Rossignol first succeeded in producing ammonia from nitrogen in the air, and in 1910, the chemist Carl Bosch scaled this method for industrial production at BASF.[67] By 1913, the BASF plant had a production capacity of thirty-six tons of ammonia and a store of 7,200 tons of synthetic nitrogen. The company increasingly raised its production capacity over the course of the war, and the growth in demand from the German military led to the construction of a second production site at Leuna in 1917. By the end of the war, the Haber-Bosch process accounted for almost fifty percent of Germany's nitrogen

Mobilization and Munitions Production: Comparative Perspectives on Germany and Austria," in *Frontline and Factory: Comparative Perspectives on the Chemical Industry at War, 1914-1924*, 3-10.

[63] L.F. Haber, *The Chemical Industry, 1900-1930*, 188, 194.

[64] Most of this imported nitrogen came from Chile. Ibid, 198.

[65] The physicist Max Planck later claimed that without Haber's process, "Germany would have collapsed economic and militarily in the first three months of the World War." Rüdiger Hachtmann, Wissenschaftsmanagement im Dritten Reich, 392

[66] L.F. Haber, *The Chemical Industry, 1900-1930*, 200.

[67] See: Thomas Hager. *The Alchemy of Air: A Jewish Genius, a Doomed Tycoon, and the Scientific Discovery That Fed the World but Fueled the Rise of Hitler*, 91-100.; and Friedrich Bretislav. "Fritz Haber Und Der 'Krieg Der Chemiker'", 118–125.

production, and certainly saved the Germans from early surrender.[68] Beyond prolonging Germany's ability to wage war, the success of the Haber-Bosch process also set the tone for scientific contributions to the German state. Hailed as a major national contribution and easily converted to peace-time applications, Haber's synthesis of nitrogen suggested to many in the scientific community that wartime research and production was a major boon to the process of scientific discovery and, by extension, the progress of humanity.

Unlike the Germans, the French government displayed little concern for state intervention or cooperation with their chemical industry early in the war. However, the French did find the first direct battlefield application for chemistry.[69] Beginning in 1913, French scientists in the laboratory of Andrè Kling first produced what were then called *cartouches suffocantes*, or an early form of tear gas projectiles. These *cartouches suffocantes* were intended to be used as a method of civilian riot control that could skirt the restrictions of the Hague Convention.[70] The French military claimed that this tear gas was not strictly poisonous and its stated aim was pacification through irritation of the eyes, skin, and respiratory system, rather than outright destruction.[71] Furthermore, the ethyl bromoacetate inserted into the projectiles was not a gas, but rather a liquid that was aerosolized on impact.[72] As early as August 1914, the French military filled rifle projectiles with this newly developed tear gas and fired it at the German lines.

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[68] L.F. Haber, *The Chemical Industry, 1900-1930*, 203. ; Peter Hayes. "Carl Bosch and Carl Krauch: Chemistry and the Political Economy of Germany, 1925-1945", 355. See also: Friedrich Bretislav, "Fritz Haber und der 'Krieg der Chemiker,' 118.

[69] See: Sophie Chauveau, "Mobilization and Industrial Policy: Chemicals and Pharmaceuticals in the French War Effort", in *Frontline and Factory: Comparative Perspectives on the Chemical Industry at War, 1914-1924*, 21.

[70] Dieter Martinetz, *Der Gaskrieg 1914-1918*, 9. Kling was the leading scientist of Paris' Laboratoire Municipal.

[71] These early tear gases can, in fact, be toxic to humans if sufficient amounts are inhaled.

[72] Through the rest of World War I, the French and all other belligerents primarily used xylyl bromide as their main tear gas agent. Xylyl bromide was a major component in the German *Weisskreuz* (white cross) gas. The Germans used colored crosses as code names for their various types of chemical weapons. White referred to all forms of tear gasses. These code names were part of the rhetorical work involved in covering the true nature of chemical warfare. Colors did not convey the lethality of these weapons as clearly as their chemical names. The Germans also regularly referred to chemical weapons as *Kampfstoffe* (or warfare agents), suggesting that they were no different than any other weapon.

However, these early tear gas projectiles created such a weak agent that the German soldiers rarely noticed their deployment. Nonetheless, the French continued to intensify the effect of these tear gases and develop their gas grenades through 1915.[73]

German troop reports differed on the effectiveness of these early French chemical weapons. In 1919, Captain Hermann Geyer recollected that the French Ministry of War claimed that their tear gas could indeed asphyxiate a soldier if he was exposed to a considerable density over a given length of time.[74] He further recounted the French using twelve tons of tear gas grenades against the Germans on January 15, 1915. The infantryman Waldus Nestler provided a similarly troubling subjective account of the French use of tear gas in the Vosges mountains at the beginning of December 1914. He wrote, "They had thrown hand grenades or shot rifle grenades shortly before the attack, spreading a fog that brought tears to the eyes...When we heard this, we were penetrated with a terrible feeling. What a nasty weapon that was now being used! What a terrible form of warfare!"[75] The suffering of soldiers like Nestler only proved the effectiveness of tear gas to the French military, inspiring further research and production. By April 1915, the French army provided its soldiers with the Bertrand No. 1 tear gas grenade, which proved even more effective in trench warfare conditions.[76]

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[73] In November 1914, the French began using chloraceton for their grenades due to a shortage of ethyl bromoacetate. Dieter Martinetz, *Der Gaskrieg 1914-1918*, 9. See also: Olivier Lepick. *La Grande Guerre Chimique, 1914-1918*, 55.

[74] Captain Hermann Geyer was an important staff officer for Colonel Max Bauer. He drew up several of the attack plans for German gas pioneer troops and contributed to the tactics used in the Kaiser's Offensive of spring 1918. After the war, he wrote several tracts on chemical warfare, was promoted to General, and served Nazi Germany in World War II. See: Geyer, Denkschrift über den Gaskampf BA-MA N/221. This is a section of a French military pamphlet on tear gas grenade use that was printed on February 21, 1915. It was part of General Joffre's 1915 command to outfit the French front lines with tear gas grenades. Joffre would later deny that the French had ever used grenades that were not pure explosives.

[75] Waldus Nestler. *Giftgas Über Deutschland*, 4. ; See also: Rudolf Hanslian, *Der chemische Krieg*, Tafel 1. This is a sketch that depicts German soldiers who have been killed by large quantities of French tear gas.

[76] Ulrich Trumpener, "The Road to Ypres," 463. For documentation of the French use of ethyl bromoacetate see Order no. 781, Grand quartier general, April 3, 1915.

The British also began seriously discussing the use of battlefield gasses in 1913. Unlike the French, however, most British military officials initially returned to 19th century visions of smoke screens and sulfur dioxide attacks. While these ideas were not immediately realized, the British did also begin irregular testing of chloraceton, benzylchlorid, and other tear gases.[77] However, the British War Office did not create full-time chemical weapons laboratories until after the Germans had already attacked at Ypres. In fact, under the command of Lord Kitchner, the British military even hesitated to retaliate in 1915, citing the already disregarded restrictions on asphyxiating gases in the Hague Conventions.[78] Only after the completion of a scientific investigation and a government report on the German chlorine gas attack did the British begin to form a gas warfare service. This so-called Special Brigade was placed under the leadership of Major Charles Howard Foulkes of the Royal Engineers. By the summer of 1915, both the British and the French had organized their gas warfare divisions and began readying their own offensive gas attacks.

Like the Entente powers, the Germans also studied the effects of chemical agents before the outbreak of World War I. However, according to the artillery specialist Colonel Max Bauer, these tests showed that chemical weapons had little military value.[79] In fact, their initial futility

[77] Dieter Martinetz, *Der Gaskrieg 1914-1918,* 10. British chemical tests are documented in the "Historical Account of Offensive Chemical Warfare Research up to the Date of the Formation of the Chemical Advisory Committee in February 1916." ; Trumpener, "The Road To Ypres", 463.

[78] Ulf Schmidt, *Secret Science: A Century of Poison Warfare and Human Experiments*, 26. See also: L.F. Haber, *The Poisonous Cloud*, 21-23.

[79] Max Bauer (1869-1929) first served as the head of Section II of the Oberste Heeresleitung (OHL), responsible for artillery, mortars, and fortifications. Bauer received an honorary doctorate from the University of Berlin (1915) and the Pour le Mérite (1916) after he helped develop 17-inch howitzers and ordered Krupp 42cm mortars (often referred to as Big Berthas) to destroy outdated fortifications in Belgium and northern France. This contributed to a surprisingly quick rise through the military ranks, later landing Bauer a position as a major advisor on economic and political questions to his friend, General Ludendorff. Throughout the war and into the 1920s, Bauer served as a vital link between the military and heavy industry (and later right-wing extremist groups), allowing him to play a central role in the creation and production of poison gas in Germany. Martin Kitchen. "Militarism and the Development of Fascist Ideology: The Political Ideas of Colonel Max Bauer, 1916-18", 199-200.

impeded the later research, development, and employment of German gas.[80] Historian Eric Dorn Brose has pointed out that a sociocultural conflict, waged in the Prusso-German army from 1871 to 1914, further retarded the research and use of new military technologies like chemical weapons.[81] With the development of technologies like artillery guns, machine guns, and rifles, the future tactics of the German military became a site of contestation between representatives of different military branches. According to Dorn Brose, certain artillery and army engineering officers favored an embrace of these new warfare technologies, which they saw as both the key to future battlefield successes and as an avenue to new personal prestige and institutional standing in the military. On the other hand, the cavalry, which had previously enjoyed the greatest honor and esteem in the Imperial German Army, feared being made obsolete by technologies that could destroy a cavalry charge in mere minutes. Many infantrymen also distrusted new battlefield technologies, in part for their potential to shake up the preexisting military hierarchy, but even more for their demonstrably violent effect on the common soldier's body.

Representatives from both the cavalry and the infantry used three major arguments to criticize and prevent the increased use of technology on the battlefield. First, they argued that many technologies (like early tear gas) often failed to work as desired; they could not be trusted to achieve a desired tactical outcome. Second, certain technologies were not part of the inherited rules of war, either because they simply broke with military tradition or because they were

[80] Ulrich Trumpener, "The Road To Ypres", 463-464. See Bauer's "Denkschrift betreffend den Gaskampf und Gasschutz", pg. 2, Nachlass Max Bauer, Bundesarchiv Koblenz.
[81] Eric Dorn Brose, *The Kaiser's Army: The Politics of Military Technology in Germany during the Machine Age, 1870-1918*, 3.

prohibited by the Hague Conventions. Third, they insisted that battles were won and lost through sheer willpower; it was both the discipline and the élan of men that decided victory.[82]

Given the entrenched status and privilege of both the German cavalry and infantry, these arguments often succeeded in holding off serious military engagement with previously untapped areas of industry and science until the fall of 1914. This situation finally changed in September of that year, when the German military was defeated by Allied forces at the First Battle of the Marne, thus forcing the Germans to formally abandon the Schlieffen Plan. This defeat prevented the Germans from continuing their march towards Paris and induced them to dig in to their positions on the Western Front, setting the stage for the years of trench warfare that would follow. Disgruntled factions of the officer corps began searching for someone or something to blame for this military failure. High-ranking advocates of new military technologies like Colonel Max Bauer attributed the setback to the army's avoidance of technological advances, stating that the days of cavalry charges were finally over.[83] Indeed, the subsequent removal of General Helmuth von Moltke as chief of the general staff, the appointment of Lieutenant General Erich von Falkenhayn, and the reevaluation of German tactics in late 1914 now opened the door for a

[82] See, for example: Erich Dorn Brose, *The Kaiser's Army,* 66-69. See also: Roger Chickering, Stig Förster, Manfred Boemke, editors. *Anticipating Total War: The German and American Experience, 1871-1914* (Cambridge: Cambridge University Press, 1999).

[83] Eric Dorn Brose, *The Kaiser's Army: The Politics of Military Technology in Germany during the Machine Age, 1870-1918*, 3. Many of these technological progressives were officers in the artillery or army engineer corps. In contrast to the aristocratic cavalry and infantry officers, these men were often of middle class origin. Dorn Brose argues that this difference is important for explaining the sociocultural changes occurring in the German military during this period. Middle-class men could hope to achieve greater military and societal standing by entering a division of the army that required a level of practical scientific education and allowed for advancement through the application of said knowledge. This prerequisite education helped to foster connections between these branches of the military, the scientific academies, and industrial firms. Colonel Max Bauer was one such liaison. The historians Martin Kitchen and Gerald Feldman have both argued that Bauer's middle-class origin inspired his faith in technological solutions to military problems. Under Erich von Falkenhayn, Bauer was made head of Section II of the OHL, which was responsible for heavy artillery, mortars, and fortresses. See: Martin Kitchen. "Militarism and the Development of Fascist Ideology: The Political Ideas of Colonel Max Bauer, 1916-18", 203. ; and Gerald Feldman, *Army, Industry, and Labor in Germany 1914-1918,* 36-37.

new breed of officer who either promoted or quietly accepted the ascendency of new military technologies on the battlefield.

In 1915, the German high command, or Oberste Heersleitung (OHL), under the newly-appointed Erich von Falkenhayn decided to revisit the possibility of employing chemical weapons for three reasons. First, as the war on the western front became less mobile, the Germans sought any technological advantage that might break through the Allied lines. Reports from the front stated that traditional shells and explosives were not completely effective in destroying entrenched enemy positions. Second, facing a shortage of steel in 1915, the Germans were forced to manufacture their artillery shells using cast iron. Because cast iron was weaker than steel, German shell walls were so thick that they did not allow much space for interior explosives. The OHL hoped to find an alternative shell filling that could expand outward from such a small container.[84] Third, in the early fall of 1914, the Haber-Bosch process was not yet fully integrated into industrial war production. The German high command was still facing a rapidly diminishing supply of nitrogen and thus, a rapidly diminishing supply of explosives and bullets. Chemical aerosols and gasses appeared as a possible replacement armament that could be abundantly produced by a pre-existing German industry.[85]

In late September 1914, Falkenhayn gave Colonel Max Bauer orders to reinvestigate the applicability of chemical weapons on the Western Front. A month later, Bauer gathered a group of scientists and army officials at the Wahn artillery range outside of Cologne to discuss the creation of a new chemical shell that could dislodge entrenched enemy positions.[86] Proposed by

[84] Ian Hogg, "Bolimov and the First Gas Attack", 17.
[85] Ulrich Trumpener, "The Road to Ypres," 464. ; Werner Plumpe, *Carl Duisberg 1861-1935*, 443-444.
[86] This expert committee included the influential chemist Walther Nernst (1864-1941) and the director of the Bayer dyeworks factory at Leverkusen, Carl Duisberg (1861-1935). Most of the scientific members of the committee had connections to the Kaiser Wilhelm Institute for the Advancement of Science in Berlin. Nernst was already internationally famous in the world of chemistry for his work on thermodynamics and electrochemistry and for his

the internationally respected academic chemist Walther Nernst, the first experimental weapon produced a non-lethal nasal irritant that could be fired in a standard shell casing.[87] The German military first deployed 3,000 of these so-called Ni-shells on October 27 at Neuve-Chapelle.[88] However, they had so little effect that Entente soldiers later reported that they never detected any chemical irritants. According to a popular anecdote, the gas was so weak that General Falkenhayn's son won a case of champagne by betting that he could stand in a cloud of the Ni-shell irritant for five minutes.[89] Nevertheless, the German army received 20,000 of these shells before the project was deemed a failure.[90]

By November, Bauer's chemical research committee had moved on to a suggestion from the chemist Hans Tappen.[91] Tappen proposed filling artillery shells with xylyl bromide to create an effect like that of the French tear gas grenades. Bauer was initially skeptical of shells filled with liquid, but Tappen eventually proved the feasibility of such a weapon through his own laboratory tests.[92] These so-called "T-Shells" were first evaluated at the Kummersdorf artillery rang outside Berlin, and then at Wahn in January 1915.[93] Falkenhayn himself was present at the Wahn tests and later approved the production and use of Tappen's new weapon. The chemical firms of Bayer, Hoechst, and the Kahlbaum factory in Berlin were contracted to produce the shells and only a few weeks later, they were issued to Colonel-General August von Mackensen's

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celebrated textbook, *Theoretical Chemistry*. For another discussion of early German attempts to develop chemical weapons see: L.F. Haber, *The Poisonous Cloud*, 24-28.

87 Max Bauer, *Der Grosse Krieg in Feld Und Heimat*, 67-68. Subsequent shell tests at Wahn were conducted in conjunction with the Bayer factory in Leverkusen.

88 The Ni in Ni-shells stood for *Niespulver*, or sneezing powder.

89 Ian Hogg, "Bolimov and the First Gas Attack," 17.

90 "Herstellung Und Lieferung von Geschoss-Fullung," (BA) 201-005-001

91 Hans Tappen was a scientist at the Kaiser Wilhelm Institute for Physical and Electrochemistry. He was also the brother of Gerhard Tappen, a close advisor to Falkenhayn in the OHL.

92 Curt Wachtel, *Chemical Warfare*, 66. See also: Tappen's personal war diary, November 6-9, 1914, Nachlass Gerhard Tappen, BA-MA.

93 "Herstellung Und Lieferung von Geschoss-Fullungen III," (BA). They were named T-Shells in honor of Tappen.

Ninth Army on the Eastern Front.[94] Mackensen was ordered to provide a diversion with the gas while Field Marshal Paul von Hindenburg arranged for a major offensive against Russian troops.[95] In preparation for the diversionary chemical attack, German soldiers were outfitted with cotton pads that could be tied in front of their noses and mouths. The pads were moistened with a chemical retardant that had to be reapplied regularly.

On January 3, 1915, the Germans attacked Russian troops at Bolimow, between Lodz and Warsaw. The T-Shells were fired into the Russian lines, but the cold weather suppressed the xylyl bromide and the shells had little to no effect.[96] Tappen subsequently added bromoacetone (B-*Stoff*) to the shells to prevent their failure in cold weather.[97] These new T/B-Shells were sent to Duke Albrecht of Württemberg and his Fourth Army in Flanders. In the early spring of 1915, the new T-Shells again achieved little effect at Nieuport and in the Ypres region. This encouraged Bauer's advisory committee and the OHL to turn their attention toward another potential chemical weapon that had been in development since December 1914 under the direction of the chemist Fritz Haber.

The Orderly Academic: The Early Life of Fritz Haber

Fritz Haber was born in 1868 in Breslau, Prussia to a wealthy Jewish family whose collective story reflected that of many upwardly mobile Jewish families in late 19th century

[94] By the autumn of 1915, the Bayer and Hoechst dyeworks were converting much of their industrial production to war purposes. These companies had realized that the war was not going to end any time soon and that this was their best chance at wartime expansion. While they received government contracts and subsidies for their wartime production, they continued to complain that these contracts were too irregular and insufficient. BASF avoided the production of potential weapons likes chlorine gas, but they did provide intermediary materials (theylene cholorhydrin and thiodiglycol) that were then used for poison gas production. See: Werner Abelshauser et. al. *German Industry and Global Enterprise*, 165.

[95] German infantry units remained skeptical of using these T-Shells. It was the importance of this offensive and the need for diversionary tactics that convinced Hindenburg to ultimately employ chemical weapons.

[96] Robert E. Cook. "The Mist That Rolled Into The Trenches: Chemical Escalation In World War I", 36.

[97] Rudolf Hanslian, *Der chemische Krieg*, 57.

German-speaking lands.[98] The extended Haber family first made their money as wool merchants in Kempen, but by the time Fritz was born, they had obtained various respected positions in politics, law, and other lines of mercantile business. Fritz's father, Siegfried Haber, owned a successful firm that sold pharmaceuticals, dyes, resins, oils, fats, and paints.[99] Siegfried reportedly had a loving relationship with his wife, Paula, who died giving birth to Fritz. Paula's early death reportedly created a lasting rift in Siegfried and Fritz's father-son relationship and young Fritz was quickly given over to the care of his aunts. As a child, Fritz developed and maintained a close and affectionate relationship to his step-mother, who eventually became his primary caregiver. While the Haber family remained tightly tied to the Jewish community through family connections in Breslau, they were not noted as particularly religiously-minded or observant Jews. Consequently, young Fritz was sent to the Johanneum primary school and the St. Elizabeth Gymnasium, both of which were open to students of different religious backgrounds who desired a humanistic education in the German tradition. While Fritz was not noted as a particularly gifted student while attending these schools, except perhaps in rhetoric, he successfully passed his gymnasium exams at St. Elizabeth's in 1886. His father preferred that Fritz remain in the family dye trade upon graduation, but the notably gregarious boy saw university as a path to the wider world. With grudging assent from Siegfried, Fritz attended

[98] For the most comprehensive German language biography of Fritz Haber (1868-1934) see: Margit Szöllösi-Janze, *Fritz Haber 1868-1934* (München: Verlag C.H. Beck, 1998). The other comprehensive resource is Dietrich Stoltzenberg's *Fritz Haber: Chemiker, Nobelpreisträger Deutscher, Jude* (Weinheim: VCH Verlagsgesellschaft, 1994), which has been abbreviated and translated to English: Dietrich Stoltzenberg, *Fritz Haber: Chemist, Novel Laureate, German, Jew* (Philadelphia: Heritage Press, 2004). Less rigorous studies include: Morris Goran, *The Story of Fritz Haber* (Norman: University of Oklahoma Press, 1967) ; Thomas Hager, *The Alchemy of Air: A Jewish Genius, a Doomed Tycoon, and the Scientific Discovery That Fed the World but Fueled the Rise of Hitler* (New York: Harmony, 2008) ; Daniel Charles, *Between Genius and Genocide: The Tragedy of Fritz Haber, Father of Chemical Warfare* (London: Jonathan Cape, 2005) ; Daniel Charles, *Master Mind: The Rise and Fall of Fritz Haber, the Nobel Laureate Who Launched the Age of Chemical Warfare* (New York: Harper Collins, 2005).

[99] In fact, Siegfried Haber's company was one of Germany's largest importers of natural indigo.

Friedrich Wilhelm University in Berlin to study chemistry, a field that could prove valuable to the family dye trade.

In Berlin, Haber was initially disappointed with the work of his advisor, the chemist A.W. Hofmann.[100] This encouraged him to first transfer to Heidelberg University to work under Robert Bunsen for the duration of 1887 summer semester. He then moved back to Berlin to attend the Technical College of Charlottenburg for the remainder of his degree.[101] In the summer of 1889, Haber's studies were put on hold so that he could serve a one-year Prussian military service term in the Sixth Field Artillery Regiment back in Breslau.[102] Haber was immediately attracted to the military lifestyle, and he continued throughout his life to affect the military speech, posture, and gait that he picked up in his service.[103] In fact, he was so pleased by this new lifestyle that he competed for an officer's commission with the hope of making the military his permanent career. While Haber did prove himself worthy enough to become a serious candidate for the commission, he was ultimately passed over. Greatly affected by this disappointment, he believed that his Jewish heritage had hurt his candidacy, as no Jew had ever been selected as a reserve officer in a combat service.

After this difficult personal failure, Haber returned to the Technical College of Charlottenburg to begin studying organic chemistry under Carl Liebermann.[104] In 1891, he

[100] August Wilhelm von Hofmann (1818-1892) was a respected German chemist at the Royal College of Chemistry in London and the University of Berlin. He was a co-founder of the German Chemical Society in 1867. Working in organic chemistry, he made great strides in aniline and coal tar research for the German chemical industry.
[101] Robert Bunsen (1811-1899) was a pioneer in photochemistry. He is best known for his development of the Bunsen burner.
[102] Volunteer service was normally three years, but Haber only served one because his father was willing to pay for his horse and military equipment. This was a generally accepted practice for wealthier sons in Prussia.
[103] Haber was often described by his contemporaries as maintaining an upright military posture, clipped but informative speech, and a brisk marching gait.
[104] Carl Liebermann (1842-1914) was a student of Adolf von Baeyer and took over his chair in organic chemistry at the University of Berlin once Baeyer left for the University of Strasbourg in 1870. Liebermann was best known for his synthesis of the red dye alizarin.

finished his thesis on the derivatives of piperonal and received his doctorate from Friedrich Wilhelm University.[105] With his degree in hand, Haber returned to Breslau to work in his father's chemical company. Once back home, Fritz continuously fought with his father, eventually choosing to spend most of his time in practical apprenticeships at various distant chemical factories. Feeling that his working relationship with his father would always lead to conflict, Haber finally left the family business in 1892 and took an academic position as an unpaid assistant under Ludwig Knorr at the University of Jena. Over the next two years, Knorr assigned Haber to repetitive laboratory tasks that he quickly came to resent.[106]

While Haber's scientific work in Jena was relatively uneventful, he did undergo one major personal change. In November 1892, Fritz converted to Protestantism. It remains unclear exactly why Haber chose to convert, but this move certainly helped him to secure a place for himself in the academic world. Finding an *Assistent* position was much easier without facing the obstacles put in place to bar Jews from the academy. The decision also possibly derived from Fritz's experience in the military and his belief that his religion led to his failure to obtain an officer's commission. Whatever the combination of motivations, most theories about the nature of Haber's conversion argue for a practical cause rather than a real change of faith.[107] In fact, Haber's personal doctor and close friend, Rudolf Stern saw the conversion as continuation of

[105] The Technical College of Charlottenburg was not yet able to grant doctorate degrees so Haber received his from the Friedrich Wilhelm University.

[106] Knorr was known for his successful synthesis of several pharmaceuticals. Knorr noticed the young Haber's resentment and thought little of his work. Haber, in turn, wanted to turn to physical chemistry and work with Wilhelm Ostwald. He was granted a meeting with Ostwald in 1893, but it did not lead to a place in his Leipzig laboratory. Morris Goran, *The Story of Fritz Haber*, 16. For correspondence between Haber and Oswald see: Regine Zott. editor. *Fritz Haber in seiner Korrespondenz mit Wilhelm Ostwald sowie in Briefen an Svante Arrhenius* (Berlin: ERS Verlag, 1997)

[107] Dietrich Stoltzenberg, *Fritz Haber*, 33. Only Haber's second wife Charlotte claimed that Fritz converted for religious convictions, even though Haber rarely attended church after his conversion. Charlotte also believed that the conversion may have been Fritz's way to symbolically break free from his father. Daniel Charles, *Master Mind*, 28-29.

Haber's true faith, a belief in the insolubility of the German nation. Stern thought that Haber sincerely desired to become more "authentically German" and to profess his loyalty to the Reich through conversion.[108] Certainly, since his early education and his time spent in the military, Haber was a staunch German patriot with a particularly strong desire to align himself with the imperial regime. In fact, Haber's godson, Fritz Stern, once described him as: "German in every fiber of his being, in his restless, thorough striving, in his devotion to friends and students, in his very soul and spirit."[109]

In the spring of 1894, the twenty-six-year-old Haber was finally able to leave Jena after obtaining a paying *Assistent* position at the Technical University of Karlsruhe. Karlsruhe was not a major center for academic chemistry at the time, but it did have strong funding avenues through ties to the BASF chemical company in nearby Ludwigshafen. Indeed, Haber's experience cultivating industry relationships in his father's firm served him well here. Once in Karlsruhe, Haber's two main advisors, Carl Engler and Hans Bunte, gave him a great level of research freedom.[110] This allowed Haber to move into the field of electrochemistry, where he gained attention for his reportedly tireless work ethic. Haber slowly built a name for himself through research in both organic and electrochemistry in the late 1890s and early 1900s, and in 1906 he received a full professorship in physical chemistry.

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[108] Daniel Charles, *Master Mind,* 29-32. Stern made this argument about Haber's conversion in light of the contemporaneous political debates over the heterogeneity of the German state and German society. Theodor Mommsen's 1880 essay "Another Word on our Jewry" had countered Heinrich von Treitschke's controversial assertion that the Jews were a burden to the German nation. Mommsen claimed that the Jews were an integral part of the young German nation, but that they needed to hold national loyalty over their religious convictions. According to Mommsen, Christianity and Christendom was now more of an identification with the West, than a professing of religion. This argument over the so-called "Jewish Question" likely influenced Haber's sense of nationalism.
[109] Fritz Stern, *Dreams and Delusions,* 54.
[110] Carl Engler (1842-1925) was the director of the laboratory of chemical technology at Karlsruhe, working on dye production and fiber technology. Hans Bunte (1848-1925) was Engler's appointed successor, working both on dye technologies and gas illumination.

Upon taking up his university chair in Karlsruhe, Haber and his *Assistent* Gerhard Just began an exceptionally varied research agenda that brought significant recognition and widespread approval to his laboratory. By 1908, Haber was concentrating on nitrogen fixation and signing a collaborative contract with BASF. This work would ultimately garner Haber his first taste of national renown and the 1918 Nobel Prize in Chemistry. On the eve of World War I, Haber stood in a fortuitous position between the academy and industry, between the worlds of pure science and technological application.

The Foundation of the Kaiser Wilhelm Society for Physical- and Electrochemistry

Fritz Haber was not the only German chemist who straddled the presumed intellectual and institutional divides between pure and applied research. As early as 1905, the celebrated German chemists Emil Fischer, Walther Nernst, and Wilhelm Ostwald sought to create a national chemical research institute that would be able to foster academic collaboration on large scale research projects.[111] They set up an association to solicit funds for the new "Imperial Chemical Institute," and while they received donations from individual scientists and industry leaders, they failed to obtain backing from the Prussian Ministry of Finance. Undeterred, the nascent plan was renewed in 1908 with the intention of including various other areas of science in a larger research organization that would be called the *Kaiser Wilhelm Gesellschaft* (The Kaiser Wilhelm Society or KWG). The Society, originally envisioned as the German version of Oxford University, would now operate independently of the German academy. However, it was

[111] At the time, Emil Fischer (1852-1919) was the Director of the Institute for Chemistry at the University of Berlin. Walther Nernst (1864-1941) was the director of the Institute for Physics at the University of Berlin. Wilhelm Ostwald (1853-1932) was the director of the Institute for Physical Chemistry in Leipzig. German physics already maintained a national laboratory, the *Physikalisch-Technische Reichsanstalt* (PTR), founded in 1887. Created primarily by the industrialist Werner Siemens, the PTR served as a model for the envisioned "Imperial Chemical Institute." See: David Cahan, *An Institute for an Empire: The Physikalisch-Technische Reichsanstalt 1871-1918* (Cambridge: Cambridge University Press, 1989)

still intended to foster significant connections between academics, especially at Humboldt University in Berlin. Fischer reallocated the funds originally collected for the standalone chemical institute to the Kaiser Wilhelm Society and requested that one third of the annual budget go to physical chemistry. However, the Prussian Ministry remained hesitant to proffer state funds and it was unclear whether the KWG could strictly operate on private donations. As late as September 1910, the Prussian government was unsure if it would provide financial support, even though Kaiser Wilhelm II was set to announce the opening of the scientific society in October of that year.

At a September 17th organizational meeting, a wealthy Saxon banker named Leopold Koppel resolved the funding problem by agreeing to independently fund the Kaiser Wilhelm Institute for Physical Chemistry (or KWI for Physical Chemistry), the subsidiary chemistry institute within the overarching KWG. Koppel had made his money through the ownership of an independent banking firm, several hotels, and a gas light company that he started in 1892 with the Austrian chemist Carl Auer von Welsbach. Located in Berlin, the gas light company was named the *Deutsche Gasglühlichtgesellschaft-Aktiengesellschaft* (or Degea), later changed to the *Auer Gasglühlicht Gesellschaft* (or *Auergesellschaft).*[112] The Auer company primarily worked with gas mantles, luminescence, rare earths, and radioactive materials. It was this work that brought Fritz Haber to the Auer offices in Berlin as a research consultant. From the moment of his initial arrival, Haber greatly impressed Leopold Koppel and the two men quickly became friends.[113] They shared not only professional interests in the field of physical chemistry, but also

[112] The Activated Charcoal Companies (EIA) D2./4 ; Degea Aktiengesellschaft (Auergesellschaft) Berichte, Korrespondenz (EIA) Degussa IW 24.5./2-3
[113] Charlotte Haber, *Mein Leben mit Fritz Haber*, 116-117.

a similar personal story. Koppel, born Jewish, converted to Christianity both to marry his wife and to garner the subsequent business advantages that conversion made possible.

Between 1908 and 1910, Koppel attempted to woo Haber to a permanent position at the Auer company. Haber repeatedly declined the offer, stating that he was pleased with the scientific freedom that he enjoyed in Karlsruhe. Koppel was not easily deterred and he saw several business opportunities in his bankrolling of the Kaiser Wilhelm Institute for Physical Chemistry and Electrochemistry.[114] First, Koppel made sure that the KWI could apply for scientific patents, which could then be inexpensively licensed to the *Auergesellschaft*. Second, the KWI was another avenue for bringing Haber closer to the Auer factories in Berlin. By asking Haber for his employment requirements in 1910, Koppel made it clear that he intended to install Haber as the head of the institute. Expecting that his requests would be too great and that he would remain at Karlsruhe, Haber demanded that the KWI be made a first-rate research institution; thus, he required a sufficient budget, total control over hiring, a professorial position at the University of Berlin, membership in the Royal Prussian Academy, and the transfer of his Karlsruhe research assistants.[115] Further, he demanded a tenured position as a state official with power equal to that of the director of the Institute for Physical Chemistry. To Haber's surprise, Koppel agreed to these requirements and Haber was installed at the head of the KWI for Physical and Electrochemistry in the summer of 1910. Two months later, Kaiser Wilhelm II gave Haber the title of *Geheimer Regierungsrat* (or privy councilor).[116]

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[114] Koppel made his personal interests in the Kaiser Wilhelm Institute abundantly clear when he pointed out that physical chemistry was the "field that has the most direct impact on the industry to which I am personally closest."[114] Daniel Charles, *Master Mind,* 121.

[115] Haber, of course, also made fiduciary demands. He was to be paid an annual salary of 15,000 marks with benefits. Haber also took several of his research assistants with him to the KWI. Robert Le Rossignol, Haber's assistant in ammonia synthesis, did not join them. Instead, he took a position at the Auer company.

[116]Haber also lured Richard Willstätter, a widely respected organic chemist at the Swiss Federal Institute in Zurich, to his Institute at Dahlem in 1912.

Throughout 1911, Haber, now a leading chemist in the German academy, busied himself with the plans for building his institute in the Berlin suburb of Dahlem. Proving himself a great organizer of science and a uniquely personable diplomat, Haber helped to bring Albert Einstein to serve as the intended director of the KWI for Physics in Berlin. The two men first men in 1911 at the annual meeting of German natural scientists in Karlsruhe where Einstein was impressed by Haber's "uncanny agility" and "fertility of ideas."[117] Haber, in return, firmly supported Einstein's theory of relativity, which helped to convince Einstein to join the Prussian Academy of Sciences in Berlin in 1914. This mutual admiration turned into a strong friendship that was maintained through their letter exchanges until Haber's death in 1934.[118] For many German scientists, including Einstein and the chemist Richard Willstätter, Haber was best defined by his numerous friendships founded on loyalty and respect. Writing on his travels with Haber, Willstätter reflected that "the most beautiful trips were the ones I took with Fritz Haber; they were hours of friendship in which I came to know and understand his individuality, his noble mind, goodness of heart, wealth of idea, and his boundless, extravagant drive."[119]

Throughout 1911, Haber continued solidifying both his personal relationships in the scientific world and the buildings that would serve as the physical home of his institute. In the span of eleven months, construction crews erected two large academic buildings, which officially opened their doors on October 23, 1912. The German Kaiser attended this opening ceremony and made a short speech that was influenced by a recent mine explosion. Wilhelm II encouraged the

[117] Fritz Stern, *Einstein's German World,* 103

[118] In 1915, Einstein privately tutored Haber's son Hermann. The elder Haber and Eistein's relationship was strained through the rest of the war due to Haber's stringent nationalism and his contribution to the German war effort. However, on January 18, 1918, Haber wrote to Einstein in part to mend any rift that the war may have created in their friendship. He wrote, "I have too much respect for your person and achievement to ever make fun about something you do and that I personally am extremely fond of you." Haber to Einstein, Jan 1918 (EA).

[119] Dietrich Stoltzenberg, *Fritz Haber,* 205.

scientists of his new institute to synthesize chemicals that could alert miners to the presence of dangerous gases and ultimately save more Germans from the hazards of airborne toxins. Such a call to national duty appealed to Haber, and the Institute's staff of five scientists, ten technicians, and thirteen assistants began working on a methane gas detector. By the end of 1912, Haber received great acclaim from both the Kaiser and the larger Kaiser Wilhelm Society when he presented his prototype of the marsh gas whistle.[120] However, further potentially life-saving research was abandoned with the outbreak of the war in 1914.

Taming the Air: Haber's Early Chlorine Gas Research

On the eve of World War I, Fritz Haber was in the middle of a six-week vacation at Karlsbad to recover from "gallstones and moodiness."[121] When the war was announced in the summer of 1914, Haber ended his sojourn and returned to Berlin to volunteer for active duty as a noncommissioned officer. This was a renewal of the patriotic spirit that Haber had displayed in his short stint in the Prussian military. However, at the age of forty-four, Haber was rejected for military service. Overcoming his initial disappointment, he soon found other ways to contribute to the war effort. First, Haber signed the Manifesto of the Ninety-Three, which unequivocally supported Germany's war aims and its military actions.[122] Even among fellow signees, Haber was particularly supportive of the German state, displaying a distinct fondness for the

[120] The tone of the marsh whistle changed based on the presence of toxic gas.
[121] Dietrich Stoltzenberg, *Fritz Haber,* 127.
[122] Klaus Hoffmann, *Otto Hahn: Achievement and Responsibility,* 83. From the field of chemistry, Adolf von Baeyer, Emil Fischer, Walter Nernst, Richard Wilstätter, and Wilhelm Ostwald all joined Haber in signing the Manifesto. It is fair to say that strict pacifists like Albert Einstein were the exception to the broadly bellicose nationalistic sentiment that pervaded German science.

authoritarian structure under the Prussian Kaiser. In fact, the physicist J.E. Coates once said that Haber's greatest wish was "to be a great soldier, to obey and be obeyed."[123]

Unlike the industrialist Carl Duisburg and the chemist Walther Nernst, Haber never admitted feelings of guilt over his role in the death and destruction of World War I.[124] In fact, like many of the signees of the Manifesto of the Ninety-Three, Haber equated German victory with the triumph of *Kultur,* or a more spiritually meaningful form of high-brow culture that many Germans claimed to represent and promote. But for Haber, this sense of Germanic *Kultur* extended beyond the writings of luminaries like Goethe and Schiller, including German chemistry in this same cultural vision. Thus, for Haber, German scientists were equally entangled in the supposed cultural struggle in which the German nation was now engaged. This position stood in contrast to the vision of science as an international and collective endeavor that had helped to shape the practices and institutional relations of science in 19th century Europe. Indeed, Haber was later quoted as saying that a German scientist must "serve mankind in peace and the fatherland in war."[125]

With such a patriotic disposition and personal connections throughout the world of chemistry, Haber was quickly installed as the head of the chemistry department for Walther Rathenau's Board of Wartime Raw Materials. Often called the "Haber Office," this position allowed Haber to exert his influence over both the scientific academy and industrial firms. His specific task was to direct the adaption of current chemical research projects for military

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[123] Margit Szöllösi-Janze, "The Scientist as Expert: Fritz Haber and German Chemical Warfare During the First World War and Beyond", in *One Hundred Years of Chemical Warfare: Research, Deployment, Consequences*, 21.
[124] Werner Plumpe, *Carl Duisberg 1861-1935,* 467.
[125] Henry Harris, "To Serve Mankind in Peace and the Fatherland in War: The Case of Fritz Haber," 31. Haber also later justified his military service by stating, "When the war broke out, no one wanted to lag behind, and the scientist remembered that Archimedes had delivered the eternal example of a researcher who served the advancement of humanity through his scientific work in peace, but in war he served his homeland and devised a war machine to protect it". Die chemische Industrie und der Krieg, 1920 (MPG) Va 5 734

purposes. The Kaiser Wilhelm Institute was an integral piece of this transition, and Haber directed his departments to begin researching new explosives and shell fillings, including tear gasses.[126] But by the end of 1914, Haber and Rathenau's personal relationship had deteriorated and Haber left his position with the War Materials Board to focus solely on his new role as head of the Chemistry Section in the Ministry of War.

Given his chemical expertise, Haber had served as a consultant on Hans Tappen's T-Shell project since the fall of 1914. During the testing of these projectiles, Haber realized that tear gases would never be effective in small quantities. To achieve an effective density of the gas, large quantities of shells would need to be fired in tight clusters.[127] Shell casings were still scarce for the German military so there was little that could be done in 1914 to strengthen T-Shell attacks. To avoid similar logistical problems, Haber suggested to Bauer and Falkenhayn that perhaps chlorine gas could be released from cylinders.[128] According to this place, Haber would insert siphon tubes into steel drums, each holding twenty kilograms of liquid chlorine, and then attach a lead pipe to each siphon tube. The pipe would be placed on top of the German trench and when wind conditions were favorable, a valve could be opened, thus turning the liquid chlorine to a gas that could waft towards the enemy trench. In theory, the chlorine would form a yellow-green cloud with a density greater than air that would roll along the ground, corroding enemy guns and forcing a troop retreat. However, this would require the Germans to release the gas at a close distance to the enemy trenches.

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[126] These projects included Gerhard Just and Otto Sakur's experiments with dichloromethylamine on cacodyl chloride. In one of their attempts to insert this unstable compound into a cast iron shell, the shell exploded, taking off Just's right hand and killing Otto Sakur. The early stages of the Haber Office's work also led to the largescale adoption of the Haber-Bosch Process, which ultimately solved Germany's nitrogen shortage and made Haber a national hero in the scientific world.

[127] Harold Hartley, "Report on German Chemical Warfare, Organisation and Policy, 1914-1918," 4163-2 and -3.

[128] Chlorine was a widely available byproduct of many chemical processes. Haber knew that it would serve as a more powerful lung irritant than tear gas.

Part of the attractiveness of Haber's plan was its legal and moral ambiguity. Because the Germans claimed that their intention with chlorine was to irritate rather than kill the enemy, the OHL could make an argument that they were adhering to the rules of war set down in the Hague Conventions. Falkenhayn and Bauer further argued that any clause in the First Hague Conventions' articles regarding "poison or poisoned weapons" referred to the intentional poisoning of drinking water or foodstuffs rather than poison gasses. The wording of the Second Convention's ban on poisoned gas specifically mentioned projectiles, but Haber's cylinders would not employ gas shells. Still further, the wording of the agreements on poisoned weapons repeatedly mentioned the inducement of an enemy's "unnecessary suffering." Throughout the war, Haber and Max Bauer continually argued that poison gas was no worse than the explosives that permanently maimed and disfigured so many men. If none of these arguments pacified the Allies, the German commanders at least felt confident that the French had already tested these legal boundaries through their use of potentially lethal tear gas. The Ministry of War gave Haber's plan a green light for development and both Haber and his KWI were subsequently brought closer to the Prussian military bureaucracy.

Haber proved extremely skilled in both transforming his KWI laboratories into a military research institute and integrating his endeavors into the preexisting military hierarchy. Towards the end of 1914, he began to assemble what would later be called *Pionierkommando* 35 and 36 (Pioneer Regiments 35 and 36).[129] These were two army engineer regiments that would be responsible for the deployment of gas and all other future tasks related to gas warfare.[130] While Colonel Otto Peterson served as the regimental commander of the gas troops, Haber and

[129] These pioneer regiments were also referred to in coded language as *Disinfektionstruppe*, or disinfection troops.
[130] The German military first created Pioneer Regiment 35 and later added 36 after Ypres. Pioneer Regiment 36 was first sent to the Eastern Front in May of 1915. Soldiers often jokingly referred to the *Pioniertruppen* as *Stinkpioniere* (or stink pioneers).

Friedrich Kirschbaum of the KWI were made military advisors.[131] Haber had notable power in staffing the two regiments and began to hand-select 500 promising chemists and physicists to join the ranks. As one member of the regiment later reported: "Any officer selected by Haber, regardless of where he was at the time, was soon transferred by Lieutenant Colonel Bauer to Peterson's organization…Haber sought out all physicists and chemists of whom he had heard."[132]

Haber's select group included the later-famous scientists Otto Hahn, Gustav Hertz, James Franck, Hans Geiger, Walter Madelung, and Wilhelm Westphal.[133] Otto Hahn (1879-1968) was a chemist who would later win the Nobel Prize for splitting the atomic nucleus. Before the war, he was already working on radiation at the KWI for Chemistry. Gustav Hertz (1887-1975) was an experimental physicist who would later win a Nobel Prize for his work on inelastic electron collision in gases. He was the nephew of the better-known Heinrich Rudolf Hertz of electromagnetic wave research. James Franck (1882-1964) was a physicist who also later won a Nobel Prize for discovering the laws governing the impact of an electron on an atom. He also directed the Chemistry Section at the Metallurgical Laboratory of the University of Chicago, a significant research sector of the Manhattan Project. Hans Geiger (1882-1945) was a physicist who later helped in constructing the Geiger-Müller counter and in describing the atomic nucleus. Geiger and Hahn would also serve on the project that attempted to produce an atomic bomb under the Nazis. Walter Madelung (1879-1963) went on to a professorship at the University of

[131] Otto Peterson was a regular officer in his mid-50s who originally commanded the engineers of Königsberg before taking command of the Gas Pioneers.
[132] Franz Richardt, report, MPG, Dept. Va, Rep. 5, 1494.
[133] Auszug aus dem Kriegstagebuch von Otto Gerhard Lt. im Res Reg 201 und ab Marz 15 bei den Gastruppen, 1956 (IZS) N 60.14/ 1-16. Ludwig Hermann was also a member of the gas regiment. In 1933, he would be made head of the Hoechst chemical factory under the IG Farben umbrella company. Stephan H. Lindner, *Inside IG Farben*, 77-78.

Freiburg where he was renowned for his work in dye chemistry and Wilhelm Westphal (1882-1978) became a well-known physics professor at the University of Berlin.

As the Pioneer Regiments grew throughout the war, additional young scientists and engineers joined as a way to advance their careers and gain access to Haber. Among those who later joined were Rudolf Hanslian and Hugo Stoltenzberg, both key players in German chemical weapons production and defense in the interwar years. By April 27, 1915, the Pioneer troops had grown from 500 to 1,600 men. While some of these men would later feel guilty for their participation in the early stages and development of chemical warfare, Haber was reportedly able to convince them to join through his sheer force of personality and his respected position in the chemical field. He held personal meetings with several hesitant men in which he talked of the moral relativity inherent to war and of his unshaken belief that the Germans could win the war swiftly with a massive gas strike that would save countless lives. Otto Hahn remembered how Haber gave him a lecture:

> about how the war had now become frozen in place and that the fronts were immobile. Because of this situation, the war now had be fought by other means in order to be brought to a favorable conclusion. He then gave me a lecture on chlorine gas clouds, which had to blow over enemy trenches in order to force the enemy to come out of them. I interjected that the use of poisonous substances was certainly universally condemned, whereupon he replied that the French had already tried something similar with shells in autumn of 1914. We would thus not be the first to use this kind of weapon. Anyway, in war, methods have to be use that lead to its rapid conclusion.[134]

While men like Hahn could be convinced by Haber, a select few scientists remained concerned by science's new level of cooperation with the German military. While Albert Einstein never renounced his friendship with Haber, the two drifted apart over Einstein's avowed pacifism.[135]

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[134] Johannes Jaenicke, memorandum on a conversation with Otto Hahn in January 1955, MPG, Dept. Va, Rep. 5 1453.

[135] Einstein loathed German imperialism and viewed himself as a Swiss internationalist. Throughout his career, he remained skeptical of German civil society and German culture due to anti-Semitic attacks levied at his work. Fritz Stern, *Einstein's German World,* 116.

The physicist Max Born also refused to join Haber's gas warfare efforts, later stating that Haber served as a "lightning rod" for the ethical concerns surrounding chemical weapons.[136]

By late December 1914, Haber and his men began small scale tests of chlorine cylinders (or "F batteries") at the Wahn artillery range. For gas protection, the pioneer troops were outfitted with the Dräger *Selbstretter* breathing apparatus, a cumbersome canister of oxygen that was attached via rubber tubing to an adjustable mouthpiece.[137] Hampered by the *Selbstretter,* the gas troops would slowly embed a few gas cylinders and practice the synchronized release of the gas. While technical problems still delayed the development of an effective piping system for large-scale chlorine attacks, the OHL chose to clear the weapon for use on the Western Front. Interestingly, the German High Command never witnessed the weapon's effectiveness because they feared that a large-scale test could spread chlorine for miles around Wahn.[138]

Both the OHL and Haber were insistent on the fact that surprise was a key component in the success of poison gas.[139] The gas would need to create a considerable level of chaos and confusion in the Allied lines if the Germans were to achieve a complete breakthrough. However, German commanders were skeptical about the possibility of secretly installing such large cylinders near the enemy's trench. Furthermore, the speed required for this attack was made doubly difficult by its reliance on the weather. The plan needed a slow and steady wind moving in a westward direction.[140] Beyond these technical problems, several military commanders still harbored distrust of the cultural changes that gas might bring to military practice. A close advisor

[136] William R. Shea, *Otto Hahn and the Rise of Nuclear Physics*, 172.
[137] Otto Hahn, *Mein Leben: Die Erringerung des grossen Atomforschers und Humanisten*, 118.
[138] January 9, 1915, Kriegstagebuch (BA-MA) Nachlass Gerhard Tappen
[139] Mit der Länge des Kriegs wachsen, 1918 (MPG) Va 5 522
[140] The Germans quickly began to expand their knowledge of meteorology for the deployment of gas. Prior to World War I, meteorology was not a particularly standardized science and a good deal of guesswork was involved. Making matters more difficult, Belgian weather was particularly volatile and difficult to predict. By 1917, the *Frontwetterdienst* (front weather service) was sending weather reports to the German artillery every two hours.

to Falkenhayn, General Gerhard Tappen, described chlorine gas as "initially repugnant" and of an "unchivalrous nature," while Major General Berthold von Deimling, who would later superintend the attack at Ypres stated, "I must admit that the task of poisoning the enemy as if they were rats went against the grain with me as it would with any decent sentient soldier."[141]

Regardless of these hesitations, the OHL knew that breaking through the enemy's trench lines was essential to a speedy victory in the West. The early stages of trench warfare had made the achievement of such a breakthrough seem exceedingly difficult, and technological solutions appeared increasingly attractive. In order to decide where to employ the potential wonder-weapon, the OHL asked each of the German Army commanders if they were interested in testing gas on their front. All but Duke Albrecht of Württemberg refused, thus requiring that Albrecht's 4th Army at Ypres bear witness to the first chlorine attack. Ypres was not the ideal location for the attack since the ground was uneven and the wind direction normally shifted throughout the year. Nevertheless, the Germans convinced themselves that westward winds would prevail and that the uneven ground would allow the gas to move downhill towards the enemy.

Over the course of January and February 1915, the OHL ordered 6,000 cylinders each carrying forty kilograms of chlorine gas and another 24,000 cylinders each carrying twenty kilograms. By early April, the Bayer chemical concern had delivered about 700 tons of chlorine gas to the pioneer troops.[142] This delivery was not an easy task. Due to the absence of filling stations, cylinders were filled at railheads and then freighted to the Ypres front. Loading and unloading the heavy cylinders was exceedingly difficult and extra soldiers were requisitioned for

[141] Tappen to Reichsarchiv, July 16, 1930, MA-BA ; Diana Preston, *A Higher Form of Killing*, 87. Crown Prince Rupprecht also tried to prevent the use of gas, claiming that the Allies would eventually respond with their own poison gases. Modris Eksteins, *Rites of Spring,* 162.

[142] Carl Duisberg, the CEO of Bayer, had cultivated a close relationship with Max Bauer and was in frequent contact with Haber by 1915. He readily agreed to have Bayer supply the German military with chemicals since Bayer's international chemical market had disappeared with the start of the war. The formation of the consolidated I.G. group was also inspired by the financial struggles that dyework firms faced at the onset of hostilities.

the duty.[143] None of this process was particularly stealthy and the Allies shelled the Germans after hearing the noise of nightly cylinder operations. In early March, Allied shells hit entrenched chlorine cylinders, injuring several German soldiers. In a second shelling, three men were killed and fifty were injured by the escaping gas. On April 2nd, Colonel Max Bauer and Fritz Haber also nearly died when they accidentally rode into a gas cloud during a final large-scale test of the cylinders at Beverloo. In his memoirs, Bauer described the effects of the gas:

> Privy Councilor Haber and I were present [for the gas trial]. The gas was released properly, but the devilish gas plagued us and we both tried to ride out of the cloud. At that moment, we lost our bearings in the fog, a mad cough set in, our throats were constricting—we were lost. The horses gasped, trembled, and began to stumble—there, in the highest distress, the cloud cleared and we were saved. But we were in bad shape. Terrible headaches and attacks of suffocation plagued us, and we were ill for several days.[144]

The Spiteful Cloud: The Attack at Ypres

The Germans initially believed that their soldiers did not need any special protection against the effects of the chlorine gas so long as the wind blew towards the Allies. Haber's near death experience at Beverloo convinced him otherwise and he procured 3,000 *Selbstretters* for the Pioneer troops and ordered another 3,000 more for machine gunners and other "essential troops."[145] At the last minute, in mid-April, the regular German infantrymen were issued cotton pads seeped in sodium thiosulphate.[146] This method of protection was not ideal since soldiers would have to hold these pads to their noses and mouths, making fighting nearly impossible.[147]

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[143] At Ypres, the Germans used the term *Disinfektion* (Disinfection) as a code word for gas deployment.
[144] Oberst Max Bauer, *Der grosse Krieg in Feld und Heimat*, 69.
[145] This second order of *Selbstrettern* was not fulfilled in time for the attack. Haber stated that he could not convince the Army commanders that protection against gas was necessary. See the letter from Haber to Dräger in Rudolf Hanslian, *Der deutsche Gasangriff bei Ypren am 22. April 1915*
[146] Chef des Generalstabes des Feldheeres, 1915 (BA-MA) PH3/1012 LSFN 4576F. See also: William Boyd, *With a Field Ambulance at Ypres*, 67.
[147] Gasschutzwesen, Allg.u.Besonderes 1915-1918, BHK, Generalkommando I. Armee-Korps (WK) 1276

Furthermore, the pads did nothing to protect the eyes since the German General Staff did not believe that chlorine gas could cause ocular damage.[148] Beyond flawed scientific knowledge, this lack of protection was also partly due to the impatience of the German commanders at Ypres, who wanted to conduct the attack before they were recalled to the Eastern Front.[149] The commanders first alerted the pioneer regiments for attack at 10:30pm on April 14th, but canceled the attack at 1:45am due to imperfect weather conditions. They again alerted for an attack on April 19th, but subsequently countermanded the order. After these two aborted offensives, both the pioneer regiments and the assault troops reportedly felt increasingly on edge, worrying that the Allies had learned of the plan and taken measures to protect themselves. Indeed, the French had heard of the attack from a captured German reserve infantryman named August Jager. Several other German prisoners corroborated Jager's story, which was also confirmed in March when Allied shells hit the German cylinders, creating a visibly gaseous explosion.[150] Nonetheless, the French chose to disregard the information, assuming that Jager was planted by the Germans to spread false information. The British and Canadians took the reports more seriously but still did little to prepare themselves.

The third German gas alert came on April 21st but was postponed to the morning of the 22nd. On the 22nd, the men waited until just after 5:00pm when commanders finally gave the order for attack and 6,000 cylinders were simultaneously opened along 7000 meters of the northern Ypres front. One can only imagine the awe inspired by the 150-ton white cloud of chlorine that rose to thirty meters in the air and slowly wafted at about one mile per hour toward the French lines, gradually turning to a yellowish-green color. The cloud eventually reached the

[148] Gasschutzwesen, Allg.u.Besonderes 1915-1918, BHK, Generalkommando I. Armee-Korps (WK) 1276
[149] In the spring of 1915 the Russians were increasingly pressuring the Austro-Hungarians in the Carpathian Mountains, forcing the Germans to consider sending reinforcements.
[150] William Moore, *Gas Attack! Chemical Warfare 1915-19 and Afterwards*, 23.

French trenches, predominantly manned by Franco-Algerian troops, and immediately began to choke the men present. Those men who did not immediately suffocate on the ground ran from their positions. In turn, the Germans warily advanced behind the cloud, trying to avoid their own lingering gas. Reportedly, they shot or stabbed many of the French soldiers that they found writhing in agony. One infantryman Fischer wrote of the attack:

> Woe be unto the enemy when they encounter our perfume. It's pure mass murder and with almost devilish joy we put an end to them quickly. It is easy to explain why we didn't take many prisoners, we beat to death everyone left alive in the trenches. The English often beg on their knees, but they also die on their knees…With poison we fight for Kaiser and fatherland and against the whole world.[151]

In about an hour, the Germans had taken the northern outlying areas of Ypres. By dusk, they had captured around 2,000 Allied soldiers and fifty-one artillery pieces. But with the arrival of night, they stopped at a canal rather than pursuing the retreating French army. This allowed the remaining French troops to regroup with Canadian soldiers and counterattack the new German positions during the night.

At 2:00am on April 24th, the Germans released fifteen more tons of chlorine toward the 2nd Canadian Brigade. The Canadians held their ground for a short period of time, but eventually retreated towards the town of Ypres. Again, the Germans stopped their advance after they reached their initial objective and dug in.[152] This slow and steady form of advance did not adhere to Haber's insistence on speed and surprise. The soldiers' decision revealed both their inexperience with the advantages of their new weapon and their fears about its indiscriminate capacity for killing.[153] Furthermore, the commanders' initial doubts about the effectiveness of the

[151] Gerhard Hirschfeld and Gerd Krumeich, *Deutschland im Ersten Weltkrieg*, 24-25.
[152] The orders from the German commanders explicitly detailed the ground to be taken and then demanded that troops dig in and wait for further actions. See: Ulrich Trumpener, "The Road to Ypres", 474-475, 477.
[153] The German soldiers had feared gas since the cylinders were first installed. The first gas casualties were four German soldiers who were installing a cylinder when it was hit by a shell. Gas leaks also made several German soldiers sick and increased antipathy towards the new weapon. Leo van Bergen, *Before My Helpless Sight*, 192.

new weapon hampered its success. The gas pioneer Otto Lummitsch wrote, "Unfortunately the Supreme Command had not prepared sufficient reserves because they doubted the effectiveness of the new weapon. Otherwise is would have been possible to make a decisive breakthrough."[154]

The Germans used gas at least four more times over the course of the Second Battle of Ypres. In each occasion, they employed it either to weaken Allied morale directly before an attack or to delay Allied reinforcements from the town. Soon after the second attack against the Canadian Brigade, the British outfitted their troops with cotton pads and gas retarding chemicals.[155] On May 24th, the Germans conducted their final assault on Ypres with the aid of chlorine gas. They created a small push to the south of the original gas attacks but made little progress. The British experienced few casualties and maintained their position around Ypres, already learning how to resist the choking clouds. By the end of May, the Germans realized that their chlorine gas would not be the wonder weapon that could prove decisive in this war.

According to Haber, the German commanders had not allocated sufficient resources for the attack, nor had they acted quickly enough on April 24th when the element of surprise was at its greatest.[156] It was not the fault of his weapon, but rather the folly and timidity of the men that had prevented the attack from succeeding. The German commanders learned rather different

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[154] Otto Lummitsch, "Meine Erinnerungen an Geheimrat Prof. Dr. Haber", MPG, Dept. Va, Rep 5, 1480.

[155] The British would tie the cotton pads or wet handkerchiefs to their faces. If they ran out of neutralizing chemicals, they would urinate on the pads. The Germans, on the other hand, were significantly more advanced in their treatment of gas casualties. They had already begun to outfit their field hospitals with artificial respirators called Dräger Pulmotors. Pulmotors were suitcase-sized boxes which could pump oxygen through a hose to the afflicted soldier. The Dräger company first introduced the Pulmotor in 1907 for use in the mining industry. Military doctors and sanitary personnel received cursory on-site training with the device. Generalstabes des Heeres on Gas, 1915 (BA-MA) PH3/252 LSFN 4503F

[156] Reflecting on the need for surprise in chemical warfare, Haber was prescient enough in early 1916 to begin considering the role of airplanes in future chemical attacks. After sketching out this aerial combat, Haber wrote, "I am hoping for peace [in the next few months], though I would not want a peace by which France and Belgium would remain foes with a military capacity. Because quite aside from all ethical and political considerations, a peace that would oblige us to arm against a formidable enemy in the West as we had to do so carefully in the past would impose on us material burdens that apparently today are not yet recognized." Fritz Stern, *Einstein's German World,* 122.

lessons from Ypres. For them, gas was another new technology that required systematic preparation and technical know-how. Officers would need to assess the right terrain, weather, and density for future gas clouds.[157] Additionally, regular German infantrymen needed gas training and a form of protection against their own gas clouds. Commanders further realized that they might soon need protection against retaliatory gas attacks. Crown Prince Rupprecht, commander of the Sixth Army, pointed out that the prevailing winds in France headed eastward toward the German lines. If the Allies adopted similar gas weapons, then they could deploy them "ten times more often than we could."[158]

Regardless of the relative failures of the attack at Ypres, the chlorine gas did claim its victims. Casualty reports varied widely due to both the inability to assess the damage of a new weapon and the desire to over- or under-inflate casualty numbers for propaganda purposes.[159] Based on comparative reports, the German gas specialist Rudolf Hanslian estimated that there were about 7,000 gas victims at Ypres, including 350 deaths. While the attack did little to break the Allied front, it had a great effect on the psyches of the Allied soldiers. The poison cloud was an imposing visual spectacle, and the injuries that it produced were particularly gruesome. The German soldier Rudolf Binding wrote that "The effects of the successful gas attack were horrible…All the dead lie on their backs, with clenched fists; the whole field is yellow…One can see [Ypres] burning—not without a pang for the beautiful city."[160]

[157] For a military source that details meteorological testing for gas attacks see: Anlagen zum Kriegstagebuch Juli 1915-April 1917, LBWK, 456 F 55, 392. For an early discussion of terrain in military gas operations see: Gaserkrankerung, Gasberichte und Gaskurse Nov 1915-Jan 1916 (LBWK) 456 F 16, 57
[158] Kronprinz Rupprecht von Bayern, *Mein Kriegstagebuch*, 304-305.
[159] The Germans initially claimed that their medical services only treated 200 Gas casualties on April 22nd and only twelve men died. The Allies claimed that 15,000 men were injured by gas and 5,000 were killed.
[160] Rudolf Binding, *A Fatalist at War*, 64. Binding later became a recognized German war poet and novelist.

An Unprecedented Crime Against Humanity: Allied Perceptions of Ypres

Narrations of the death and destruction at Ypres infuriated the British back home. *The London Times* reported on April 26, 1915 that:

> the Germans were employing stifling gases, which were released by special devices in the German trench and driven into the French trench by the northerly wind. The use of 'bullets, the only purpose of which is the spread of suffocating gases' was forbidden by the International Declaration in the Hague on July 29, 1899, and Germany agreed to this declaration…It has not even been proven whether missiles have been used at the attack to the north of Ypres, but it has been shown that suffocation was the sole purpose, and that Germany has violated the Hague provision, and thus placed a new crime on the great list of its perfidy.[161]

Twelve days later, the *Times* described the chlorine gas as "the devilish tricks by which soldiers are poisoned and condemned to slow, agonizing death." The report continued on to chastise the German military command, stating that:

> The horrors inflicted by the poison gas clouds are constantly hidden from the German nation. Nothing is more remarkable than the complete silence of the German press, evidently in the pursuit of strict secrecy about the use of poisonous gases in battle…The whole world must now understand that the Germans and their base means cannot destroy the work of civilization that has been built up over centuries of human life.[162]

Contrary to the initial claims of *The London Times,* German newspapers did in fact report on the German use of gas at Ypres. On April 26th, the *Frankfurter Zeitung* reported the attack, but also claimed that poison gas was far preferable to the destruction wreaked by conventional shells.[163] In her book *A Scrap of Paper,* the historian Isabel Hull has shown how the German authorities explicitly failed in the battle of international propaganda that was waged during World War I. Hull points out that the German state's conception of *Notstand* (or state of

[161] Re-translated from a German translation in 4. Armee, 1915 (BA-MA) PH3/569 LSFNM4521F. These outcries contributed to the depiction of German soldiers as murderous Huns in Allied propaganda. For instance, in *Mr. Britling Sees it Through,* H.G. Wells called the Germans "apes with science in their hands." Future German disregard for international laws of warfare would hasten the spread of this portrayal. H.G. Wells, *Mr. Britling Sees it Through,* 291.

[162] 4. Armee, 1915 (BA-MA) PH3/569 LSFNM4521F. See also: Marion Girard, *A Strange and Formidable Weapon,* 136-12; and English reports, 1915 (BA-MA) PH 3/577 LSFN 4524F

[163] "Through German Eyes: Poisonous Gases: A Quick and Painless Death", *The London Times,* 29 April 1915, p. 6.

emergency) regularly subordinated civilian concerns to a bellicose international policy directed by the military. The idea that "emergency" or "necessity" could trump international law and justify warfare was the kind of rationalization that propelled the German use of poison gas in the first place.[164] This same formulation also applied to the press and soldier correspondence. The German authorities kept projects like Haber's secret and utilized a degree of censorship after their debut.[165] Once German newspapers did start reporting on Ypres, they parroted that same justifications that had been previously crafted by Haber and Falkenhayn's staff. In June 1915, the *Kölnische Zeitung* argued that:

> The basic idea of the Hague agreements was to prevent unnecessary cruelty and unnecessary killing when milder methods of putting the enemy out of action are possible. From this standpoint, the letting loose of smoke clouds, which, in a gentle wind move quite slowly towards the enemy, is not only permissible by international laws, but is an extraordinarily mild method of war.[166]

The *Militär Wochenblatt* similarly stated that "[gas and related technologies are] certainly often bitterly perceived, but tactically and militarily they are acceptable. 'War is merciless, death is death.' whether by bullet, or gas, or bomb, or burning liquid. The soldier in the field knows only the one task, to win."[167] A related article again pointed out that the French use of *cartouches suffocantes* proved that the German gas was only a matter of retaliation. The writer stated that,

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[164] Isabel Hull, *A Scrap of Paper*, 44-50, 231-239. This idea is expanded to explain the brutality of German soldiers in colonial endeavors and in World War I in: Isabel Hull, *Absolute Destruction: Military Culture and the Practices of War in Imperial Germany* (Ithaca: Cornell University Press, 2005). For an account that is more critical of the decision-making of German elites than of a national militaristic culture see: Alan Kramer, *Dynamic of Destruction: Culture and Mass Killing in the First World War* (Oxford: Oxford University Press, 2007) ; Alan Kramer and John Horne, *German Atrocities, 1914: A History of Denial* (New Haven: Yale University Press, 2001)

[165] See: Wolfgang Wietzker, Giftgas im Ersten Weltkrieg: Was konnte die deutsche Öffentlichkeit wissen?, 69-73. For the failures of German home front propaganda see: David Welch, *Germany and Propaganda in World War I: Pacifism, Mobilization, and Total War*, 267. ; Florian Altenhöner, *Kommunikation und Kontrolle: Gerüchte und städtische Öffentlichkeiten in Berlin und London 1914/1918*, 88. For a description of German propaganda agencies see David Welch, *Germany, Propaganda, and Total War, 1914-1918: The Sins of Omission*, 22-25, 36-40. And for a discussion of censorship see Ibid, 27-36. ; Wolfgang G. Natter, *Literature at War, 1914-1940: Representing the "Time of Greatness" in Germany* (New Haven: Yale University Press, 1999). For censorship of soldier letters see: Benjamin Ziemann, War Experiences in Rural Germany, 1914-1923, 42.

[166] *Kölnische Zeitung*, June 26, 1915

[167] "Der Wert der inneren Linie", *Militär Wochenblatt* (169/170) 1915, 4036-4037.

"the development of German chemical science, of course, allows us much more effective means of war. In view of this, the [British] appeal to the laws of warfare cannot be correct."[168] Indeed, many Germans had a particularly easy time in believing these justifications for gas because they viewed the standing international order as a British creation. Laws that restricted modern weapons like gas were outdated and only upheld to retain British military advantages.[169]

If the gas attack at Ypres did not have a great effect on the battlefield, it did certainly have a major impact on the perception of the war, at least in the Allied press. Following the attack, many British and French citizens and infantrymen were forced to reevaluate their assumptions about honor and fairness in warfare. However, military men and scientists who had significant knowledge about the history and nature of gas warfare were substantially less scandalized.[170] For many of these specialists, April 22, 1915 was not the birth of chemical warfare, as it is often proclaimed. Humans had poisoned arrows, contaminated drinking water, and deployed chemical explosives for thousands of years. Furthermore, Ypres was not even the inception of "modern" chemical warfare.[171] Both the French and the Germans had used potentially lethal tear gases for months prior to Haber's attack.[172]

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[168] "Die Verwendung von betäubenden Gasen, *Militär Wochenblatt* (114/115) 1915, 2759-1763. The *Vossische Zeitung* printed a similar article that claimed that "our opponents have used this means of combat for months." Tim Grady, *A Deadly Legacy: German Jews and the Great War*, 68.

[169] Modris Eksteins, *The Rites of Spring*, 160. See also: *Berliner Tageblatt,* April 26, 1915: "The everyday talk is of the 'German fumes' at Ypres….From what we have heard there is no danger to life but only a nasty condition lasting four hours or so…The English are sentimental fellows: they do everything to force us into the hideous death facing the population at home and then complain about a little swelling of the mucous membrane. And not having signed the provisions of international law, they demand that we should respect them."

[170] Historian Olivier Lepick argues that if the Germans had not used chlorine gas at Ypres then another belligerent would have surly employed poison gasses later in the war. Olivier Lepick, *La Grande Guerre Chemique 1914-1918*, 65.

[171] Ulrich Trumpener, "The Road to Ypres", 480.

[172] Olivier Lepick, *La Grande Guerre Chemique 1914-1918,* 54-59. See also: Olivier Lepick. "Une Guerre Dans La Geurre: Les Armes Chimiques 1914-1918." *Revue Historique Des Armees*, no. 203 (1996): 73–86. For a German report of early French gas use see: Otto Borggräfe, "Mein Tagebuch" 1914-1915 (IZS) N10.3-7

Instead, for these experts, April 22nd was remarkable in the history of chemical warfare simply for its sheer scale. Both the volume of gas and the size of the front were unprecedented. The 150 tons of chlorine gas used at Ypres could only have been produced by an industrialized nation that had engaged its large chemical companies in military armament.[173] Several tacticians and technicians, including Haber, also realized that the attack was important for its psychological effects. The thirty-meter cloud of green gas was an extraordinary sight for the soldiers on the ground. In their somewhat overstated opinion, this was a horrific weapon that could achieve mass death and destruction. Regardless of the validity of this claim, the German intention for this seemingly monstrous weapon cannot be disregarded. While Haber claimed that there was no appreciable difference between French tear gas and chlorine, Falkenhayn reportedly asked Emil Fischer for something more powerful than T-shells in 1914. Spurring the initial development of Haber's chemical weapons research, Falkenhayn specifically requested something that could incapacitate the enemy "permanently."[174] Undoubtedly, both these details and the often-fanciful perceptions of the attack at Ypres shaped how the battle was later remembered as an instance of German perfidy.[175]

[173] The Chemische Fabrik Griesheim-Elektron at Bitterfeld was eventually designated the leading German producer of chlorine. They supplied 34,500 tons during the war.
[174] Ulrich Trumpener, "The Road to Ypres," 467.
[175] Interestingly, even Germany's Austro-Hungarian allies refused to develop and use poison gas under the directions of Emperor Franz Joseph. It was only after the Italians used gas bombs against the Austrians in 1916 that the Austro-Hungarian military began creating its own "gas warriors." Manfried Rauchensteiner, *The First World War and the End of the Habsburg Monarchy, 1914-1918,* 543. In a 1917 meeting between the Austrian propagandist Franz Kreuz and Italian troops, Kreuz apparently warned that "the German chemists have invented terrible weapons...and no mask will be able to protect you. Goodbye to all of you who will remain alive, goodbye too to those who will not live!" Mark Cornwall, The Undermining of Austria-Hungary: The Battle for Hearts and Minds, 79.

The Warrior in the White Coat: Fritz Haber, the KWI, and the Escalation of the Chemical War

Chemical weapons testing continued unabated during and after the battle at Ypres. Even in the midst of one of the first attacks against the British, the gas pioneer and promising physicist James Franck was found fearlessly taking air samples in a shell crater.[176] The enthusiasm of Haber's scientists was later matched by gas researchers in Britain and France. These men cited several reasons for their eagerness to engage in military research. First, in 1915, the long-standing link between science and progress was still relatively unquestioned, especially among the scientists themselves. This encouraged the view put forth by Haber that poison gas must be a more humane weapon.[177] Idealists envisioned future knock-out gas that could pacify entire armies without a shot fired. Second, many scientists defended their work with gas as a patriotic necessity, relying on much of the national propaganda to demonize the enemy. Third, many believed that gas research would lead to advances in tangential scientific and technical fields that would eventually benefit humanity.[178] Curt Wachtel, a pharmacologist under Haber and the future founder and director of the Institute of Industrial Hygiene and Professional Diseases, later wrote:

> A science guilty of creating the means of immeasurable destruction and human suffering may be considered more than fully exculpated through the great contributions to public hygiene and welfare which resulted from the same research on war gases. Certainly, many more lives have been saved through these and other accomplishments resulting from the wartime study of gas attack than were sacrificed by the latter during the World War.[179]

[176] Jost Lemmerich and Ann Hentschel, *Science and Conscience*, 55.
[177] Hugh R. Slotten. "Humane Chemistry or Scientific Barbarism? American Responses to World War I Poison Gas, 1915-1930", 477.
[178] World War I gas research did in fact advance countless other scientific and technical fields. To name just a few: meteorology, pest control, firefighting, mining, underwater exploration, medicine, pharmaceuticals.
[179] Curt Wachtel, *Chemical Warfare*, 12.

Lastly, many gas researchers saw the war as a way to advance themselves professionally or to grow the institutional power of scientific organizations or chemical firms. All of these arguments and self-justifications revealed the extent to which the scientific development of gas warfare highlighted what the writer Diana Preston has called the First World War's "conflicts and ambiguities between expediency and morality in warfare."[180]

Shortly after reports from Ypres returned to Germany, the Kaiser celebrated his perceived victory.[181] In a rather extraordinary move, Wilhelm II ignored the esteemed military process of advancement and promoted Fritz Haber from a sergeant in the militia reserve to a regular captain in the German army. This fulfilled Haber's early dream of entering the Prussian careerist ranks. He began to regularly wear an officer's uniform and to demand the formal respect that came with such a positon.[182] At the same time, Haber's new military role came with a great deal of work, which Haber indefatigably tackled, often at the expense of his personal relationships and his physical health.[183]

During this period, Haber further reorganized the Kaiser Wilhelm Institute for Physical and Electrochemistry to meet the increasing demands for war related research. In 1915, over half of the KWI's expenditures were related to military projects. By February 1916, practically all its

[180] Diana Preston, *Before the Fallout: From Marie Curie to Hiroshima*, 52.
[181] This celebration was commemorated as Ypres Day in Germany.
[182] Henry Harris, "To Serve Mankind in Peace and the Fatherland in War: The Case of Fritz Haber," 35.
[183] Fritz Haber married his wife, Clara Immerwahr, in 1901. Immerwahr was also a converted Jew with a talent for chemistry. She received a PhD in chemistry from the University of Breslau and quietly translated and contributed to much of Haber's early work. When World War I began, Clara rejected Fritz's nationalistic military contributions, finding them contrary to the international ideals of science. On May 2, 1915, after seeing Fritz return from Ypres in his military uniform, Clara shot and killed herself with Fritz's pistol. While Immerwahr had previously expressed feelings of depression, some have speculated that her suicide was an act of revolt against Haber's militarism. After finding his wife dead on the following day, Haber left home to continue his gas trials on the Eastern Front. For a balanced account that denies direct associations between Clara's suicide and Fritz's war service see: Bretislav Friedrich and Dieter Hoffmann, "Clara Immerwahr: A Life in the Shadow of Fritz Haber", in *One Hundred Years of Chemical Warfare: Research, Deployment,* 55-60. While Haber may have been a more loving husband than popular accounts afford him, the story of Clara's suicide immediately impacted the public perception of Haber. In her personal diary, Princess Evelyn Blücher reported disgustedly that she had heard that Haber was proud to have sacrificed his wife to the German war cause. Evelyn Blücher, *An English Wife in Berlin,* 87.

expenses were military in purpose.[184] The KWI's advisory committee, which included Emil Fischer, Walther Nernst, and Richard Willstätter, now brought on Bayer's CEO Carl Duisberg to facilitate cooperation between laboratory research and industrial production.

On July 4, 1916 Leopold Koppel suggested a new fund to the Ministry of War that would finance the continued research of warfare technology. Haber was most likely the real voice behind the proposed creation of the Kaiser Wilhelm Foundation for the Sciences of Military Technology (KWKW). Two management boards would direct this institute, comprised of both scientists and military men. Haber saw this new institute as a way to put the two groups on equal footing and as a method to garner military honors for war researchers. The KWKW began research in the spring of 1917, but achieved little success and was eventually transformed into the Kaiser Wilhelm Foundation for Technical Science in 1920.[185] Haber also envisioned the Institute for Applied Chemistry and Biochemistry as an institutionalized continuation of his research on chemical weapons after the war. Indeed, Haber was already readying himself for the war's end by trying to secure peacetime funding and cement his power both in the scientific world as well as the German military hierarchy. He wrote in 1917, "in peacetime, the development of weapons should be given over to the military, but research on the chemical makeup of these weapons should be carried out in a new scientific institute, while the Kaiser Wilhelm Institute for Physical Chemistry and Electrochemistry must return to its original goals."[186] The board of the larger Kaiser Wilhelm Society refused to create an institute that was clearly intended for military purposes, but the German War Ministry agreed to provide six

[184] Bretislav Friedrich and Jeremiah James, "From Berlin-Dahlem to the fronts of World War I: The Role of Fritz Haber and his Kaiser Wihlem Institute in German Chemical Warfare", in *One Hundred Years of Chemical Warfare: Research, Deployment,* 32.
[185] See: Manfred Rasch, "Science and the Military: The Kaiser Wilhelm Foundation for Military-Technical Science", in Roy Macleod, and Jeffrey Allan Johnson, eds. *Frontline and Factory: Comparative Perspectives on the Chemical Industry at War, 1914-1924*, 187-192.
[186] Fritz Haber, memorandum, 18 Sept 1917 (MPG) Dept Va, Rep 5, 1616.

million marks for such applied weapons research. The Kaiser Wilhelm Society eventually compromised and granted Haber a special department within his KWI for continued weapons research.

By 1917, control of Haber's department was shifted from the Central Chemistry Office to Department W8 of the Ministry of War.[187] Organized under section A10, Haber headed this small military department concerned exclusively with chemical warfare supplies.[188] Through A10, Haber would eventually control nine KWI departments in different parts of Berlin, all working on various aspects of chemical warfare.

Department A, under Professor Olivier Herzog, dealt with the inspection of gas mask face-pieces. Department B under Dr. Friedrich Kerschbaum employed 31 scientists, engineers, and pharmacologists and another 16 assistants to test new poison gases for warfare applications. Department C under Dr. Hans Pick employed 14 researchers and 27 assistants to develop gas mask filters. Department D under Professor Heinrich Wieland synthesized new poison gases. Department E under Dr. Ferdinand Flury researched all matters of pharmacology and toxicology related to chemical warfare. Department G under Hans von Tappen oversaw the development of gas shells and explosives. Department H under Otto von Poppenberg developed general explosives and trench mortars. Department J under Professor Paul Friedländer tested weaponized gas and worked closely with chemical firms. And Department K was a short-lived section under Professor Erich Regener that investigated particulate clouds.[189] In order to staff these sections,

[187] Ministry of War, Dept. W8, Oct. 1916, (MPG) KWG, Dept I, Rep. 1a, 36, General Administration, 1153.
[188] A10 was originally the Haber Office under the Artillery Division. As A10, it was an independent department of the General Staff.
[189] For detailed descriptions of all the departments see: Jeremiah James et al, *One Hundred Years at the Intersection of Chemistry and Physics: The Fritz Haber Institute of the Max Planck Society 1911-2011*, 32-33. While Regener's Department K was short-lived, historian Carl Freytag has claimed that his research into very-fine Bluakreuz gas may have revolutionized chemical warfare. Carl Freytag, "Bürogenerale und Frontsoldaten der Wissenschaft. Atmosphärenforschung in der Kaiser-Wilhelm-Gesellschaft während des Nationalsozialismus," in

Haber recruited many of these significantly younger scientists through his long-standing academic connections. The various departments held weekly meetings where all research information would be efficiently funneled up to Haber. But the need for secrecy and Haber's desire for a strict hierarchy often reduced communication between the departments and stifled horizontal research creativity.

Department	**Director**	**Primary Purpose(s)**
Dept. A	Prof. Olivier Herzog	Gas mask design and testing
Dept. B	Dr. Friedrich Kerschbaum	Poison gas testing
Dept. C	Dr. Hans Pick	Gas mask filters
Dept. D	Prof. Heinrich Wieland	New poison gas development
Dept. E	Dr. Ferdinand Flury	Pharmacology and toxicology
Dept. G	Hans von Tappen	Gas shells and explosives
Dept. H	Otto von Poppenberg	Explosives/trench mortars
Dept. J	Prof. Paul Friedländer	Industry cooperation
Dept. K	Prof. Erich Regener	Cloud particulates

Table 1: Table displaying the different departments in Fritz Haber's Kaiser Wilhelm Institute

In 1917, research at the KWI shifted from gas-blowing operations to the development of gas shells.[190] Haber's scientists also worked tirelessly on arsenic compounds like Clark I and II as well as the development of mustard gas. Haber saw both types of chemical weapons as ways to circumvent the effectiveness of new Allied gas masks. This, he believed, was another turning point in which the strength of the combined German chemical industry and research institutes could hand the military a decisive advantage. While arsenic compounds never had great military success, mustard gas proved relatively effective when the Germans first used it in July 1917. The

Gemeinschaftsforschung, Bevollmächtigte und der Wissenstransfer die Rolle der Kaiser-Wilhelm-Gesellschaft im System kriegsrelevanter Forschung des Nationalsozialismus, 233.

[190] In 1917, Haber also married Charlotte Nathan, a woman who worked at a social club that he regularly attended. Originally Jewish, Nathan also converted to Christianity for Haber. Happiness in the marriage was short lived, as Haber was absorbed by his work for the German military and the two regularly fought over Haber's first son, Hermann. The couple had their own daughter, Eva-Charlotte, in 1918 and a son, Ludwig Fritz, in 1921. In 1927, Fritz and Charlotte divorced.

mustard agent could burn the eyes and lungs, leading to temporary blindness or respiratory infection. More importantly, it affected bare skin, creating serious chemical burns on those who were exposed for relatively brief periods of time. While German sanitary troops were outfitted with KWI-manufactured rubber suits to protect them from mustard gas, the Allied soldiers remained unprotected, suffering greatly when mustard gas was first introduced at the Third Battle of Ypres. By now, Haber had realized that the key to this new weapon (like all previous chemical weapons) was exploiting its capabilities before the Allied scientists could mimic its production.

To meet the massive demand for Clark and mustard gas shells, the Germans built a new shell filling plant at Breloh under the direction of Haber. The plant was named Klopper Works and then placed under the supervision of a previously wounded gas pioneer named Hugo Stoltzenberg.[191] Stoltzenberg had been a research assistant at the Chemical Institute of the University of Breslau, a chemical weapons researcher at Haber's KWI, and a director at the Adlershof shell filling plant. Unfortunately for Stoltzenberg, the Klopper Works faced numerous building setbacks and was not made fully operational until early 1918. This delay allowed the Allies enough time to synthesize their own version of mustard gas often called Yperite.[192] By July 1918, the French had produced a substantial number of mustard gas shells and distributed them to the British and Americans.[193] Clearly, by 1918, the Germans had lost yet another technological advantage at a moment in the war in which the disparity in raw materials was

[191] Gasschutz Lummitzsch, Otto: Meine Erinngerung an Geheimrat Haber, 1955 (MPG) Va 5 534. Stoltzenberg was wounded in the left eye when a chlorine cylinder exploded at the Second Battle of Ypres.
[192] The Allied term Yperite came from the German use of mustard gas at the Third Battle of Ypres.
[193] By 1918, chemical shells made up about 50% of all German shells fired. Gas shells made up 35% of French, 25% British, 20% American shells. Bretislav Friedrich and Jeremiah James, "From Berlin-Dahlem to the Fronts of World War I: The role of Fritz Haber and his Kaiser Wilhelm Institute in German Chemical Warfare", in *One Hundred Years of Chemical Warfare: Research, Deployment, Consequences,* 42. In the Battle of the Marne in 1918, about 80% of German shells contained gas. Dirk Hackenholz, Die elektrochemischen Werke in Bitterfeld 1914-1945, 108.

beginning to take its toll. While German gas shells were rarely in short supply, essential materials for gas protection like rubber and chlorinated lime were scarce. The arrival of mustard gas on the battlefields of 1917/18 made life at the front hellish for German infantrymen. Shortages of supplies and the constant presence of vesicant agents like Yperite finally stretched the nerves of German soldiers too thin. Troop morale plummeted as soldiers ignored correct gas protocol and Haber's chemical war ultimately helped bring about the final German surrender on November 11, 1918.

The Impossibility of Defeat: The Legacy of Fritz Haber's KWI at War's End

Ever the believer in German superiority, Haber refused to imagine that the Germans would lose the war until the autumn of 1918 when domestic reforms seemed necessary to keep the German home front from unrest. Even in September 1918, Haber was preparing for continued chemical warfare in the upcoming year. But when the armistice did come, Haber quickly set his plans in motion to return the KWI to peacetime activities. Departments were separated and laboratories were returned to non-military research projects. Haber did this with the funds that the Ministry of War had granted him in 1916, which were surprisingly never rescinded in the face of other material shortages. It appeared that the KWI would endure the war, but Haber was forced to flee to Switzerland when he was placed on the Allied war criminals list.[194] During this brief exile, Haber experienced a nervous breakdown brought on by both sheer exhaustion and anxiety over his wartime work. However, after only a few months in Switzerland, the Allies stopped requesting Haber's extradition and he was allowed to return to Germany.

[194] Walther Nernst and Carl Duisberg were also place on the war criminals list. They, too, were never apprehended and punished.

Once back, Haber employed his knowledge of poison gases for pest control research at the KWI.[195] His lofty reputation in the German scientific world was somewhat rehabilitated when he received the 1919 Nobel Prize in chemistry for his contribution to the Haber-Bosch nitrogen fixation process.[196] This allowed Haber to become the driving force behind the Emergency Committee for German Science, an organization that raised funds for research projects through contacts with the federal and state governments as well as private industry.[197] He also became a regular face at the Prussian Academy of Sciences as he began to strike the pose of an elder statesman for German science.[198]

In 1923, a German national committee brought Haber in for questioning to determine if his actions during the war adhered to the rules of international warfare. Haber returned to his many arguments about the humane-ness of chemical weapons and the retaliatory nature of the attack at Ypres. He wrote in his lectures from the 1920s that:

> Gas weapons have experienced the bitterest denigration. The allegations of a violation of international law and of sheer cruelty have been raised against this alleged German invention in all languages. There is no remedy for the hostility of a press that does not take the facts seriously even after the patient restating of the truth. We did not invent gas weapons. Their origins go back to the days when men learned to ferret the enemy out of their fixed positions, and chemical weapons have been mentioned since Plataeae and Belium in the Peloponnesian War. We did not even invent the more effective gases of

195195 See: Margit Szöllösi-Janze. "Pesticides and War: The Case of Fritz Haber." *European Review* 9, no. 1 (2001): 97–108.

196 The awarding of the Nobel Prize to Haber did not go without controversy. Many scientists saw this as an affront to the pacifistic and international ideals of science. The awarding of the prize also raised several debates in the scientific community and broader national political arenas over the ethics of chemical warfare. In fact, the United States experienced a significant and public discussion over the further funding of its Chemical Warfare Service. The second director of the service, Major General Amos Fries mustered all of Haber's arguments about the humane nature of chemical weapons to continue federal funding in the interwar years. See Theo Emery, Hellfire Boys: The Birth of the U.S. Chemical Warfare Service and the Race for the World's Deadliest Weapons (New York: Little, Brown, 2017)

197 Helmut Maier, Rüstungsforschung in der Kaiser-Wilhelm-Gesellschaft und das Kaiser-Wilhelm-Institut für Metallforschung, 1900-1945/48, 224.

198 Haber continued to create scientific and personal networks in the interwar years. In particular, he tried to keep Albert Einstein in Berlin by providing "satisfactory conditions." This mean both insulating Einstein from anti-Semitic attacks and providing him with substantial funding. Fritz Stern, *Einstein's German World,* 130-131.

> modern chemistry; for it is undisputed that France provided its soldiers with gas-rifle grenades when the war broke out.[199]

Haber further insisted that future generations had nothing to fear from the arrival of modern chemical weapons. The committee accepted this defense and deemed that Haber had done nothing to break international law during the war, especially since no other nation chose to indict him. Following this decision, he was allowed to remain at the KWI and enjoy his position as an elder statesman in the world of German chemistry.

The historian Margit Szöllösi-Janze has pointed out that it is often difficult to measure the power of scientists like Haber. Their influence is often only revealed through networks of individuals or small groups.[200] Early in the war, Fritz Haber's level of political power did not appear substantial outside the world of academic chemistry. While he was the head of a KWI institute in 1914, he only presided over five employees and two academic buildings. However, Szöllösi-Janze reminds us that scientists are often "flexible enough to take on tasks that cut across fields," allowing them to potentially control "astonishingly extensive domains."[201] This was certainly the case with Haber, who maintained fortunate connections to the major German chemical firms, allowing him to serve as a mediator between his own academic world, the chemical industry, and the German military. In his position as the head of the KWI, he could simultaneously help hire men like Albert Einstein, forge business contracts with Carl Duisberg, and work on problems of military application for Max Bauer. These multiple roles encouraged vastly different perceptions of a complicated man whose personal strengths could be used for the forging of friendships or the destruction of human bodies. The physicist Lise Meitner once

[199] Fritz Haber, *Aus Leben und Berug: Aufsätze, Reden, Vorträge*, 15
[200] Szöllösi-Janze, Margit. "Losing the war, but gaining ground: The German chemical industry during World War I." in *The German Chemical Industry in the Twentieth Century*, 94.
[201] Ibid.

explained Haber's shifting priorities by describing him as a man who wanted to be "both your best friend and God at the same time."[202]

The importance of Haber's role in the research and use of chemical weapons should also be considered in relation to the social structures that allowed Haber to achieve notoriety. As Bruno Latour expressed in his celebrated 1987 text *Science in Action*, "Scientists and engineers speak in the name of the allies that they have shaped and enrolled; representatives among other representatives, they add these unexpected resources to tip the balance of force in their favor."[203] Haber's allies certainly included his laboratory assistants, the chemical firms, his patron Leopold Koppel, and military men like Max Bauer. But one can also look to the objects and artifacts like the synthesized gases and the gas mask that cooperated in and seemingly necessitated Haber's work.

Regardless of the networks (both human and inhuman) that made Haber's rise to power possible, the man was distinctively driven through his sense of national duty and his unshakable belief in the value of modern chemistry. In a 2005 reappraisal of *Science in Action*, Latour now argued that various individual claims to motivation or action should be given equal ontological weight to that of collective networks.[204] This "practical metaphysics" would respect the importance of individual actors' personal beliefs in the propulsion of historical events. Of course, after the chlorine cylinder attacks at Ypres, Haber's military rank and the growth of his institute brought his massive level of influence to light. He wrote of his own position:

> I was one of the mightiest men in Germany. I was more than a great army commander, more than a captain of industry. I was the founder of industries; my work was essential for the economic and military expansion of Germany. All doors were open to me.[205]

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[202] Ruth Lewin Sime, *Lise Meitner: A Life in Physics*, 142.
[203] Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society*, 259.
[204] Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network Theory*, 255.
[205] Daniel Charles, *Master Mind: The Rise and Fall of Fritz Haber, the Nobel Laureate Who Launched the Age of Chemical Warfare*, 141.

The extent to which scientists like Haber lent their own personal prestige to Germany's war aims is certainly part of the unique German scientific experience in World War I. While well-known British, French, and American scientists actively supported their countries' war efforts, the Manifesto of the Ninety-Three reads as a who's who of German scientists and scholars.[206]

In Haber's case, the degree to which he was personally willing to assist imperial German aims was arguably unmatched. By September 1917, Haber's KWI employed 2,000 people, 150 of whom had been made temporary state officials. Between 1915 and 1917, the KWI's budget had increased by fifty times to three million marks.[207] The now titled Kaiser Wilhelm Military Institute spread from its original buildings in Dahlem and occupied various other Kaiser Wilhelm Society institutes and academic buildings. Small impromptu shacks sprang up around the large laboratory buildings and a guarded fence surrounded the compound. As Haber's Institute grew and swallowed up other research groups, the physicist Lise Meitner despondently wrote that, "the Haber people treated us like conquered ground."[208]

The cooperation between academic chemistry and industrial firms was not a new phenomenon in Germany. Personal and professional connections between the two realms, like those that Haber maintained prior to 1914, provided the necessary channels for relatively seamless cooperation during the war. While men like Carl Duisberg did not relish the idea of war

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[206] Fritz Stern, *Einstein's German World,* 114.

[207] Margit Szöllösi-Janze, "The Scientist as Expert: Fritz Haber and German Chemical Warfare During the First World War and Beyond", in *One Hundred Years of Chemical Warfare: Research, Deployment, Consequences*, 17. See also: Jeffrey A. Johnson. "The Scientist Behind Poison Gas: The Tragedy of the Habers." *Humanities* 17, no. 5 (1996): 25–29.

[208] Klaus Hoffmann, *Otto Hahn: Achievement and Responsibility*, 85. Lise Meitner (1878-1968) was Otto Hahn's research partner in the radioactivity laboratory at the KWI for Chemistry. Once Hahn returned from World War I, the two continued their work and became central figures in Haber's KWI colloquia. In 1938, Hahn and his pupil Fritz Strassman sent Meitner research reports in which they procured barium as a byproduct of their experimental bombardment of uranium. Meitner and her nephew Otto Frisch recognized that Hahn and Strassman had achieved nuclear fission and encouraged Hahn to publish his findings. This was a key discovery for the later attempt to build atomic weapons in Nazi Germany, the USA, and Great Britain.

in 1914, the national need for chemicals and explosives helped to earn the large chemical firms like Bayer, BASF, and Hoechst a leading position in Germany's economic foundations.[209] This came with a level of financial uncertainty that led to the subsequent merge into the 'expanded I.G.' in 1916, but it also fostered technological innovation and cooperation between the various firms. This allowed the companies to focus on specific chemical products, and in turn, the lines of production and delivery remained fairly streamlined throughout the war.[210] Between 1915 and 1918, German chemical companies produced an estimated 99,500 tons of chemical weapons.[211] Trumpeting this production capacity, Carl Duisberg stated that "in chemistry, the superiority of German science and technology over our adversaries has been demonstrated. Hopefully, this will always be the case, not only during the war, but in the future as well."[212]

[209] Margit Szöllösi-Janze, "Losing the war, but gaining ground: The German chemical industry during World War I." in *The German Chemical Industry in the Twentieth Century*, 121.
[210] There was a shortage of chemical products after the 1916 reorganization of the Board of Wartime Raw Materials under the WUMBA (*Waffen- und Munitionsbeschaffungsamtes*) and later the *Kriegsamt* as part of the Hindenburg program. The increased demand for production overtaxed the chemical firms.
[211] According to historian Dirk Hackenholz, the Germans produced 82,600 tons of chlorine during the war. Dirk Hackenholz, Die elektrochemischen Werke in Bitterfeld 1914-1945, 108.
[212] Abwehr von Stinkgeschossen etc, 1916- (BA) 201-008-001

	UK	France	Germany
Chlorine	21,156	12,500	87,000
Phosgene	1,384	15,700	23,655
Mustard Gas	522	1,968	7,659
Tear Gas	1,819	481	3,710
Blue Cross gases	98	N.A.	8,027
Gas Shells	8.3 million	17.1 million	38.6 million

Table 2: Amounts of chemicals in tons and individual gas shells produced by the U.K., France, and Germany from 1915 to 1918. The chemical numbers include the production of supplies that were not used for chemical warfare. These numbers were derived by L.F. Haber.[213]

At the end of the war, a handful of large chemical firms under the newly formed I.G. collective were in the position to create near-monopolies on the national market.[214] The Allies set up the Military Inter-Allied Control Commission (MICC) under Marshal Ferdinand Foch to try to restrict these companies from future military production, but it was difficult to draw the line between civilian and military applications for so-called "dual-use" factories.[215] French officials attempted to obtain industry secrets from BASF and Hoechst but the companies resisted exposing their chemical processes at substantial financial cost. The German government now realized the full value of chemical firms and was willing to protect them as part of their essential

[213] L.F. Haber, *The Poisonous Cloud*, 261.
[214] The historian Hew Strachan found that the dividends for the major chemical companies rose on average 200 percent during the war. Hew Strachan, *Financing the First World War*, 104-105
[215] The Allies only shut down German production sites that could be determined as distinctly and entirely used for war production. For more on the MICC see: Jeffrey A. Johnson and Roy Macleod, "The War the Victor's Lost: The Dilemmas of Chemical Disarmament 1919-1926," in *Frontline and Factory: Comparative Perspectives on the Chemical Industry at War, 1914-1924*, 230-238.

national infrastructure.[216] This level of national concern for chemical production would continue throughout the 1920s and 30s.[217]

The historian Jeffrey Johnson has maintained that the efficient and structured cooperation between academic scientists, the chemical industry, and the military that took place in Germany during World War I was the product of a specific path to industrial modernization. He argues that the German chemical industry's rapid growth in the late 19th century, coupled with its internal competitiveness and inability to garner national funding, encouraged Emil Fischer to seek private funds in the creation of a national chemical institute. This privatization created a necessary link to industrialists like Leopold Koppel and an enduring requirement that academic chemistry justify its value through a research agenda that could be applied to national or corporate endeavors.[218] Given his extensive experience with numerous dyeworks firms, it is no surprise that Fritz Haber was hand-selected by Koppel to serve as a lynchpin between science and industry. Nevertheless, Haber's success in merging industrial manufacturing and scientific research into the military apparatus was not inevitable.

The German military commanders' misgivings about using poison gas at Ypres were part of a larger military resistance to external influence, especially that of a Jewish scientist. But changes in military command over the course of World War I and the rise of more technologically-minded officers like Max Bauer allowed for closer cooperation with a man like Haber. The German military continued to maintain the upper-hand in their merging with science

[216] Roy M. MacLeod. "Chemistry for King and Kaiser: Revisiting Chemical Enterprise and the European War." In *Determinants in the Evolution of the European Chemical Industry, 1900-1939*, 47.
[217] Jeffrey A Johnson, "Technological Mobilization and Munitions Production: Comparative Perspectives on Germany and Austria" in Roy Macleod, and Jeffrey Allan Johnson, eds. *Frontline and Factory: Comparative Perspectives on the Chemical Industry at War, 1914-1924*, 16.
[218] Jeffrey A. Johnson. *The Kaiser's Chemists: Science and Modernization in Imperial Germany*, 133.

and industry and tensions continued to cut along institutional lines, but the structures were now in place to pacify these personal differences in the service of the German nation.

By bridging the military and academic world, Haber's Institute had become one of the first steps in what would later be called "Big Science."[219] Not only did the KWI create the kind of intuitional overlap necessary for future large-scale research projects, but it also encouraged many researchers trained in so-called "pure science" to begin working on technological applications for their chemical knowledge.[220] In this way, Haber and his fellow researchers were initiators of what would later be referred to as "technoscience," or the blending of theoretical and applied research.[221] Reflecting on Haber's role in integrating technoscience into the German military apparatus, historian Mark Walker wrote, "Science was clearly a significant part of military power, and German science and scientists were important parts of the war effort."[222] The theologian and first president of the Kaiser Wilhelm Society, Adolph von Harnack expressed the relevance of this claim in 1916 when he wrote that:

> Our enemies…brought German science and military strength as close together as possible. Of course we knew all along that these two pillars..., deep down, have a hidden connection; but we did not know that this connection is so immediate that military strength can be directly promoted by science and constantly open new connections with it...Create, organize, discipline: in this triad of German spirit and German labor, military strength and science come together.[223]

Harnack's words foreshadowed the immediate ripple effects that Haber's bureaucratic structures (which were never fully dismantled until after 1945) would have on Germany's post-war path.

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[219] Margit Szöllösi-Janze, "The Scientist as Expert: Fritz Haber and German Chemical Warfare During the First World War and Beyond", in *One Hundred Years of Chemical Warfare: Research, Deployment, Consequences,* 16-17. Historian Fritz Stern wrote that Haber "had contacts everywhere—with officialdom, with politicians…and with people of rank in the private world." Fritz Stern, *Einstein's German World,* 134.

[220] Between 1914 and 1918, an estimated 2,000 German scientists worked on chemical warfare. Andrew J. Rotter, Hiroshima: The World's Bomb, 16.

[221] David F. Channell, A History of Technoscience: Erasing the Boundaries between Science and Technology, 71-74.

[222] Mark Walker, *German National Socialism and the Quest for Nuclear Power 1939-1949*, 4.

[223] Adolph Harnack papers, (SBB) KWG, 3.-5. Jahresbericht, pp. 3-5, Sect. IV, Box 23

The dire consequences that would follow made Fritz Haber's KWI one of the 20th century's principal test cases for the integration of technoscientific research and industrial production into a military apparatus. When searching for a historical analogy for Fritz Haber's wartime activities, Haber's godson, the late historian Fritz Stern, wrote that the KWI became "a kind of forerunner of the Manhattan Project."[224] This assertion was not only true because Haber's KWI provided a blue print for a massively coordinated military project like the creation of the atomic bomb, but also because many of Haber's associates, employees, and friends like Otto Hahn, Albert Einstein, Otto Frisch, James Franck, Hans Geiger, and Leo Szilard would play significant roles in the supposed inauguration of the Atomic Age.

[224] Fritz Stern, "Freunde im Widerspruch. Haber und Einstein", in Forschung im Spannungsfeld von Politik und Gesellschaft, Geschichte, und Struktur der Kaiser, 529.

CHAPTER 2: THE MAN IN THE RUBBER MASK: WORLD WAR I AND THE DEVELOPMENT OF THE MODERN GAS MASK

As part of the augmented cooperation between German science, industry, and the military that began to take off after April 22, 1915, the gradual technological development of the respirator accelerated at a newly frantic pace. The German chlorine attack at Ypres not only drastically sped up the research and design of protective devices, but also employed these new technologies in previously unknown circumstances. In many ways, the development of the gas mask is the corresponding story to Haber's chlorine gas.[225] For it would be the mask that determined how people would live in the "prolonged climate of fear" and the "permanent state of readiness" that poison gas demanded.[226] The careful design of the mask could allow humans to live, and perhaps even thrive, in a new environment where the presence of healthy air could not be presupposed. Thus, the development of the gas mask was both a resistance to the fulfillment of Fritz Haber's vision of a chemically saturated modern battlefield and an integral part in the gradual realization of such a reality. If an airborne weapon of annihilation was to be created after the introduction of the modern gas mask, it would now have to be able to break the mask's presumably airtight seal.

At first glance, the gas mask was purely a salutary device, a gift from science that could protect men from suffocation. But, at the same time, the mask served as a new challenge that escalated the chemical war by encouraging chemists to search for increasingly lethal and pervasive gases. The philosopher Langdon Winner has made it clear that such phenomena are

[225] In fact, one could argue that the scientific history of gas research in World War I is really a technological history of ancillary gas protection devices and methods of delivery. This is because all of the major chemicals used in the war had been synthesized prior to 1915. The development of "new gases" like Lewisite or Blue Cross were a matter of application or recombination. Bretislav Friedrich and Jeremiah James, "From Berlin-Dahlem to the fronts of World War I: The Role of Fritz Haber and his Kaiser Wilhem Institute in German Chemical Warfare", in *One Hundred Years of Chemical Warfare: Research, Deployment*, 38.
[226] Peter Sloterdijk, *Terror from the Air*, 28.

inherent to what he calls a "technological order." According to Winner, technologies like the gas mask, that are intended to provide people with a sense of safety in a technologically dangerous world, are intrinsically difficult to control.[227] Humanity's desire for greater security drives the continuous development and creation of increasingly capable prophylactic technologies, often at the expense of other basic societal concerns. In turn, more dangerous weapons are devised to circumvent the newest prophylactic devices. Such a vicious technological circle expends large amounts of resources and produces a prolonged climate of societal fear. In this case, by intertwining the historical development of poison gas with that of respirators and gas masks, the moments in which modern chemical warfare was conceived and pursued come into focus. In these moments of conception, questions of protection and discipline penetrated German discussions of chemical warfare and persisted long after the First World War.

The Development of Respirators: A Long History

Humans have long sought to provide breathable air in toxic or otherwise harmful environments. European reports of sea sponge filters for protection against natural toxins go as far back as the ancient Greeks. Moreover, the use of chemical gases in warfare was not wholly unfamiliar to the ancient world. The renowned Greek historian, Thucydides, claimed that in the Peloponnesian War, the Spartans attempted to weakened the Athenian defense of Plataea by burning a mixture of sulfur, pitch, and wood.[228] In the Middle Ages, European navies heated quicklime, or calcium oxide, and sent the resulting gas towards enemy ships in order to blind

[227] Langdon Winner, Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought, 27.
[228] Thucydides, *The History of the Peloponnesian War*, 81. The Romans related similar accounts of early chemical warfare. See: Plutarch, *Plutarch's Lives Volume 3,* 401. Plutarch describes how Sertorius used lime and ash to blind the Characitanians.

sailors.[229] While protection against such attacks was mostly limited to simple textiles and animal bladders, both early chemical weapons and naturally occurring toxins sporadically stimulated human concern for airborne poisons.

This age-old fear of poisons motivated various pre-modern attempts to technologically mediate or pacify noxious air. For instance, 17th century plague doctors filled their beak-like masks with dried herbs, flowers, and/or spices with the hope that their fragrances might protect against what was assumed to be an airborne illness. Around the same time, Leonardo da Vinci proposed the use of a finely woven textile dampened with water to protect against potential airborne toxins. Da Vinci also created rough designs for underwater breathing tubes, a tangential engineering concern that was often historically tied to the search for an effective respirator.[230] However, it was not until 1785 that the intendant of the cabinets of physics, chemistry and natural history for the Count de Provence, Jean-Francois Pilatre de Rozier, developed the first air-providing respirator. Pilatre de Rozier's respirator was a small mask attached to a tube that would allow the wearer to descend into poisoned wells or mines.[231] The design was not widely adopted, even after Pilatre de Rozier personally demonstrated its effectiveness, but it did renew 18th century interest in the development of a respirator that could be used in newly developing industrial fields.

In 1796, Alexander von Humboldt completed work on a *Respirationsmaschine* that could be used to rescue miners from arsenic leaks. This respirator was an inflatable bag connected via tubing to a small mouthpiece. In an attempt to expand the uses of his invention, Humboldt

[229] Susan Rose, *Medieval Naval Warfare 1000-1500*, 30.
[230] Robert F. Marx. *The History of Underwater Exploration*, 40. In the 1710s, the Englishmen John Lethbridge and Andrew Becker constructed the first pressurized underwater diving suits. In 1819, the German-born engineer Augustus Siebe created his own version with a metal helmet and canvas suit. This would remain the standard rig for underwater dry diving into the 20th century. Siebe would go on to found Siebe, Gorman, and Co, a respirator firm that produced tens of thousands of gas masks for British civilians before and during World War II.
[231] Benjamin W. Richardson, editor, The Social Science Review and Journal of Sciences, 29.

pitched the respirator to the Prussian military as a useful tool for sappers who worked underground with gun powder and other explosives. The Prussian Chief War Department tested the respirator and found it reliable, ultimately granting Humboldt imperial funding for subsequent production.[232] While respirators would reach a new level of development in the late 18th and early 19th centuries through ties to mining, firefighting, and underwater diving, they would never fully break free from these early military associations.

Firefighters first employed respirators in the early 1820s, after the Englishman John Deane entered a burning stable while wearing an antique knight's helmet attached to an air hose. In 1823, John and his brother Charles patented this impromptu invention as the "Smoke Helmet."[233] The soon standardized helmet was constructed of copper and attached to an airtight leather or canvas suit, resembling that of an underwater diving rig. One short tube protruded from the front of the helmet for exhalation and a long rubber hose ran from the rear of the helmet to a bellows that provided fresh air. The engineer Augustus Siebe produced the first standardized Smoke Helmets in 1827 but the design achieved little commercial success until it was repurposed for diving in 1828.

Up until the mid-1800s, all available artificial respirators employed hoses to supply fresh air. Thus, the wearer of such devices could never stray too far from the source of oxygen, nor could they move without restriction. But as industrial mining expanded in Europe and the United States, mining companies increasingly desired a mobile respirator that could purify toxic air. In 1847, the American inventor Lewis Haslett created the "Inhaler or Lung Protector" to filter mining dust out of the air. Haslett's Lung Protector featured a mouthpiece with two valves, one for inhalation through moistened wool and one for exhalation. The compact simplicity of

[232] Ursula Klein, "The Prussian Mining Official Alexander von Humboldt", 52.
[233] John Bevan, *The Infernal Diver,* 14-18.

Haslett's filter design allowed the wearer to walk about freely, and thus, the Haslett Inhaler is often considered the progenitor of the modern gas mask.

To better Haslett's invention, the Scottish chemist John Stenhouse created his own mobile respirator in 1854 that incorporated powdered wood charcoal between two sheets of wired gauze. In 1871, the Irish physicist John Tyndall replicated Stenhouse's design and added lime and glycerin to the charcoal filter. This search for increasingly effective chemical filters would continue throughout the late 19th century, coupled with the corollary demand for face protection in toxic environments. British inventor Samuel Barton's 1874 respirator added a rubber and metal face shield, glass eyepieces, and a rubber coated hood. While there were several other respirator models that followed, the inventions of Haslett, Stenhouse, and Barton established the respirator's major structural elements for the next four decades.[234] By the turn of the twentieth century, respirators were largely successful at combatting the kinds of toxic fumes that European scientists, engineers, miners, and firefighters encountered.

Throughout the 19th century, the major German respirator manufacturers were located in northern cities like Hamburg, Lübeck, and Bremen chiefly due to their proximity to the sea. Companies like *Ludwig von Bremen*, *Hamburg*, founded in 1870 as the first German manufacturer of diving equipment, provided the respirators necessary for various underwater industries. In 1899, *Neufeldt & Kuhnke*, later renamed the *Hanseatische Apparatebau-Gesellschaft*, supplanted *Ludwig von Bremen* as the dominant manufacturer. The *Hanseatische Apparatebau-Gesellschaft* produced the great majority of turn-of-the-century German diving equipment, including breathing apparatuses, on production sites in Bremen, Hamburg, and Kiel.

[234] Other designs included Benoit Rouquayrol and Auguste Denarouse's 1860 Resevoir Regulateur, George Neally's 1877 Smoke Excluding Mask, Henry Fleuss' 1878 Fluess Apparatus, the 1881 Vajen-Baden Smoke Protector, Bernhard Loeb's 1891 Loeb Respirator, Louis Muntz's 1902 Muntz Respirator, and Garret A. Morgan's 1914 Safety Hood and Smoke Protector.

In 1889, the Lübeck-based mechanic Johann Heinrich Dräger founded the *Dräger and Gerling* company to produce beer tap technology and high pressure valves. The company began working on oxygen supply devices in the late 1890s under the direction of Johann's son and the company's chief engineer, Bernhard Dräger. By 1902, the company had produced an oxygen supply device for aviation, an anesthetic delivery device, and a portable respirator.[235] In that same year, Bernhard entered management of the company and the name was changed to *Drägerwerk: Heinrich und Bernhard Dräger*. As part of his mission to diversify and grow the company, Bernhard outfitted the Dräger Model 1904/09 breathing apparatus for mining work.[236] The Model 1904/09 received positive reviews when rescue workers used it extensively in the Courrières Mine Disaster of 1906.[237] Bernhard Dräger would then turn his attention to diving rescue equipment, creating a portable system that served as one of the antecedents to SCUBA gear. These effective devices and their successful marketing allowed Bernhard to open a subsidiary company in the United States in 1907, the Draeger Oxygen Apparatus Co.

Through its use in industry, the respirator mask already stimulated mental associations with danger and tragedy in the late 19th century. Whenever a respirator was required, the wearer knew that they were in a potentially lethal situation. As technological developments and capital investment allowed the mining, diving, and chemical industries to grow, the respirator was used in progressively deadly scenarios. Industrial workers and chemists increasingly donned respirators to work with deadly gasses like arsenic and sulfur and respirators were also worn in dark mines, cold waters, or enclosed spaces like industrial tanks. Thus, these devices required a

[235] See: Heinrich Dräger, *Heinrich Dräger Lebenserinnerungen* (Hamburg: Alfred Janssen, 1917)
[236] See: Lisa Dräger, *Von Biermaschine zum Rettungswesen* (Lübeck: Drägerdruck, 2007)
[237] 1,549 French miners died in the 1906 Courrières Mine Disaster when coal dust ignited and the explosion filled the mine. This was the second largest mining disaster, in terms of human death totals, in human history. Wilhelm Haase-Lampe, *Sauerstoffrettungswesen und Gasschutz Gerätebau und Organisation in ihrer internationalen Entwicklung: Gerätebau*, 13.

substantial level of technological trust from the wearer, who could not afford any malfunctions while at work. Nevertheless, at the dawn of the twentieth century, the steady development of the respirator appeared to most contemporaries as part and parcel of greater European technological progress. For most, it was merely a safety device that would both save human life and allow humans to conquer new and dangerous worlds.

The Modern Gas Mask: A New Technological Necessity

Immediately after the first chlorine cylinder operations at Ypres, the Germans continued to test the effectiveness of their poison gas attacks. In early May 1915, Fritz Haber and his gas regiments headed to the Eastern Front where they hoped that the wind conditions would prove more consistently favorable. Pioneer Regiment 36 was assigned to General Mackensen's Ninth Army, now west of Warsaw.[238] Throughout that summer, the Germans released a mixture of chlorine and phosgene gas towards the Russian troops in multiple offensives.[239] Phosgene had been used since 1883 in the manufacture of crystal violet dyes and Haber had hoped to use the gas since December 1914, requesting a phosgene-chlorine mix from Carl Duisberg and the Bayer company in March of the following year.[240] Phosgene was deadlier than chlorine and invisible to the naked eye, but it was also much denser and difficult to control. After being poisoned during the cylinder filling process, Carl Duisberg wrote that:

> Privy Councilor Haber, at my suggestion, also wants his chlorine bombs at least 25% phosgene - he cannot use any more. How unpleasant it works is best seen from the fact

[238] General Mackensen's Ninth Army was also chosen for the T-Shell tests in early 1915. For a first-hand account of Eastern gassing operations see: Albert Münscher, *Hinter Stacheldraht und Bajonetten: Kriegstagebuch 1914-1918*, 275

[239] The Germans gave both chlorine and phosgene (and later Perstoff) the code name Grünkreuz (or green cross) gas. Green cross gases were all pulmonary agents.

[240] Over the course of the war, Bayer and Hoechst produced the most phosgene. Starting in September of 1916, Bayer averaged 300 tons per month and Hoechst produced 139 tons per month. BASF produced phosgene at the cheapest cost and had a capacity for 7,200 tons per year.

> that I spent almost eight days in bed after I only inhaled this gruesome stuff a few times. The same thing happened to my assistants, who had to recover for four weeks at Wiesbaden because the lung damage they sustained was worse than mine. If you treated the enemy for hours with this most poisonous of all gaseous products, and they did not (which would probably be case) immediately die, they would later become ill and get feverish bronchitis.[241]

In an attempt to better control the dangerous phosgene gas, Haber and the KWI mixed it with chlorine, which would help carry it through the air.

The shallower trenches of the East did little to protect the Russian soldiers from the low-hanging gas and they suffered immensely.[242] The gas pioneer Otto Hahn described the scene, writing:

> During the attack, we encountered a significant number of gas-poisoned Russians who could no longer escape from the cloud. They had been surprised by the gas without a protective mask and were now lying or squatting in a lamentable state. We tried to rescue one or another with our breathing equipment, but we were unable to prevent their deaths. At that time, I was both deeply ashamed and inwardly very excited, because after all, I had helped to create this tragedy myself.[243]

While these attacks were successful in producing Russian casualties, they again did little to advance the German forward line. German commanders began to believe that gas could not be effectively used alongside an infantry attack. Indeed, military meteorological science was not sophisticated enough to predict the seemingly erratic winds, and gas would inevitably blow back on the German troops. For instance, on June 12, 1915, the wind changed direction during one such gas attack and created total panic in the German lines. Officers counted 1,100 Russian and

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[241] "Herstellung Und Lieferung von Geschoss-Fullung," (BA). 201-005-001. Otto Hahn wrote that phosgene remained the strongest poison throughout the war, even surpassing prussic acid. Otto Hahn, *My Life. The Autobiography of a Scientist,* 121.

[242] Infantryman Johanna Martini reported that the Russians were only equipped with a salt solution to protect them from the gas. He wrote, "Only two breaths were necessary to bring about death. If the soldier did not immediately die, then he would become sick and die a few days later after the gas had eaten away his lungs." Johanna Martini, Errinerungen aus dem Weltkrieg 1914-1915 (DTA) Sig 1847 Reg 1562

[243] Otto Hahn, *Mein Leben: Die Erringerung des grossen Atomforschers und Humanisten,* 120. See also: Mitteilungen des Kriegsministeriums fur den Gasschutzoffizier, Jan 1916-April 1917 (LBWK) 456 F 3, 1115

German dead and another 350 injured Germans.[244] After this blunder, the German military concluded that gas served better as a psychological weapon that could harass the enemy and weaken resistance before an attack. As an added effect, gas forced soldiers to don gas masks, which were difficult to wear while fighting and irritating when worn for hours at a time.[245] Fritz Haber quickly became aware of this tactic, later stating that:

> All modern means of combat, although they seem to be aimed at the death of the enemy, owe their success only to the emphasis with which they temporarily shatter the psychic power of the opponent. The battles that decide the outcome of the war are not won by the physical annihilation of the enemy, but by mental imponderables that at a crucial moment deny resilience and give rise to the idea of defeat.[246]

Not surprisingly, the lack of control over gas clouds also soured infantrymen and their officers to the new weapon. In an attempt to embolden the troops, the proponents of chemical weapons turned their attention to gas protection and training. In May 1915, the German army expanded its issue of cotton pads for gas protection.[247] Experts knew that these provided little defense, but they had no other options until they could produce a fully functioning and cost effective respirator. During these early stages in the chemical war, some German soldiers were outfitted with goggles and more durable particle-filtering masks.

The German medical services conducted training sessions for the use of these crude protective devices, and military pharmacists were tasked with the distribution of masks and neutralizing solution.[248] Gas protection protocols stressed the importance of confidence in the rudimentary mask. Thus, medical personnel were instructed to tell the soldiers that if they

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[244] Otto Hahn, Mein Leben: Die Erringerung des grossen Atomforschers und Humanisten, 120
[245] The Belgian chemist Leo Baekeland wrote that "anyone who tries on of these masks in peaceful comfortable surroundings realizes what a hellish warfare those Huns have introduced." Joris Mercelis, *Beyond Bakelite: Leo Baekeland and the Business of Science and Invention,* 119
[246] Rudolf Hanslian, *Der chemische Krieg,* 199.
[247] Gastruppe S. 18-51 Manuscript für Buch "Otto Hahn- Mein Leben" 1915 (MPG) Abteilung III Laufzeit 1567 Repositur 14A Blatzahl 19 Bestell-NR 6280
[248] Fritz Haber and his KWI took over this task in 1916.

remained calm and put the cotton pads over their nose and mouth they would undoubtedly survive a gas attack.[249] They further claimed that artillery and machine gun fire could disperse gas clouds even though no real evidence of this existed.[250] Not surprisingly, the pads were difficult to keep fastened to the face and the chemical solution often dried up, leading to German casualties. The lack of effective protection remained a problem on the Western Front until the German gas regiments moved east and gas operations were temporally suspended. During this lull in gas warfare in the West, the Auergesellschaft gas mask factory and the Griesheim, BASF, and Bayer chemical factories began to offer military courses in gas protection. Shortly thereafter, trained gas protection officers were added to each German regiment, tasked with drilling soldiers in correct gas discipline.[251]

Fritz Haber quickly realized the desperate need for a more reliable protective device and assigned Departments C and D of the KWI to design a new gas mask. Haber also turned to the Dräger company to help improve the gas pioneer's *Selbstretters* by reducing weight and increasing the amount of available oxygen. The *Selbstretter* now served as the basis on which scientists and engineers conceived of a new gas mask. However, the large oxygen tank apparatus appeared wildly impractical for the common soldier. Developers needed to increase portability and significantly reduce the respirator's weight. Further gas mask test projects were conducted at Bayer, Schering pharmaceutical, Kahlbaum pharmaceutical, and, at Haber's suggestion, the Auergesellschaft.[252]

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[249] Generalstabes des Heeres- Gas, 1915 (BA-MA) PH3/252 LSFN 4503F
[250] Analgen zum Kriegstagebuc Inf Reg 114, July 1915-March 1916 (LBWK) 456 F 40, 185
[251] Gasschutzwesen, Allg.u.Besonderes 1915-1918 (BHK) Generalkommando I. Armee-Korps (WK) 1276
[252] Fritz Haber Briefe 1915 (MPG) Va 5 856. The gas mask project was led by Professor Karl Quasebarth (1882-1949) at the Auergesellschaft. Quasebarth was the son of the director of the Chemical Factory Rhenania in Aachen and a professor at the Technical University in Aachen. The Auergesellschaft, as an electrical engineering firm, was in a unique position to create gas masks. They (and Siemens & Halske) owned machines that could manufacture the sockets of electric-lamps. This threaded socket design was repurposed for the connection between the gas mask mouthpiece and the three-layer filter.

The first air filter prototype was a small cartridge filled with a layer of diatomite, or wood burned with diatomaceous earth. The small cartridge, about the size of a modern diving regulator, could be raised to the mouth and breathed through when necessary. A subsequent prototype employed a layer of pumice that was saturated with potash to absorb chlorine and charcoal powder to protect against tear gases. The organic chemist Richard Willstätter and his assistants Adolf Pfannenstiel and Friedrich Joseph Weil devised the third filter at the Kaiser Wilhelm Institute for Chemistry. Willstätter was a good friend of Haber but also a committed pacifist, refusing to work on any project that would contribute to the production of weapons. However, he agreed to work on gas-protection devices, feeling obligated to help Haber since he was instrumental in offering him a position at the KWI.[253] Willstätter's team came up with the "three-layer cartridge" in a matter of five weeks, incorporating layers of diatomite, granulated active charcoal, and pumice or diatomaceous earth saturated with hexamethylenetetramine or piperazine.[254]

Through tests at the Auergesellschaft gas tower in August 1915, the KWI deemed Willstätter's cartridge effective in counteracting both tear gases and chlorine.[255] While Haber had dealt with raw materials shortages and high costs during the research process, he had managed to coordinate the creation of an effective filter in just three months.[256] Now, to protect the eyes and nose of the wearer, the cartridge had to be affixed to a mask. Hans Pick of the KWI's Department C, Reginald Oliver Herzog of Department D, and engineers at the Auergesellschaft

[253] For correspondence between Haber and Willstätter see: Petra Werner and Angelika Irmscher, editors, *Fritz Haber Briefe an Richard Willstätter 1910-1934* (Berlin: Verlag für Wissenschaft und Regionalgeschichte, 1995)
[254] Willstätter received the Iron Cross II in May of 1917 for his creation of the three-layer filter. Over 30 million filters were used during the war.
[255] Wilhelm Willstätter, *Aus Meinem Leben*, 238. Filters were continually tested throughout the war. James Frack remembered sitting in a gas chamber in 1916 with a gas mask and breathing until the filter became ineffective. He did this dangerous work with Otto Hahn, Hans Geiger, Wilhelm Westphal, and Gustav Herz. Jost Lemmerich and Ann Hentschel, *Science and Conscience*, 58. ; Otto Hahn, *My Life*, 121.
[256] Fritz Haber to Carl Duisberg, Aug, Sept, and Oct 1915 (MPG), Dept Va, Rep 5, 856, 961, 962.

subsequently fashioned the first *Linienmaske*, named after the airtight seal that the rubberized mask attempted to create with the lines of the soldier's face.[257]

The *Linienmaske* covered the entire face and was strapped around the back of the head. An additional strap allowed the mask to hang around a soldier's neck in moments of impending attack. Willstätter's filter could be screwed on or off the mouthpiece, allowing for the replacement of any oversaturated filters. The OHL initially ordered 2,750,000 masks and by September of 1915, they announced the *Linienmaske* as standard issue for frontline soldiers in the West.[258] However, this announcement did not take production delays into consideration, and by November of that year, only 1,200,000 masks had been delivered. The Bayer Company also struggled to meet the OHL's demand to produce 20,000 filters a day, further complicating delivery.[259]

The Auergesellschaft, Drägerwerks, and the Hanseatische Appartebaugesellschaft served as the major producers of gas masks throughout the war.[260] But to meet the high level of demand, smaller firms like Metzler and R. Roeckl also received contracts.[261] While these firms assembled the masks, myriad other companies were required for the raw materials and smaller assembled pieces. For example, twenty firms were involved in the creation of Auergesellschaft masks alone. Of those twenty, Siemens & Halske created the celluloid eyepieces, while Bayer, BASF, and Aussiger Verein provided the chemicals for the filter cartridges. Haber's KWI served as the

[257] There was an initial suggestion to make the first mask out of metal. PH/2/ (BA-MA) Sig 1786 ort 22, mag h2OG, Reihe 229, Regal 2, Gefach 3
[258] Armeeoberkommando 6, 1917-1918 (BA-MA) Armeeoberkommando 6, 2427
[259] Fritz Haber Briefe 1915 (MPG) Va 5 856
[260] The first gas masks for the Austro-Hungarian army were also produced by the German manufacturers. Holger H. Herwig, *The First World War: Germany and Austria-Hungary 1914-1918*, 236.
[261] Auer produced approximately 60% of all masks during the war. Dräger and Hanseatische manufactured about 20% each. Dräger had to pay Auer 22 Pfenning for each mask produced based on a licensing agreement for the threaded filter attachment.

central mask distribution point. In a factory in Berlin, a large workforce predominantly made up of German women tested and packed the masks that were ready for delivery to the front.[262]

Through Haber and his benefactor Leopold Koppel, the Auergesellschaft became increasingly valuable to the German Ministry of War as the major producer of gas masks. However, the Dräger Company also stood to gain from their cooperation with the war effort.[263] Dräger first received a contract for 50,000 *Selbstrettern*, and by the end of 1915, they were producing 500 per day. In July of that same year, they received their first contract for 650,000 *Linienmasken*. By the end of the war, Dräger had delivered 4,573,310 masks. The Dräger factory expanded during the war and employment rose from 300 to 1,500 workers. At the start of the war, Dräger made about 2.4 million Reichsmark (RM) per year and by the end, sales had risen to 9.3 million RM.[264] While Bernhard Dräger was outspokenly critical of the use of weaponized gas, he remained a staunch nationalist and a supporter of Germany's war aims. His son, Heinrich, had joined an artillery unit, and by 1917, he had survived several gas attacks.[265] Consequently, his father Bernhard believed that by manufacturing the devices that would save soldiers' lives, the Dräger company was engaged in one of the few moral tasks of armament manufacturing.[266]

[262] As more gas masks were produced, gas mask testing was moved to a site at Adlershof in Berlin. About 2,000 Berliners worked on checking and packing gas masks. By the end of the war, about 10,000 people were employed in the manufacture of the masks. Bestimmungen Ausstattung des Heeres mit Gasschutzgerat, 1920-24 (BA-MA) RH/12/4 sig 75 ort 22 Mag H3EG Reihe 125 Regal 2 Gefach 3

[263] During the war, the Dräger Company did lose significant business abroad. Their office in the United States was closed once the Americans entered the war and the British blockade prevented any further international business. About 40% of Dräger's pre-war sales came from the United States.

[264] Bernhard Lorentz, Industrieelite und Wirschaftspolitik 1928-1950: Heinrich Dräger und das Drägerwerk, 37.

[265] Welf Böttcher and Martin Thoemmes, *Heinrich Dräger: Eine Biographie*, 36-37.

[266] Michael Kamp, Bernhard Dräger: Erfinder, Unternehmer, Bürger 1870 bis 1928, 385.

Visions of Destruction: Early Fears of Civilian Gassing

By July 1915, the British were beginning preparations for launching their own first gas attack. After much debate, British commanders had finally decided that the German attack at Ypres invalidated the Hague Conventions. Now that international restrictions were apparently nullified, the British felt that they could not risk falling behind in a technological development that might yet produce a major battlefield advantage.[267] The Germans were well aware that the British were moving gas cylinders to the Western Front and they began to issue gas masks and instructions for their use to front line soldiers. On September 25th, Major Charles Howard Foulkes and his three British gas companies opened 168 cylinders of chlorine gas at the Battle of Loos.[268] The Germans retreated and the British took the town of Loos, but they failed to eliminate all German resistance. On September 27th, the British unleased their remaining gas cylinders near Nueve Chapelle, but by the 29th, the Germans had pushed the British back to their original lines.

The Germans reported about 26,000 men killed or wounded at Loos. Of this total, 106 men were sick from gas. The British counted about 59,000 casualties, making their attack a failure in terms of comparative losses.[269] However, this was not how the British perceived the battle. Foulkes and the other British commanders were ultimately pleased with their first foray into gas warfare. The Germans, on the other hand, now experienced the utter chaos and fear of a

[267] The French were not in the position to retaliate with chlorine gas early in the war because French chemical manufacturers produced little of the gas. The French did, however, continue their production of tear gas and began to place it in artillery shells, thus anticipating future developments in chemical warfare.
[268] The Battle of Loos lasted from September 25 to October 8, 1915. For a firsthand account of the Special Brigade see: C.H. Foulkes, *"Gas!" The Story of the Special Brigade* (Uckfield: Naval and Military Press, 2009). For varying scholarly treatments see: Albert Palazzo, *Seeking Victory on the Western Front: The British Army and Chemical Warfare in World War I* (Lincoln: University of Nebraska Press, 2000) ; Donald Richter, *Chemical Soldiers: British Gas Warfare in World War I* (Lawrence, University of Kansas Press, 1992) ; George H. Cassar, *Trial by Gas: The British Army at the Second Battle of Ypres* (Lincoln: Potomac Books, 2014) ; Tim Cook, *No Place to Run: The Canadian Corps and Gas Warfare in the First World War* (Vancouver: UBC Press, 1999)
[269] L.F. Haber, *The Poisonous Cloud*, 57.

gas attack. In many instances, their gas masks failed, their rifles and artillery jammed, and officers' orders were muffled by their masks. One German officer reported that as soon as the gas entered the trench, he lost all control of his men.[270] Nevertheless, laudatory reports of German bravery and cool-headedness under gas swept through the military.[271] These recurring stories suggested to German commanders that while gas was a uniquely vexing weapon, it could in fact be tamed by soldiers who were correctly outfitted, well-trained, and mentally steeled.

Through the winter of 1915-1916, chemical warfare was exclusively waged with chlorine gas cylinders and tear gas shells. By the summer of 1916, these two methods of chemical warfare appeared far less fearsome than they did at Ypres since properly worn gas masks could now protect soldiers from the swirling toxins. Furthermore, variable weather conditions restricted the regular deployment of chlorine gas clouds. Experts claimed that chlorine was not effective on completely calm days or in overly powerful winds, heavy rain, strong sunshine, or cold weather.[272] With these many atmospheric limitations, armies could not effectively utilize gas during any of the winter months. Most soldiers welcomed the winter respite from chemical warfare, but German scientists and engineers back home increased their gas research, hoping to provide a technological breakthrough in the upcoming summer. Wild fantasies of gas weapons abounded in the trenches and even at scientific institutes, with men claiming the possibility of machine gun bullets filled with gas, the mass gassing of enemy crops, and aerial gassing of major population centers.[273]

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[270] James E. Edmonds, *History of the Great War*, 179. See also: Edgar Jones, "Terror Weapons: The British Experience of Gas and Its Treatment in the First World War", *War in History* 21 no 3 (2014): 355-375.
[271] Erfahrungs aus den Gasangriffen der Englander am 25 September 1915 (BA-MA) PH 6-I/36 LSFN 4644F
[272] Schutzengraben-Markblatt Beachte fur den Gaskampf, 1915. (BA-MA) PH 5-II/61 LSFN 4590F; Schutzmassnahmen der 34 Infantrie-Division gegen feindliche Gaskampfmittel, 1915-16 (BA-MA) PH 14/216 and 217 LSFN 4875F
[273] Gefechtsakten des GasdienstOffiziers Jan 1918-Sept 1918 (LBWK) 456 F 16, 423. See also: L.F. Haber, *The Poisonous Cloud,* 62.

This last vision, while never fully realized in World War I, proved to be the most salient. Friedrich Kerschbaum's KWI Department B tried twice to produce effective aero-chemical bombs, but failed both times to hit test targets and to produce a dense enough gas cloud.[274] Nevertheless, German civilians, especially near the western border with France, feared the possibility of being gassed. When a press report from October 23, 1916 stated that civilians in Metz had died from gas exposure, Germans around the country wondered whether the Allies had begun dropping gas from planes.[275] On December 11th of the same year, the *Stuttgarter Neues Tageblatt* reported that citizens were confused as to whether they should find cover or flee in the case of an aero-chemical attack. Civilians argued that if the planes dropped gas bombs, then they would be trapped in gas-filled fallout shelters.[276] Even German military divisions worried over the necessary rescue operations if phosgene was indeed used against a major western city like Karlsruhe.[277]

German citizens often felt that they too should be outfitted with gas masks. However, the OHL was not in the position to fulfill this request due to raw material shortages and inadequate manufacturing capacities. Thus, the German military tried to pacify the population with vague gas emergency plans.[278] Similar fears, compounded by the German use of zeppelins, proliferated

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[274] Hermann Geyer, *Der Weltkampf um Ehre und Recht: Der Seekrieg, der Krieg um die Kolonien, die Kampfhandlungen in der Türkei, der Gaskrieg, der Luftkrieg*, 526. Historian Rolf-Dieter Müller claims that the Germans chose not to further pursue aerial gassing because they felt that the Allies would match any violence against civilians. Rolf-Dieter Müller, "Total War as a Result of New Weapons? The Use of Chemical Agents in World War I" in *Great War, Total War,* 109.

[275] Schutzmassnahmen gegen feindliche Fliegerangriffe Juni 1916-Mai 1917 (LBWH) M 77/1 Bü 629. Historian L.F. Haber estimates 5,200 civilian gas casualties throughout the war, including workers at shell filling plants, but this number may have been underestimated. L.F. Haber further estimates 111 deaths. L.F. Haber, *The Poisonous Cloud,* 249. ; Gerard J. Fitzgerald, *Chemical Warfare and Medical Response During World War I,* 616.

[276] Schutzmassnahmen gegen feindliche Fliegerangriffe Juni 1916-Mai 1917 (LBWH) M 77/1 Bü 629

[277] Anlagen zum Kriegstagabuch Juli 1916-Aug 1916 (LBWK) 456 F 26, 22

[278] On April 4, 1917, the War Ministry ordered 50,000 gas masks for civilians who lived or worked eight kilometers from the front. Anweisungen und Verfugungen uber die Gasschutzlager, die Ausbildung, den Bedarf von Gasschutzmitteln und den Gaskampf, 1915-1917 (LBWK) 465 F 3, 620. Sanitation emergency groups were set up in major western cities to deal with a potential gassing. Schutzmassnahmen gegen feindliche Fliegerangriffe Juni 1916-Mai 1917 (LBWH) M 77/1 Bü 629. In an anecdotal moment that revealed civilian fears over gas, Ernst Jünger

among the citizens of French and British cities. A German trench journal mocked anxious Londoners for discussing possible city blackouts and gas mask distribution.[279] "If all the lights were doused," the journal asked, "how would citizens even find their way back home?"

Ironically, these calls for the mass creation and distribution of protective devices allowed the German War Ministry to justify the allocation of more raw materials to the war effort instead of the home front. Practically all of Germany's supply of rubber (and later leather) was earmarked for gas mask production, leaving civilians without certain bare necessities.[280] This was the logic of a technological order in which the gas mask provided soldiers with a sense of order and control in a world of perceived danger.[281] For the Germans in World War I, the production and maintenance of such technologies increasingly appeared more important than basic civilian needs.

While aerial gas bombs remained a prominent fear on the home front, European scientists and engineers turned their attention to developing mid-range gas shells for the military. In the winter of 1915-16, all of the major belligerents began to fabricate both chlorine and phosgene shells in order to make gas a more accurate and controllable weapon. To make these shells effective, militaries needed ever-thinner casings that could fit greater quantities of gas and release it on impact. These new shells also required a lead lining to prevent the gas from eating away at the iron or steel casing.[282] Due to regular exposure to both the lead linings and the

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reported that French civilians near the front gathered in front of a lieutenant colonel's quarters and demanded gas masks. See: Helmuth Kiesel, ed., *Ernst Jünger Kriegstagebuch 1914-1918*, 140.

[279] The Committee on the Defense of London ultimately rejected the idea of distributing masks to all Londoners. The British War Cabinet also considered this idea, but felt that they could never train civilians to properly don masks. For the reactions of the British and French presses to the possibility of Zeppelin attacks see: Susan R. Grayzel. "The Baby in the Gas Mask: Motherhood, Wartime Technology, and the Gendered Division Between the Fronts During and After the First World War." In *Gender and the First World War*, 130-132.

[280] For a historical treatment of wartime shortages in Berlin see: Belinda Davis, *Home Fires Burning: Food Politics, and Everyday Life in World War I Berlin* (Chapel Hill: University of North Carolina Press, 2000)

[281] Langdon Winner, Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought, 27.

[282] Shell linings were initially made of lead but these were later replaced by ceramics and then glass.

chemicals themselves, shell filling proved to be incredibly dangerous work. In his autobiography, the gas pioneer Otto Hahn wrote of phosgene splashing into his eye during his stint filling shells and the subsequent required surgery. The German chemical factories regularly reported such industrial injuries that often resulted from cracked shell linings.[283] Filling mustard gas shells was similarly dangerous and factory workers suffered symptoms including fatigue, headaches, indigestion, spasms of the eyelids, and shortness of breath. Medical reports also recorded frequent cases of bronchitis, asthma, lung infections, heart arrhythmias, and depression. In fact, a post-war American account claimed that as many as one-third of all Hoechst factory workers were absent at one time due to gas exposure.[284] Consequently, factory workers were also outfitted with the German *Linienmaske,* and by December 1915, the Germans were turning out 24,000 gas shells per month.

Technological Developments and Tactical Changes: Gas Shells and the Escalation of the Chemical War

In the spring of 1916, the French were the first to employ phosgene gas shells at Verdun. The Germans were taken by surprise and many soldiers did not yet have a gas mask due to long-standing production delays.[285] Colonel Max Bauer and Fritz Haber felt that the Allies were now catching up in the race for decisive gas weapons and they claimed that ideological resistance within the OHL had wasted the German opportunity for chemical battlefield superiority.[286] By

[283] Hahn even reported unconfirmed claims of employee death. Otto Hahn, *Mein Leben: Die Erinnerung des grossen Atomforschers und Humanisten*, 122-123 ; Bayer correspondence with Otto Hahn, 1947-1968 (MPG) Abteilung III Laufzeit 1948-1968 Repositur 14A Blatzahl 35 Bestell-NR 5336. The Hoechst and Bayer chemical companies performed most of the gas shell filling for the German military. Many of the shell fillers were women.
[284] Gerard J. Fitzgerald, "Chemical Warfare and Medical Responses in World War I", 119.
[285] Wilhelm Wittekindt "Meine Kriegserlebnisse 1916-1918 (DTA) 1229
[286] Max Bauer, *Der grosse Krieg in Feld und Heimat*, 70; Fritz Haber Briefe 1916 (MPG) Va 5 857

the Battle of the Somme in the summer of 1916, the Allies were firing thousands of gas shells per attack. However, the importance of this change in weaponry was not fully felt until the following year, and both the Germans and British continued to supplement gas shells with cylinder attacks.

The value of cylinders was particularly called into question in late April 1916 when the Germans lost nearly 1,500 men to their own gas at Hulluch. During this battle, the pioneer troops had released phosgene and chlorine gas towards the British, but the wind direction changed and blew the gas back onto the Second Bavarian Corps. This tactical mistake was followed by a massive failure of the German gas mask due to improper fitting and filter oversaturation. Fritz Haber subsequently ordered the continued development of the *Linienmaske* and the responsible KWI departments soon delivered the improved *Rahmenmaske*, named for its tighter connection to the wearer's face.[287] This fit was achieved with a fabric lining inside the mask that could conform to the contours of the face. The mask was made in three sizes (large, medium, and small), and each soldier was required to know their face size during distribution.[288] From September 1915 to September 1916, twelve million *Rahmenmasken* were delivered to the German troops. At the height of this production, the largest manufacturing firms like the Auergesellschaft delivered approximately 2.3 million masks monthly.[289]

[287] Fritz Haber Briefe 1916 (MPG) Va 5 857. Otto Hahn wrote that "gas masks underwent continuous improvement" throughout the war. Otto Hahn, *My Life*, 121.
[288] Military pamphlets were circulated that detailed how to measure the size of one's face. The gas officer was tasked with performing the measuring and then ordering masks for the company. Both the *Rahmenmaske* and the *Linienmaske* were referred to as *Gummimasken* because their face pieces were made of rubberized cotton.
[289] Max Schwarte, *Die militärischen Lehren des Grossen Krieges*, 458. New gas masks were also delivered to German troops in the East where chemical warfare continued against the Russians and to the German Navy, which stocked most larger ships with gas masks to combat toxic fumes produced in naval combat. See: Steven J. Main, "Gas on the Eastern Front During the First World War (1915-1917)", 123. ; Norman Friedman, *Fighting the Great War at Sea: Strategy, Tactics and Technology*, 172.

The *Rahmenmaske* was issued with Willstätter's three-layer filter already screwed on to the mouthpiece and the entire mask carefully folded within a metal carrying case. Thus, the mask could be quickly removed and donned without fumbling to attach a filter.[290] Shortly thereafter, the Willstätter filter was improved to allow for more fluid breathing. Technological developments were coupled with an increased attention to soldiers' gas discipline. Each regiment and independent battalion was now required to have two gas officers. Usually, this would be a junior officer like a captain, and an enlisted man, often a sergeant or corporal. These officers were required to participate in a gas school course at least once per year. Army gas schools were established in October of 1916 in Berlin and Leverkusen, but gas courses were also taught closer to the front lines and in chemical factories.

Upon arrival at the gas schools, officers would learn how to best drill their regiment in gas preparedness. They also listened to the gas lectures that they would then be expected to deliver to their men once a month.[291] A syllabus from a 1917 gas course included instruction in: throwing gas mines, shooting artillery gas shells, the nature of blistering gasses, the enemy gas arsenal, ground rules for gas protection, the resources of the gas protection service, the sizing and fitting of gas masks, the nature of the front weather service, gas exposure in a gas chamber, gas protection practice, and first aid for gas sickness.[292] Gas officers were further required to keep track of the condition of all regimental gas protection equipment and to conduct gas mask exercises once a month. These exercises usually consisted of ten minutes of singing and simple aerobic movements while wearing a gas mask.[293] Finally, the gas officers would report any use

[290] Wilhelm Hoffmann, Die deutschen Ärzte im Weltkriege. Ihre Leistungen und Erfahrungen, 389.
[291] Infanterie-Divisionen (WK) 1245 1915-1918 (BA-MA)
[292] Preussische Heeresgasschule Offiziers Ausbildungskurs 1. Feb. 1917 (BA-MA) PH/21/ sig 23, ort 22, Mag H2OG, Reihe 228, Regal 1, Gefach 5
[293] RH/12/9 Sig 32 (BA-MA) Signatur 32, Standort 22, Magazin H3EG, Reihe 125, Regal 5, Gefach 2

of gas in the field to both the meteorological services and the War Ministry. A third enlisted officer would write and file these monthly reports, which were then funneled up to Haber's Kaiser Wilhelm Institute when necessary.[294]

By the early fall of 1917, the Germans had reduced their chlorine cloud attacks and embraced gas shells as the future of chemical warfare. This became necessary because British Small Box Respirators proved particularly adept at defending against cylinder gases. Furthermore, in April 1917, the British unveiled the Livens projector, a small mortar-like weapon that could quickly fire gas shells at a range of 500 to 1800 meters.[295] The Livens projector circumvented the extensive delivery apparatus of the gas cylinders, and its shells offered more resistance to variable weather. Most importantly, the Livens projector substantially increased the attacker's level of surprise. Mortars could deliver gas at any time and almost any place. The Germans quickly developed their own rifled projector in the summer of 1917 and from then on, soldiers on the Western Front lived in constant preparation for gas.[296]

Gas projectors were not the only significant technological developments that would alter the face of chemical warfare in 1917. By July of that year, the Germans were firing shells filled with the arsenic compounds Clark I and II, often referred to collectively as Blue Cross (*Blaukreuz*) shells.[297] Clark irritated the upper respiratory tract, causing both sneezing and vomiting. The Germans often referred to this gas as *Maskenbrecher* (or mask breaker) because they believed that the gas particles were fine enough to permeate gas mask filters and caused sneezing fits. For this reason, German artillery units would fire Clark shells followed by

[294] Dienstvorschrift fur den Gaskampf und Gasschutz 1917 (BA-MA) PH/2/ sig 2090 ort 22 mah H2OG Reihe 229 Regal 1 Gefach 1
[295] Lichtbild-Erkundung englischer Gaswerfer, 1917 (BA-MA) PH 5-II/267 LSFN 4599F
[296] Vortrag uber Gasschiessen in Verteidigung und Angriff, 1917. (BA-MA) PH 5-II/379 LSFN 4605F
[297] Hoechst was the main contractor for supplying Clark. They later involved their associate firm Cassella. Clark I was originally synthesized in 1878 by the German chemists August Michaelis and Wilhelm La Coste. Clark II was developed for the German military in 1918 by the chemists Sturniolo and Bellinzoni.

phosgene, hoping that Allied soldiers would remove their masks to sneeze and then breath the deadly phosgene. New tactics like these required precise cooperation between field gunners, who were increasingly trained in the objectives of gas warfare.[298] Referring to the coordination of gas shell firing, Fritz Haber claimed that "a good army would change its gas fumes like an elegant lady would change her clothes, and the changeability or just the possibility of changeability was part of the point of the weapon."[299]

During this same period, Haber's KWI laboratories developed mustard gas shells, formally introducing them in July 1917 at the Third Battle of Ypres.[300] Mustard gas had been previously ignored as a chemical weapon because it was not viewed as sufficiently lethal. However, now that gas tactics sought to wear down the enemy's morale, mustard gas appeared far more useful. Contrary to its popular name, sulfur mustard was an oily liquid that could remain in soil or ground water for months. When soldiers came in contact with small droplets of mustard gas, it created a blistering effect on the skin, irritated the eyes, and often induced vomiting. In large quantities, mustard gas could cause internal and/or external bleeding, often destroying the lungs' mucous membrane over the course of four to five weeks. Obviously, the

[298] Feldartillerie-Regiment Nr 18 Gasschiessen aus dem Jahre 1918 (BA-MA) PH/21 sig 24, ort 22, Mag H2OG, Reihe 228, Regal 1, Gefach 5

[299] Betäubungs und Gas Schutzmittel im Kriege 1914/15 (BHK) M Kr. 13826

[300] Mustard gas and similar compounds were given the code name Yellow Cross (or *Gelbkreuz).* The Germans also called it Lost—a combination of the last names of the two men who proposed it as a warfare gas: Wilhelm Lommel (of Bayer) and Wilhelm Steinkopf (of Department G of the KWI). The Allies frequently referred to mustard gas as Yperite since it was first unveiled at the Third Battle of Ypres. Mustard agent was synthesized by European scientists as early as 1822, but its irritating properties were not noted until it was again produced by the British chemist Frederick Guthrie in 1860. The German method of production (Meyer-Clarke) combined the 1886 method of the German chemist Viktor Meyer and the 1913 work of British chemist Hans Thatcher Clarke. At the time, Clarke was working in a Berlin laboratory in 1913 alongside Emil Fischer. Fischer reported Clarke's discovery to the German Chemical Society, which then passed on this information to the KWI. Towards the end of 1918, the Americans produced their own Lewisite, which acted as a stronger mustard agent. It was first synthesized by the Belgian chemist Julius Arthur Nieuwland in 1904 and then secretly developed as a weapon by the American chemist Winford Lee Lewis. Lewisite was never used in World War I; however, the Germans heard of Lewisite's development and anxiety over its lethal powers spread among frontline soldiers.

gas mask did little to protect against contact with mustard gas, making attacks with the "king of all battle gasses" particularly hellish experiences for infantrymen.

Battlefield tactics changed throughout 1917 to make the most of these new chemical technologies. Achieving a surprise attack from a distance was no longer difficult. Artillery batteries began firing great quantities of gas shells at small sections of enemy territory, hoping to achieve dense gas clouds in seemingly random patterns. These *Gasüberfälle,* or gas assaults, were often conducted at night to further demoralize enemy troops.[301] Additional tactics included firing mustard gas across a front in order to create an impenetrable smoke screen, firing gas shells into the rear of an enemy and fragmentation shells into their frontline, and firing high concentrations of mustard gas into recently ceded territory to prevent enemy incursion. The German artillery called these new gas-saturated areas of the battlefield *Gassümpfe* (or gas swamps).[302]

The tactics of 1917 were primarily defensive in nature and they required large numbers of gas shells to be effective. Due to the long stalemate on the Western Front, firing a weapon that could harass enemy troops without committing German soldiers to a dangerous advance became increasingly attractive to commanders. Haber even began to ruminate on the possibility of gas overtaking explosives as the most commonly fired artillery shell.[303] These novel gas tactics were particularly effective against soldiers who were new to the front and were not yet disciplined enough to remain calm and alert enough to don a gas mask. The unexperienced American troops who first started arriving in Europe in 1918 suffered particularly high gas casualties.[304] However,

[301] Formationen des ingeneurskorps und Pionierkorps der Preussischen Armee, 1917. (BA-MA) PH/14/ sig 262 ort 22 mag H5EG
[302] Gas/ 21 Juni 1918-30 Sept 1918 (LBWH) M 33/2 Bü 407
[303] Mit der Länge des Kriegs wachsen, 1918 (MPG) Va 5 522
[304] Gasangriff an der amerikanischen Front in Frankreich 1918 (BA-MA) RH/8/ Sig 1152 ort 22 mag H3EG Reihe 123 Regal 1 Gefach 4. ; Kriegsgeschichte Gasangriffe an der amerikanische Front (BA-MA) RH/61/ sig 721 ort 22 Mag H3EG Reihe 191 Regal 4 Gefach 1. For American responses to chemical warfare in World War I and

these Allied casualty numbers decreased significantly by the end of 1918, suggesting that previous exposure to gas and knowledge of gas protection did indeed help to protect the men.

Unfortunately for the Germans, new artillery tactics put significant strains on their supply of raw materials. Thousands of shells needed to be filled, only to be quickly distributed and fired at the enemy. As scientists and engineers developed new protective technologies, old masks and filters also had to be returned and refashioned with state-of-the-art materials. Due to a national shortage of rubber, the Germans were forced to manufacture leather gas masks in August 1917. The so-called *Ledermaske* reduced the dead space between the face and the mask and featured double layered celluloid eyepieces. Spectacles could now be inserted into the mask, allowing the War Ministry to claim that the *Ledermaske* was a purposeful technological improvement, rather than a desperate search for available materials.[305] These seemingly small improvements reflected the perceived need to fit the mask to a soldier's daily life amid poison gas. To the consternation of German soldiers, the leather mask actually struggled to retain its tight fit, and the angled eyepieces made it difficult to shoot. In May 1918, the KWI further introduced the S-E (or *Sonntags-Einsatz*) filter, which featured an increase in the amount of filter charcoal to protect against Blue Cross gases. Filters remained well supplied by Bayer, Schering, and Riedel de Haen through the end of the war, but masks were more difficult to produce and maintain. Gas officers insisted on constant mask cleaning and correct storage to try to extend the life of each gas mask.[306] Soldiers were instructed to use their mask until it was utterly useless, resulting in an army that wore a hodgepodge of rubber and leather gas masks that often sported several holes.[307]

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afterwards see: Thomas Ian Faith, *Behind the Gas Mask: The U.S. Chemical Warfare Service in War and Peace* (Urbana IL: University of Illinois Press, 2014) ; Charles E. Heller, *Chemical Warfare in World War I: The American Experience, 1917-1918* (Honolulu: University Press of the Pacific, 2005) ; Theo Emery, *Hellfire Boys: The Race for the World's Most Deadly Weapons* (New York: Little, Brown and Co, 2017)

[305] PH 2 Preussisches Kriegsministerium 139-197, 1917 (BA-MA) PH/2/ sig 197 ort 22 MAG H5EG LFN 4442F

[306] 1914=1918 Dokumente M Wolfen (IZS)

[307] Infanterie-Divisionen (WK) 1245, 1915-1918 (BHK)

By the end of the war, functioning gas masks were reportedly available to only one in four soldiers.[308]

While new tactics and defensive technologies changed the face of gas warfare by late 1917, gas was still not a daily part of trench warfare. Gas shells were fired intermittently, ultimately heightening the apprehension that soldiers already felt about the insidious nature of the weapon. The continual appearance of new gasses, gas delivery devices, and defensive technologies inspired wild hypothesizing about the nature of new chemical weapons. Among the Germans, Blue Cross gasses stimulated great exaggeration with soldiers claiming that no gas mask filter could stop its particulate clouds.[309] Unsubstantiated stories of hydrogen cyanide gas and flammable gas that could be dropped into trenches and then set ablaze spread like wildfire through the trenches. To quell these fears, gas officers continued to distribute gas protocol pamphlets that stressed staying calm and trusting the gas mask during an attack. Point seven of one protocol instructed soldiers to "Breathe calmly and slowly and do not let the heat inside the gas mask annoy you. It will not hurt you. Avoid running and shifting the mask by bumping it: your own restlessness is the enemy's best friend."[310]

If 1917 was the year of technological development in chemical warfare, then the summer of 1918 finally saw these advances manifest themselves on the battlefield. By then, the Germans had mostly stopped implementing technological improvements for the gas mask, instead focusing on gas tactics and gas drills for their soldiers. Major Georg Bruchmüller devised what was called *Buntschiessen*, or firing large quantities of various gas shells for short bursts of time

[308] Yvonne Sherratt, Hitler's Philosophers, 23.
[309] See: Stephanie Fredewess-Wenstrup, Mutters Kriegstagebuch: Die Aufzeichnungen der Antonia Helming 1914-1922, 206.
[310] Gasschutz April 1916-Jan 1917 (LBWK) 456 F 86, 219

at a small target area.[311] This proved particularly effective in demoralizing enemy troops and in covering German retreats. However, the Allies copied these methods and began producing their own form of mustard gas in June 1918. The Allied ability to reproduce mustard gas surprised and demoralized the German troops, and quickly mitigated any German technological advantage in the escalating chemical war.

To counter dense gas attacks, trench sentries were required to be more vigilant and faster to sound the gas alarm. In 1918, soldiers were required to wear "masks at-the-ready" more frequently, while *Entgiftungstruppen* (or sanitation troops) were formed for each battalion and tasked with cleaning the mustard gas from trenches and uniforms.[312] German commanders increasingly believed that what they called *Gasdisziplin* (gas discipline), was the key to winning the chemical war. Given the relative effectiveness of fully functional gas masks, military experts were not entirely wrong in believing that most gas causalities were a result of human error and the fog of war. However, commanders were still unsure how much discipline the army could instill in its soldiers, especially in such a stressful warfare environment.

In the final months of the war, German soldiers were especially fatigued by gas projectiles. The gas specialist Rudolf Hanslian wrote retrospectively that "there was no weapon in the war that led to the amount of shirking responsibilities as gas."[313] Gas alerts became more frequent, straining the nerves of even the most hardened veterans. Like newly arriving American troops, most German men who transferred from the eastern front to the western trenches had far less experience with gas warfare and were rarely trained in the use of gas masks. By June of

[311] *Buntschiessen* (or colored shooting) refers to the fact that the different German shells received a different color codename.
[312] This meant that the soldiers would wear the mask loosely around their necks at all times. They could then quickly raise the mask to their face in case of an attack. Armeeoberkommando 6, 1917-1918 (BHK) Armeeoberkommando 6 2427
[313] Rudolf Hanslian, *Der chemische Krieg*, 202.

1918, mustard gas rained down on the weary Germans and the army lacked the number of filters to cope with the Allied assault.[314] While General Bruchmüller's *Buntschiessen* had made the war more mobile, soldiers were now living in makeshift earthworks seeped in poisoned water.[315] Whenever possible, the men stewed their ragged uniforms in boiling water to remove the toxic chemicals that now permeated their world.[316]

In the summer of 1918, German troops were already dispirited due to heavy casualties, a lack of supplies, and the influenza epidemic. Regardless of its compounding demoralizing effects, General Erich Ludendorff claimed in his memoirs that gas was vital to the German military effort in the final year of the war.[317] While it may have provided the defensive measures that could drag the war through its last summer, it also took a huge toll on the German soldiers who were required to keep fighting. Increasingly, these men lost significant faith in the ability of their gas masks to protect them and in German chemical supremacy more broadly. As Allied gas shell production and weapon technologies reached German levels, German soldiers began to feel that they had lost the chemical war. Their head start at Ypres, the efficiency of Haber's KWI, and the cooperation of the I.G. chemical concern gave them advantages that produced almost every significant chemical invention through 1917. But by 1918, shortages in materials and the KWI's acceptance of the fact that gas masks could not be further improved gave the Allies an apparent advantage. If the chemical war was to be won by the sheer amount of war materials, then the Allies, with the influx of American resources, now had the upper hand.

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[314] Adolf Hitler later claimed that gas masks were only available to one in four men in late 1918. Yvonne Sherrat, Hitler's Philosophers, 23.

[315] Reflecting on the practice of *Buntschiessen,* Modris Eksteins counters Fritz Haber's argument about the humane nature of gas, writing that: "Gas was certainly not used because it was more humane but because it compounded the horrors to which the front solder was subjected. It was not used instead of artillery; it was used in addition to artillery." Modris Eksteins, *Rites of Spring,* 161.

[316] Sicherheitsmassnahmen bei Verwendung von Gasgeschossen, 1917 (BA-MA) PH 5-II/18 LSFN 4590F ; Gas/ 21 Juni 1918-30 Sept 1918 (LBWH) M 33/2 Bü 407

[317] Erich Ludendorff, *My War Memories 1914-1918,* 579, 597.

Estimating the number of gas casualties in World War I remains a difficult task. Britain, France, the US, and Germany did not record gas injuries unless they were the observable cause of sickness or death and Russian reporting remained even less reliable. Further still, the inhalation of small amounts of gas was not always noticed until the injurious effects appeared later in life. In sum, gas casualty reporting was hazy at best. Fritz Haber's son, the historian L.F. Haber, has done the best job in attempting to create an honest statistical account by comparing various post-war national records and considering the technological effectiveness of poison gas in each year of the war.[318] According to Haber, about 531,000 World War I casualties were caused by gas, including about 17,700 deaths.[319] Without significant knowledge of Russian figures, we can hazard to say that around 74% of them came in 1918. The Germans suffered about 107,000 casualties throughout the war, with 65% of them coming in 1918. About 4,000 of those casualties were deaths.[320]

[318] L.F. Haber, also known as Lutz, was Fritz Haber's second son and his third and youngest child. Lutz Haber spent most of his childhood in Switzerland with his mother Charlotte, later moving to London before the Second World War. In the post-war years, he became a respected economist in the U.K. His books on chemical warfare were based on deep economic studies of the British, French, and German chemical industries as well as interviews with soldiers who had been gassed. Throughout his life, Lutz Haber asserted that his father was fully responsible for the outbreak of the chemical war, and that this responsibility should never be lifted. Lutz and his sister Eva-Charlotte died in old age, while Haber's first son, Hermann committed suicide in 1946 after his wife died. Hermann's daughter Claire was also a chemist who attempted to find an antidote to chlorine gas inhalation. Claire also committed suicide in 1949 after her research project was tabled for further atomic bomb research in the United States.

[319] While the British and Americans sought to create an accurate account for their gas casualties, the French and Germans used higher and lower numbers respectively in post-war arguments over the legality and effect of chemical warfare. L.F. Haber has compared numbers provided by all of the major combatants in order to provide the best possible estimates. Russia, which likely suffered the most gas casualties throughout the war, unfortunately has no credible statistics. Italian and Austro-Hungarian totals, while comparatively low, are also estimated.

[320] L.F. Haber, *The Poisonous Cloud*, 243-244. For comparative statistics see: Dieter Martinetz, *Der Gaskrieg 1914/18*, 127-131.

Nation	1915-17	1918	Total	1918 as % of total
Germany	37,000	~70,000	107,000	65
Great Britain	72,000	114,000	186,000	61
France	~20,000	110,000	130,000	85
USA	---	73,000	73,000	100
Others	~20,000	~15,000	~35,000	unknown
Totals	~149,000	~382,000	~531,000	~74

Table 3: Table for estimated gas causalities in World War I. These numbers are based on the work of L.F. Haber who does not find the casualty numbers for Russia, Italy, or Austro-Hungary to be reliable. In his 1937 book *Chemicals in War,* A.M. Prentiss estimated 1.2 million total gas casualties, with about 400,000 coming from the Russian army; however, there are no reliable sources for this estimate. The total number of men killed by gas is also unknown, although Prentiss hazarded a guess at about 90,000. Interestingly, Prentiss' totals are the most commonly circulated numbers among online encyclopedias.

Ultimately, Fritz Haber's belief that chlorine cylinders could win the war for the Germans proved incorrect. His statements and writings from after the war suggest that he knew that gas warfare technology was not ready for its unveiling in 1915, but pressure to provide a solution to the standstill on the Western Front influenced his decisions. Even if this is true, Haber still misjudged the German ability to continue the gas war while he sought a decisive technological advancement. The KWI's continued development of protective devices did not buy him enough time. Rather, as a central part of a self-justifying technological order, the development of the gas mask merely protracted a chemical war that would contribute to the misery of the German wartime experience. While the mask did indeed save countless lives from weapons that the German had themselves unveiled between 1915 and 1917, it also facilitated a uniquely horrifying form of warfare that helped precipitate the German loss in 1918. Historian Fritz Stern described the situation, writing:

> Gas warfare did not prove decisive, though its horror—the terrifying choking, the blinding, the deaths, the experience even for survivors of a living death—has become an inextinguishable part of our collective memory, an early instance of science put to satanic service.[321]

Indeed, the Germans developed the military gas mask hand-in-hand with the new gasses and tactics that it was meant to repel. In this sense, the gas mask held off Fritz Haber's vision of an exclusively chemical warfare in which the very air that humans breathed could be immediately weaponized against them. However, at the same time, the mask often psychologically belonged to the same category as the poison gas. To many soldiers, it was an alien piece of technology that brought the wearer's mind into a world of toxic air.[322] Exerting its merciless discipline, the mask struck a Faustian bargain with the average German soldier who could meet his death at any moment unless he permanently embraced the mask. Even if this were a real possibility, the gas mask could not account for human fallibility or its own structural impermanence. Thus, the reality of a chemically-soaked modern world was never more fully realized than when German gas masks failed in the summer and fall of 1918. Trapped between fatal air and toxic soil, many German soldiers lost faith in technological salvation. While face to face with the approximately twelve million gas masks that Germany produced during the war, these men most fully realized that unmediated life could not continue among deadly gasses.[323]

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[321] Fritz Stern, *Einstein's German World,* 120-121.

[322] Considering Haber's role in the realization of the average soldier's chemical nightmare, it is ironic that General Joseph Koeth said of Haber at his funeral: "It was Haber 'that made the German gas offensive and defensive possible; therefore, millions of German soldiers are indebted to him." Report on the celebration, (MPG) Dept. Va, Rep 5, No. 1339.

[323] The U.K. produced approximately 17.5 million gas masks and France about 5.3 million gas masks. L.F. Haber, *The Poisonous Cloud,* 261.

CHAPTER 3: THE FIRST "CHEMICAL SUBJECTS": SOLDIER ENCOUNTERS WITH THE GAS MASK IN WORLD WAR I

When describing the natural environment of the western trenches in 1918, the German infantryman Rudolf Binding wrote:

> Not a blade of green anywhere round. The layer of soil which once covered the loose chalk is now buried underneath it. Thousands of shells have brought the stones to the surface and smothered the earth with its own entrails. There are miles upon miles of flat, empty, broken, and tumbled stone-quarry, utterly purposeless and useless, in the middle of which stand groups of these blackened stumps of dead trees, poisoned oases, killed forever.[324]

These "poisoned oases" to which Binding referred were largely a product of the toxic gas that wafted over or sunk into the ground on the Western Front after 1915. In their personal writings, German soldiers regularly described the strange greenish-yellow color that coated everything exposed to gas.[325] This sickly hue, reminiscent of the "pale horse of death" in the Book of Revelations, could tint everything from food to clothing as well as the mounds of earth and puddles of poisoned water that slowly seeped into the trenches.[326] Even weapons and other metallic equipment could be recolored by the chlorine gas, adding to the strange chemically produced color pallet. After such metal oxidized, it turned a deep rust color that the army priest Anton Foohs described as "money in a purse."[327]

Over the balance of the war, infantrymen had little protection against this seeping or oozing liquidized gas, which could produce chemical skin burns and temporary blinding. In most cases, men only had the gas mask to serve as their primary defense against the poisoned

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[324] Rudolf Binding, *A Fatalist at War*, 217.

[325] Interestingly, the color of death's horse in the Book of Revelations is described as *khlōros.* While this is often translated as the "pale horse," it can also mean the "greenish-yellow" horse. *Khlōros* is also the root of the word chlorine.

[326] Oliver Kock, ed, Das Tagebuch des Leutnants Nilius: Ostern 1916 bis 21.2.1918, 49. ; Gerhard Scholtz, Tagebuch einer Batterie, 93. ; Jo Mihaly, ...da gibt's ein Wiedersehn!" Kriegstagebuch eines Mädchens 1914-1918, 280

[327] Carl Werner Müller, *Verzicht auf Revanche" Das Kriegstagebuch 1914/18 des Divisionspfarrers der Landauer Gernison Dr. Anton Foohs*, 187.

environment. While the mask could filter toxins from the air, sometimes so effectively that soldiers could come to view it as a magic cloak or talisman, it provided no real protection against physical contact with liquid poisons. Thus, liquid gas was one of the many dangers that forced the average German soldier to question his own agency in the quest for effective chemical protection during World War I. This crisis of technological faith was particularly apparent in 1918, when the intensification of the gas war gave the gas mask a distinct salience in soldiers' diaries and letters.

While historical ego documents prove to be difficult sources when searching for lived realities, they can reveal certain psychological perceptions over a given period of time. Historian Stefan Ludwig-Hoffmann has recently made it clear that ego documents such as war diaries present us with the "re-writing of subjective experience," rather than unmediated insights into the unfolding of historical events.[328] By this, Ludwig-Hoffmann means that the mediated process of writing ensures that diaries are emotionally filtered and subconsciously edited by their authors. This can prove a massive stumbling block to the successful reading of ego documents for historical research and writing. However, when placed into a distinctly bounded temporal scope, these same mediated documents can play a particularly useful role. The historian Michael Wildt reminds us that:

> Diaries are irretrievable but they do have "temporal proximity"…the succession of chronological entries allows for the analysis over time of evolving personal observations and opinions, as well as the changing of perceptions, the shaping of sensory impressions into mental constructs, and the formation of personal narratives.[329]

[328] Stefan Ludwig-Hoffmann, "Germans into Allies, Writing a Diary in 1945", in *Seeking Peace in the Wake of War: Europe, 1943-1947,* 68.
[329] Michael Wildt, "Self-Reassurance in Troubled Times: German Diaries During the Upheavals of 1933, in *Everyday Life in Mass Dictatorship: Collusion and Evasion,* 58.

With Wildt's insight in mind, this chapter utilizes war diaries and letters to seek the psychological and affective responses of German First World War soldiers in their encounters with both poison gas and the gas mask. By tracking their personal writings from 1915 to 1918, the chapter reveals the changes in levels of trust and affinity that these soldiers expressed for their gas masks. As the chemical war progressed in 1916 and gas masks were made more effective, soldiers tended to gain trust in their protective devices. They described their masks in human or technological terms that expressed the integration of the mask into the soldier's life world. However, as chemical warfare drastically accelerated in 1918 and German gas masks began to fail, literary descriptions of both poison gas and the mask began to regularly take on supernatural qualities. The gas increasingly became a devilish ghost or a grim reaper while the mask represented death itself. These macabre descriptors reflected the soldiers' growing doubts about their ability to make themselves technologically impenetrable to chemical weapons as they concurrently lost trust in their ability to master the atmospheric environment.

Such a reading of the gas mask seeks what certain historians of materiality have called the 'mute power of things' to reshape human consciousness and social relations.[330] Previous scholarship has attempted similar readings in different historical periods. For instance, in the foreword of Wolfgang Schivelbusch's *The Railway Journey*, the scholar Alan Trachtenberg argued that Schivelbusch's work was an attempt to recount the creation of the so-called 'industrial subject' through his or her experience with the newly developed railroad. Trachtenberg writes:

> One feature of modernity as it crystallized in the nineteenth century was a radical foregrounding of machinery and of mechanical apparatus within everyday life. The railroad represented the visible presence of modern technology as such. Within the technology lay also forms of social production and their relations. Thus the physical experience of technology mediated consciousness of the emerging social order; it gave a

[330] Tony Bennett and Patrick Joyce, *Material Powers*, 10.

> form to a revolutionary rupture with past forms of experience, of social order, of human relations. The products of the new technology produced…their own subject; they produced capacities appropriate to their own use.[331]

Chemical technologies similarly produced their own effects on Europeans living in an industrialized world. As the German chemical industry expanded at a tremendous pace in the late nineteenth and early twentieth centuries, its products came to redefine the experience of turn-of-the-century modernity. The most dramatic crystallization of this redefinition was on the battlefields of the World War I, where soldiers regularly faced both poison gas and the ancillary devices created to control a chemically volatile world. Admittedly, one could examine the human interaction with the poisonous gas itself to reveal fears over the pervasive nature of injury and death in a newly weaponized modernity. However, gas was a uniquely ephemeral weapon and its physical presence was not always necessary to inspire action, fear, or reflection. On the other hand, as a tool of resistance and survival, the gas mask encouraged the same fears of being gassed while also exposing a soldier's level of faith in the ability to control or defend against this newly modern condition through a combination of technological armoring and individual discipline.

While Fritz Haber's KWI scientists and engineers developed the modern gas mask in 1915 as a tool to save soldiers from a horrible death by asphyxiation, this reading argues that the mask also tangibly expressed the struggle against death for the soldiers who employed it. As the chemical war progressed and gas discipline became even more stringent, the gas mask more frequently produced anxiety and fear in German soldiers. In this way, the gas mask was not merely a technology derived from necessity, but an ambivalent technological object that revealed

[331] Wolfgang Schivelbusch, *The Railway Journey*, xv. Jonathan Crary's well-known 1990 monograph *Techniques of the Observer* performed a similar study with optical apparatuses in the nineteenth century and Chris Otter has expanded this visual focus into new forms of Victorian urban construction and infrastructure. Otter, *The Victorian Eye*, 6.

potential injury or demise for the average soldier. Indeed, the gas mask forced a direct and visceral confrontation with the rapidly developing technology of the World War I battlefield. Thus, it could potentially serve to shape the first "chemical subjects," or newly-envisioned men of the twentieth century. This purely hypothetical "chemical subject" is best represented as a subset of Ernst Jünger's *Arbeiter*, or humans who do not fear the pain and death of chemical warfare but rather embrace the now toxic environment as an arena of spiritual and physical evolution.[332] Through personal discipline and a body augmented and armored by a permanently attached breathing apparatus, this new "chemical subject" theoretically burst forth into a modern future permeated by toxic gas, thus redefining the possibilities for human survival.

Locating the Body: Further Methodological and Theoretical Concerns

Many eminent historians have encountered methodological difficulties in using ego documents to locate the impact of both First World War soldier trauma and the memories of said trauma on larger historical trends.[333] Jay Winter reminds us that war memories were often later mythologized so that they could be expressed to those who did not experience the front.[334] To address issues of time and memorialization, this chapter only utilizes diaries and letters that were

[332] This modern man is represented most vividly in Ernst Jünger's 1932 text *Der Arbeiter*. The man's physical body has physiologically morphed to resemble the mechanical devices that allow him to live in a gas-filled world. Ernst Jünger, *The Worker: Dominion and Gestalt*, 142.
[333] For such studies on war trauma and memory see: Jason Crouthamel, *The Great War and German Memory: Society, Politics and Psychological Trauma, 1914-1945* (Exeter: University of Exeter Press, 2009) ; Jason Crouthamel and Peter Leese, eds., *Psychological Trauma and the Legacies of the First World War* (London: Palgrave, 2017) ; Eric J. Leed, *No Man's Land: Combat and Identity in World War I* (Cambridge: Cambridge University Press, 1979) ; *Michael Roper, The Secret Battle: Emotional survival in the Great War (Manchester: Manchester University Press, 2009) ;* Robert Whalen, *Bitter Wounds: German Victims of the Great War, 1914-1939* (Ithaca, N.Y.: Cornell University Press, 1984) ; Paul Fussell, *The Great War and Modern Memory* (London: Oxford University Press, 1977) ; Jay Winter, *Remembering War: The Great War Between Memory and History in the Twentieth Century* (New Haven: Yale University Press, 2006) ; Jay Winter, *Sites of Memory, Sites of Mourning: The Great War in European Cultural History, 1914-1918* (Cambridge: Cambridge University Press, 1995) ; George Mosse, *Fallen Soldiers: Reshaping the Memory of the World Wars* (New York: Oxford University Press, 1990)
[334] Jay Winter, Sites of Memory, Sites of Mourning: The Great War in European Cultural History, 1914-1918. 142-144.

produced between 1915 and 1918. While some of these texts have been collated or slightly edited at a later date, the selected passages remain sufficiently loyal to the initial writings from the war.[335] The chapter also gathers a broad collection of soldiers' voices by pulling from men who served in different branches of the German military, who espoused different political aims through their later memorialization of the war, and who held different military ranks. The study still skews towards literary-inclined officers, who wrote down their war experiences far more often than enlisted men, but this is mitigated through the inclusion of trench journals aimed at informing and entertaining the average German infantryman.[336] Admittedly, giving voice to the many illiterate men in the trenches remains difficult, but at least trench journal images were widely disseminated and often reflected shared sentiments of dark humor or serious concern.

Many of these essays, letters, diaries, and visual representations are mere factual exposition of the tedious daily realities of life in the army: military drills, marching orders, meals, and weather.[337] These prosaic passages frequently describe the technologies of war as mere objects, actively controlled and manipulated by humans. As such, they represent the intermediate emotional stages between readiness and fear, often reflecting such states as boredom, disinterest, or even anger over Allied violence. But in descriptions of combat, terror, and/or exhaustion, battlefield objects were described quite differently. Here, the soldier's relation to the gas mask cannot be read as merely instrumental. Thus, perhaps we should reevaluate the soldier's shifting material reality. An icon of modern warfare like the gas mask was therefore not just an object defined by its intended purpose, but a tool that was attached to the soldier's

[335] Many of these postwar edits were reductions in the amount of graphic violence, thus making it difficult to grasp the brutality of gas warfare.
[336] For a study of French trench journals see: Stephane Audoin-Rouzeau, Men at War, 1914-1918: National Sentiment and Trench Journalism in France during the First World War (Providence: Berg, 1992)
[337] This was partly due to the fact that the majority of the soldier's life in the trenches was composed of waiting and boredom. However, German military censorship also removed descriptive warfare passages in letters sent back home. Wolfgang Natter, *Literature at War, 1914-1940,* 89.

physical body and redefined by subjective interactions. Reflecting on the ways in which soldiers textually expressed their experiences, historian Eric J. Leed writes:

> But there is another significant parallel between the kinds of knowledge acquired in the experience of war and that acquired in rituals of passage. The knowledge gained in war was rarely regarded as something alienable, something that could be taught, a tool or a method. Rather, it was most often described as something that was a part of the combatant's body, like a chemical substance in the veins, a mark, a scar, a set of reflexes, a part of the individual's very potency.[338]

Following Leed's claims, an affective and corporeal reading of World War I soldiers' texts attempts to bring us closer to these physical experiences. In doing so, we can see the shifting significance of the material things that soldiers continually chose to remember. This study has identified poison gas and the gas mask as recurring literary objects in order to consider each author's relationship with battlefield reality. Soldier texts consistently emphasize the attempt to locate gas with at least four senses, often utilizing suggestive verbs and adjectives such as creeping, whistling, hissing, rising, burning, drowning, bitter, pungent, stinging.[339] Similar sensorial words were reiterated when describing the gas mask. A successful reading of these texts demands that the reader vicariously apprehend the author's emotive experience. The horrifyingly evocative texts present in this study, which ruthlessly plunge the reader into the world of the mask, make evident how this process occurs.[340]

Canisters and Cotton Pads: Encountering Early Iterations of the Gas Mask

[338] Eric J. Leed, *No Man's Lands: Combat and Identity in World War I*, 74.
[339] Julia Encke, *Augenblicke der Gefahr: Der Krieg und die Sinne. 1914-1934*, 12.
[340] Elaine Scarry's celebrated work, *The Body in Pain*, has argued that language cannot convey the human experience of pain. By definition, the torture involved in gas injury and death is a destroying, or deconstruction, of language. Elaine Scarry, *The Body in Pain*, 72. While this may be the case, this chapter particularly seeks the soldier experience of fear and anxiety, rather than pain. Historian Joanna Bourke has argued that "The emotion of fear is fundamentally about the body - its fleshiness and its precariousness. Fear is felt, and although the emotion of fear cannot be reduced to the sensation of fear, it is not present without sensation. The body is not simply the shell through which emotion are expressed. Discourse shapes bodies." Joanna Bourke, "Fear and Anxiety: Writing and Emotion in Modern History", 123,

In December 1914, Fritz Haber's pioneer troops were the first enlisted soldiers to receive artificial respirators. While testing chlorine cylinders at the Wahn artillery range, the pioneers were outfitted with Dräger *Selbstretter* respirators. These large devices could supply a soldier with oxygen for up to one hour from canisters held in a satchel bag. Once the oxygen canister was empty, a new canister could be attached to the breathing tube that snaked up to the soldier's nose and mouth. The *Selbstretter* had no attached face mask so the pioneer troops were also provided driving goggles. While this system was effective enough for the pioneer troops to install and test the chlorine cylinders that Haber's KWI provided, it significantly hampered mobility and certainly inhibited the ability to fight. In case they needed a greater range of motion or they ran out of oxygen, the gas troops often carried backup cotton pads saturated with gas retarding chemicals.

Given that most gas pioneers had backgrounds in scientific research, these troops had little trouble adjusting to poison gas exposure. While there were accidents during the early gas trials in which men were poisoned, it is not a stretch to say that the pioneers generally felt confident in the protective abilities of their devices. The *Selbstretter* was not a new technology and it had proven its effectiveness against poison gas in numerous mining rescues around the turn of the century. Gas pioneers were provided with enough canisters to last the amount of time that they would be exposed to gas and the regular supply of oxygen inspired self-assurance in their task. In preparation for gas warfare, the pioneers trained with the *Selbstretter* by performing non-strenuous activities in a gas-filled chamber for forty-five minutes.[341] The reliability of the respirator and the scientific backgrounds of the men created a unique relationship to the chlorine gas that surrounded them. For most pioneers, gas was merely a tool that could be controlled,

[341] 1914=1918 Dokumente M Wolfen (IZS)

certainly more so than enemy bullets or shrapnel. Furthermore, the pioneers rarely had to witness the suffering of their enemies after releasing gas. Gas pioneer Otto Hahn later wrote that:

> the constant handling of these strong toxins had dulled us so much that we had no scruples when we used them at the front...we front-line observers rarely saw the direct effects of our weapons. Generally all we knew was that the enemy abandoned the positions that had been bombarded with gas shells.[342]

For the average German infantryman, however, the *Selbstretter* was an impractical means of protection. Infantrymen would have to advance behind the chlorine cloud and clear out enemy resistance, requiring full mobility and clear vision. Furthermore, the *Selbstretter* was an expensive device that could not be quickly manufactured for thousands of German soldiers. Thus, it was only in mid-April 1915 that infantrymen began to receive any form of protection.[343]

After the delivery of the first iteration of gas protection, the army surgeon Stephen Westman reported that "this most primitive gasmask was like a surgeon's mask and inside it we laid a pad of cotton wool, soaked in a fluid which was supposed to filter the air one breathed and protect the lungs from the poison. The eyes were left uncovered."[344] Not surprisingly, these cotton pads did little to protect their wearers from gas. Reports from the front further claimed that many soldiers did not know how to use them correctly, often covering their mouths but not theirs noses or applying them to their chest once they felt pain in their lungs.[345] For other men, the chemical solution dried up or they simply lost their cotton pad, forcing them to use handkerchiefs and other pieces of fabric to protect against gas exposure. In fact, the soldier Wilhelm Hartung claimed that soldiers almost never had the gas retarding chemicals let alone any other liquid available at the front, so they were told to urinate on their cotton pads. He wrote,

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[342] Otto Hahn, *Mein Leben: Die Erinnerung des grossen Atomforschers und Humanisten*, 122.
[343] For a description of German gas mask distribution at Ypres see: William Boyd, *With a Field Ambulance at Ypres*, 67.
[344] Stephen Westman, Surgeon with the Kaiser's Army, 92.
[345] Tim Cook, "Creating the Faith: The Canadian Gas Services in the First World War," 759.

"Fortunately, we never needed to use [the cotton pad], and I do not think it had any practical value in an emergency."[346]

This tenuous situation did little to inspire soldier confidence in either their masks or the chlorine cylinders. Many felt anxious in the presence of the so-called "F-batteries," but they were nevertheless forced to live in close proximity to the entrenched cylinders throughout the March and April of 1915.[347] The fact that the chlorine barrels had leaked several times, asphyxiating upwards of twenty men during installation, justified these early fears.[348] These pre-attack fears also help to explain why the German soldiers advanced slowly and hesitantly behind the gas once it was released at Ypres. When these men did finally reach the French trenches, the sight of their enemies served to validate their caution. Soldiers reported that the gas victims were lying on the ground gasping for air. Their faces had turned blue and they coughed a bloody foam.[349] Writing from the initial attack at Ypres, infantryman Rudolf Binding reported that "the men do not want to hear the word 'gas' mentioned. They are fed up with the stink."[350]

Throughout the summer of 1915, such was the state of the chemical war for the German soldier on the western front. His greatest predicament was the fact that he had little protection against his own erratic weapon. However, German suffering was clearly less intense than that of the Allied soldiers. Indeed, the military chauffeur Anton Fendrich noticed some Canadians and "bad smelling Negros" lying outside of the field hospital. These were men who had been gassed and were now receiving German medical care. Fendrich wrote: "Gently, as if they were babies, the men of the Red Cross carried them to the hospital, where they were given oxygen."[351]

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[346] Wilhelm Hartnung, *Großkampf Männer und Granaten!*, 59
[347] Ulrich Trumpener, "The Road to Ypres", 472
[348] Otto Lummitsch, "Meine Erinnerungen an Geheimrat Prof. Dr. Haber", MPG, Dept. Va, Rep 5, 1480.
[349] Literatur, Kriegserfahrungen, Auslandsnachrichten, 1934-36 (BA-MA) RH/12/4 sig 41 ort22 Mag H3EG Reihe 125 regal2 gefach 2
[350] Rudolf Binding, *A Fatalist at War*, 84
[351] Anton Fendrich, *Mit dem Auto an der Front. Kriegserlebnisse*, 94-96.

Fendrich's pointed description of "bad smelling Negros" suggests a distinct interest in the Franco-Algerian troops present at Ypres. According to frequent German speculation, the Algerian and other African troops were particularly susceptible to poison gas due to their supposedly undisciplined and irrational nature. Of course, the Germans naturally saw themselves as an ethno-national group that could best withstand chemical weapons. However, the Germans also gave credit to other white British soldiers by comparing the Algerian retreat to the Canadian troops' willingness to stand their ground. As the gas war progressed, ethnically French troops were similarly afforded a certain level of respect, while Russians were regularly grouped with the unruly and unprepared colonials. Not surprisingly, these supposedly varying levels of success with gas resistance had, in reality, less to do with intrinsic ethno-national constitution and more to do with the state of a given military's gas protection guidelines.

In mid-May of 1915, Western Front gas attacks abated when the pioneer regiments moved to the eastern front. This shift in theater gave the Allies time to procure protection for their own soldiers and on April 25, General Joffre ordered 100,000 cotton masks impregnated with sodium thiosulphate for the French troops.[352] Since the cotton masks could not be immediately produced, French soldiers first learned to dig pits and fill them with water and sodium thiosulphate. They could then dip handkerchiefs in the pit and wear them as a crude form of protection. The French also hoped that these pits might neutralize the wafting gas while they struggled to disperse the gas clouds with explosives or rifle fire.

The British also provided their troops with cotton pads, which were soon supplemented by the Black Veil Respirator.[353] The Black Veil, invented by John Scott Haldane and introduced in May 1915, was a piece of black cotton that could be wrapped around the face to hold a cotton

[352] Jonathan Krause, "The Origins of Chemical Warfare in the French Army", 549.
[353] John Scott Haldane (1860-1936) was a Scottish physiologist famous for his research on mining gasses.

pad in place. While the Veil ultimately proved too unstable, it produced a ghastly image when pulled up over the entire face of a British infantryman. In June of the same year, the Veil was replaced by the British Smoke Hood, also known as the Hypo Helmet. The British physician Cluny Macpherson designed the Hypo Helmet after supposedly seeing a German soldier place a bag over his head during a gas attack at Ypres.[354] Replicating this soldier's desperate act, Macpherson merely took a canvas bag and coated it with sodium thiosulphate. Featuring a single eye slit in the front, the Smoke Hood resembled a beer keeper's hood. Thus, these early British designs inaugurated the regular battlefield presence of oddly disfiguring full-head masks.[355]

Fitting the Mask: The German Introduction to the Gas Mask in 1915

On the 14th of September 1915, Herbert Sulzbach of the 2nd Bavarian Field Artillery Regiment was first informed about the provision of gas masks. In his memoirs, Sulzbach wrote "We are given talks by medical officers about bits of equipment which are supposed to stop you inhaling poison gas."[356] These bits of equipment were most likely the *Linienmaske* and the Wilstätter filter, although Sulzbach may have simply received a cotton mouth covering, a pair of goggles, and some gas retarding chemicals. This brief passage from Sulzbach's diary provides an early interaction with the first German military gas mask. In fact, Sulzbach writes days before the British gas attack at the Battle of Loos on September 25, 1915. His language reveals a lack of

[354] Cluny Macpherson (1879-1966) was the principal medical officer for the St. John Ambulance Brigade of the Newfoundland Regiment.
[355] By the spring of 1916, all the major belligerents had some form of gas mask. The Germans claimed that the English were outfitted with the best masks. They first used the crude Hypo helmet, followed by the small box respirator, introduced in April 1916. English soldiers also eventually received a supplemental French M2 mask for longer exposures to gas. The French soldiers reportedly had varying qualities of masks, but the M2 eventually became the standard equipment. If a Russian soldier received a gas mask, it was often poorly constructed and outdated. German scientists at the KWI tested all of these Allied masks in the process of developing gasses that could penetrate their filters. Anweisungen und Verfugungen uber die Gasschutzlager, die Ausbildung, den Bedarf von Gasschutzmitteln und den Gaskampf 1915-1917 (LBWK) 465 F 3, 620
[356] Herbert Sulzbach, *With the German Guns* (Hamden CT: Archon Books, 1981), 67.

trust in the rudimentary masks. By calling them 'bits of equipment' and modifying their purpose with 'supposed', the soldier described an encounter with a new and unproven technology. While these early masks did generally fail at Loos (either due to their inability to protect soldiers from gas or their limited distribution), Sulzbach had little apparent reason to distrust the mask prior to its implementation.

Sulzbach's introduction to gas masks demonstrated a common first interaction between German infantrymen and the technology behind gas warfare. Chemical weapons and the technologies associated with them were part of the massive changes in modern warfare that took place during World War I. The early use and institutionalization of these technologies represented entirely new possibilities for industrialized mass killing.[357] When soldiers were first introduced to these devices (like the gas mask, gas shells, or the gas itself), they were often confused as to their use and/or value. Some, reflecting on the inherited rules of war, saw this new technology as un-masculine or ungentlemanly. Others found gas masks to be particularly comical or alien in form, referring to them as 'stinkhoods, mouth drums, pig snouts, muzzles, and carnival veils.'[358] Regardless of their initial interpretation of the mask in 1915, no German infantryman yet knew what chemical warfare would entail. Sulzbach and others could afford to view the gas mask with disdain, humor, or skepticism since it was not yet a necessity. Similarly, those soldiers and officers who were lucky enough to view poison gas from afar treated it as a novelty in the initial stages of the chemical war. When describing the attack Ypres from a hilltop, one German officer wrote, "It looked quite beautiful, the sun was already fairly low, which gave

[357] For more on changes in the conception of warfare during the World War I, see: William Philpott, *War of Attrition*, 4.

[358] *Die Gasmaske*. Vol 20 Beilage 2, May 20, 1917. For the use of the term muzzle (or *Maulkorb*) see: Wolfgang Foerster, ed, *Wir Kämpfer im Weltkrieg: Feldzugsbriefe und Kriegstagebücher von Franktkämpfern aus dem Material des Reichsarchivs*, 495

the gas a browny-yellow hue in the evening light."[359] By the fall of 1915, such romantic descriptions of gas were no longer written.

Soon after experiencing the gas attacks at Loos, German soldiers felt increasing respect for an attachment to the "bits of equipment" that could save them from asphyxiation. Death by chlorine and phosgene gas was a particularly long and painful experience. The infantryman Johanna Martini related that "two full breaths suffice to bring about death. Whoever does not die immediately, goes on for a few days until they become lung-sick. The gas eats away all of their internal organs."[360] Martini's inexpert impression was not wrong. Gassed men who did not immediately asphyxiate would first appear pale as their pulse began to race and their breathing became shallow. Usually, these men died an hour later from heart failure. A German military report stated that "the severely poisoned were usually able to walk back on foot and only complained of pain in the chest, combined with severe coughing. Shortness of breath was absent at first, but it appeared after about an hour, and then increased rapidly, accompanied by violent vomiting. After 2 to 3 hours, death by suffocation occurred.[361] The prolonged struggle of the gassed soldier had profound effects on perceptions of chemical warfare. It was precisely this protracted death that made soldiers particularly anxious about gas inhalation. For many, a bullet to the head represented both a less painful and a more respectable demise. Reflecting on this fear of prolonged death, one former soldier reported that:

> The important thing is whether someone wants to live or looks for death as a solution. Only in the former case will the struggle be protracted and painful. It is not so much a struggle for air, that is terrible, but the struggle to maintain consciousness. One can observe how the dying person pulls himself out of the increasing darkness into consciousness again and again and thereby into fresh agony. On a few rare occasions I

[359] Tim Grady, *A Deadly Legacy: German Jews and the Great War*, 68.
[360] Johanna Martini, "Errinerung aus dem Weltkireg 1914-1915" (DTA) Sig 1847 Reg 1562
[361] Anlagen- Englischer Gasangriff Juli 1 1917- September 30, 1918 (LBWH) M 411 Bd. 1276

> have experienced this in an unforgettable way with some Russians dying of phosgene gas.[362]

As soldiers came to realize the nature of gas death, they increasingly valued their gas masks. Alongside his coat, cigarettes, map, rifle, revolver, bayonet, and steel helmet, the gas mask became part of the soldier's essential belongings.[363] As the chemical war progressed, men began to even sleep with the gas mask close at hand in case of surprise nocturnal gas attacks. The infantryman Wilhelm Wittekindt wrote:

> It was less pleasant when we were awakened the next night by the gas alarm. We always slept with gas masks nearby to be prepared for anything, and we put them on immediately. To prevent the gas from entering the trench as much as possible, we started fires so that the warm air and smoke came out of the entrance…With the gas mask on, we lay down again and slept on.[364]

By 1916, demands for constant gas preparation increased. A German gas bulletin ordered that every officer and enlisted man have a gasmask and filter on his person day and night.[365] This included while eating, sleeping, marching, at ease, and on guard duty. The bulletin stated that a second filter should be carried in every man's bag and a third should be kept for reserve at the rear infantry or artillery positions. As demands for preparation increased, the KWI developed better protective equipment with greater customization. The German gas mask now came in three sizes: small, medium, and large. While these sizes did not always perfectly fit each soldier, the process of being measured for a gas mask created a sense of personal ownership and bespoke design. The trench journal *Die Gasmaske* claimed that the gas mask was so close to the soldier

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[362] Karl Jaspers, *General Psychopathology,* 478.
[363] Wilhelm Lustig, *Kriegstagebuch 1915-1918.* (LBI) ME 6 MM 2. See also the entry for January 1918 in: Sigrid Wisthaler, ed, *Karl Außerhofer--Das Kriegstagebuch eines Soldaten im Ersten Weltkrieg* (Innsbruck: Innsbruck University Press, 2010)
[364] Wilhelm Wittekindt, "Meine Kriegserlebnisse 1916-1918" (DTA) 1229
[365] Gorz 18 Hauptmann Ruge Stab 213.J.D., 1918 (BA-MA) PH 8-I/56 LSFN 4676F

that it might as well be his own cousin, further arguing that: "Probably no instrument of war has gained such appreciation as the gas mask."[366]

While chemical warfare became an increasingly serious matter with the introduction of new chemical weapons like phosgene and mustard gas, German soldiers continued to show a sense of humor and incredulity about the surreal nature of gas attacks through 1917. The often-callous Ernst Jünger mocked gas victims, writing "When I passed the station, there were already a lot of people who had swallowed too much gas. They made a ridiculous impression. Everyone sat around, moaning and groaning, water running out of their eyes."[367] Jünger again found it humorous when one of his comrades forgot his gas mask during an attack. "Vogel, who shares my shelter, could not find his gas mask because he had left it somewhere. He danced (I secretly enjoyed this act) under the shouts: 'Oh dear God, my gas mask, my gas mask' from one corner of the shelter to the other."[368]

While Jünger's gas humor appears particularly sadistic, plenty of other examples were far more playful. In a trench journal story entitled "The Pioneers of St. Quentin," a gas officer asks a Bavarian soldier if he smells gas. The offended Bavarian soldier replies that it is just his own personal scent.[369] Additionally, when writing in his diary, the infantryman Julius Marx described a scene in which he and his masked comrades spent a casual night surrounded by gas as an "idyllic hell."[370] Men also referred to these long-lasting gas attacks as masked balls and they called their gasmasks chloroform hoods.[371] Soldiers enjoyed posing for photos while performing mundane tasks in a gas mask, whether it be reading a book or drinking wine at the dinner table.

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[366] *Die Gasmaske*. Vol 20 Beilage 2, May 20, 1917
[367] Helmuth Kiesel, ed, *Ernst Jünger Kriegstagebuch 1914-1918*, 138.
[368] Helmuth Kiesel, ed, *Ernst Jünger Kriegstagebuch 1914-1918*, 153.
[369] Die Pioniere von St. Quentin, *Die Sappe*, 30, March 1918
[370] Julius Marx, *Kriegs-Tagebuch eines Juden*, 139
[371] Theodor Imme, *Die deutsche Soldatensprache der Gegenwart und ihr Humor*, 117, 132.

Light-hearted subversions of gas discipline were often a soldier's attempt at personal control over the uncontrollable nature of modern mechanized war. Such jokes helped to make the unprecedented scale and methods of World War I killing palatable and to normalize the wartime experience.[372] These regular attempts at gallows humor only began to disappear once the gas war rapidly accelerated in 1918. By then, the overwhelming sensory experience of chemical warfare had broken many men, proving that poison gas did its greatest damage to the psyche.

Ghouls, Goblins, and Beasts of All Kinds: The Sights of Gas Warfare

While cotton mouth coverings and the Black Veil Respirator masked the lower face and created a level of anonymity on the battlefield, the British Hypo Helmet was the first gas mask that fully disguised the soldier's entire head. The historian Tim Cook described the helmet as particularly "nightmarish, especially when soldiers materialized out of the gaseous haze."[373] Given that the Hypo Helmet was merely an unstructured canvas sack, gas-ready British soldiers now resembled something akin to a living scarecrow or a hooded man ready for execution. Subsequent masks produced similarly eerie visages. Certainly, there was something rather dehumanizing and disturbing about the concealment of the face. When gas masks were donned, the trenches were no longer filled with friends and foes. Men could no longer recognize facial displays of emotion and often felt detachment from the semi-human forms that surrounded them.[374] Seen through the celluloid eye pieces of their own gas mask, this multi-layered mediation between human bodies created a sense of isolation from the exterior world.[375]

[372] George Mosse, *Fallen Soldiers*, 155.
[373] Tim Cook, "Creating the Faith: The Canadian Gas Services in the First World War," 760.
[374] The gas protection technologies of 1918 only increased battlefield dehumanization. *Sanitätsoffizieren* (or medics) were outfitted with full rubber suits to prevent contact with mustard gas. Common infantrymen were also given gas blankets, which could be draped over the head. When donned, both the rubber suits and rubberized sheets produced ghost-like figures in the trenches.
[375] Julia Encke, *Augenblicke der Gefahr: Der Krieg und die Sinne. 1914-1934*, 214-215.

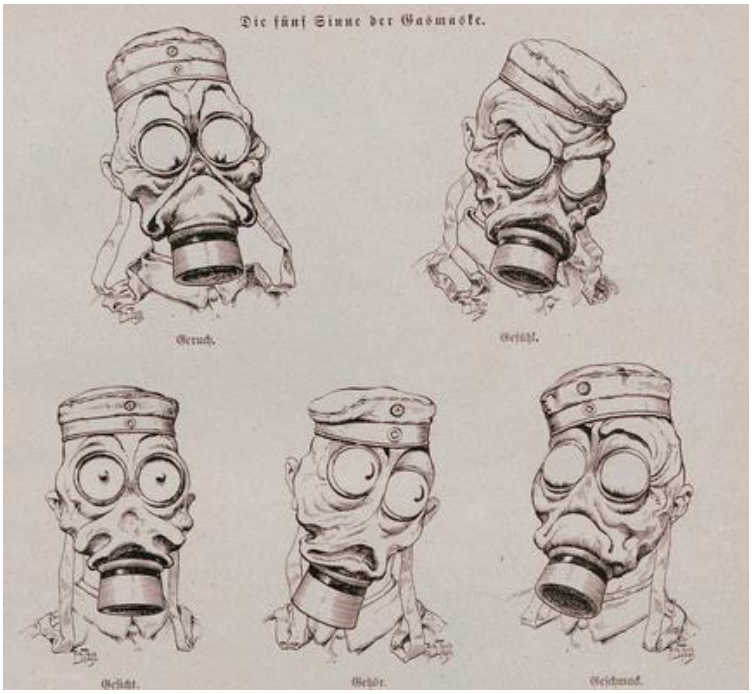

Figure 1: Arthur Thiele's "The Five Senses of the Gas Mask" (1918) attempts to humorously acknowledge the inability of the masked soldier to express emotion.[376]

With the arrival of the modern gas mask, soldiers began to describe fellow combatants with the images and metaphors of magical realism, often emphasizing an outlandish landscape populated by bug-eyed ghosts. Soldier Wilhelm Hartung described these new masked men as a "horde of the underworld," while Ludwig Renn thought they all looked like ridiculous monkeys.[377] Ernst Jünger claimed that men now had "ghost-eyes" and "fantastic beaks," while Richard Dehmel portrayed the battlefield as an "fantasy of modern technology and industry, filled with insects."[378] Infantryman Otto Ahrends wrote that under the gasmask, "one becomes unrecognizable to the other, and that the gas mask becomes a form of protection much like a

[376] Arthur Thiele, "Die fünf Sinne der Gasmaske" 1918 (UH) G 5442-2 Folio RES
[377] Wilhelm Hartung, *Großkampf Männer und Granaten*!, 233 ; Ludwig Renn, *Krieg*, 201.
[378] Ernst Jünger, *Feuer und Blut*, 102. While *Feuer und Blut* is considered one of Jünger's war novels, the text remains notably loyal to his war diaries. ; Richard Dehmel, *Zwischen Volk und Menschheit: Kriegstagebuch von Richard Dehmel*, 71

magic hood and the last resort when encountering this hell on earth."[379] Lieutenant Gregor Wörsching's diary featured the most striking evidence of just how dehumanizing the gas mask could be. When reminiscing about his fallen comrades, Wörsching recounted their lost gas masks, which now served as each soldier's ersatz face.[380]

The uncanny visual surrealism of masked combat was compounded by animal gas masks, developed by the Kaiser Wilhelm Institute for dogs, horses, and carrier pigeons.[381] These strange creatures, half-living flesh and half-technological machine, inhabited an equally altered environment that could be permeated by gas at any moment. Their presence further encouraged the metaphorical comparison between men and animals. When all living creatures were mediated by masks, soldiers felt compelled to ask themselves if the human/animal distinction was truly important.

When recounting such outlandish images of the front, soldiers frequently described both the color of chlorine gas clouds and their slow, haphazard movement across the ground. Infantryman Cornelius Breuniger wrote that "with a strong hiss, the gas escaped and rolled into a widening wedge shape against a small protective trench, a yellow-white cloud, which then melted into the dugout."[382] The men also commented on the density of these clouds once they reached their trenches because both the chlorine gas and the construction of the gas mask obstructed and confused their vision. Dieter Finzen wrote of a fog so thick that "we can't see our own hands."[383] Gas this thick regularly collected in topographic depressions and trench dugouts.

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[379] Otto Ahrends, *Mit dem Regiment "Hamburg" in Frankreich 1914-1916*, 2014
[380] Robert Sauter, ed, *Ich setze mich nieder und schreibe. Gregor: Eine Lebensgeschichte zum Ersten Weltkrieg*, 215.
[381] Hermann Geyer, *"Der Gaskrieg" in Der Weltkampf um Ehre und Recht: Der Seekrieg, der Krieg um die Kolonien, die Kampfhandlungen in der Türkei, der Gaskrieg, der Luftkrieg*, 507.
[382] Frieder Riedel, ed, *Cornelius Breuninger: Kriegstagebuch 1914-1918.* Writing from March 1, 1916.
[383] Finzen, Dieter. "Kriegstagebuch: Das Tagebuch von Dieter Finzen Aus Beiden Weltkriegen." *The War Diaries of Dieter Finzen*, 21. März 1918.

Alfred Hermann was better positioned on higher ground, but he still complained that he could only see ten feet in front of the trench.[384] Because gas attacks were often conducted at night, soldiers also struggled with low levels of light. Figures would materialize and melt away into the dark clouds, further emphasizing the spectral quality of the battlefield. The gas mask only exacerbated this poor visibility. The celluloid eye pieces did not always sit directly over the eyes and they fogged regularly, obscuring a soldier's field of vision. Furthermore, mask eye pieces were set on an angle, making depth perception and weapon accuracy incredibly difficult. Infantryman Konrad Steuernagel tested his marksmanship with a gasmask, hitting a target nearly 15% of the time unencumbered and only 8% of the time while wearing a mask.[385] Given that soldiers had to wear gas masks in expectation of attacks, this visual hindrance could also impact reading, writing, and other daily tasks.[386]

The unique killing method of weaponized gas added a further spectacle to the visual field of the German soldier. Infantryman Hartung described gas-sick men as "miserable bundles of people, laboriously dragging themselves along with crumpled, green-gray faces, vomiting where they went and dying."[387] Ernst Jünger wrote that "some of the bystanders begin to writhe in convulsions, and at last with a jerk, pull off the protective masks to vomit."[388] While Hartung and Jünger appear rather apathetic towards these dying men, levels of sympathy varied. Otto Hahn wrote that gas-sick men were particularly pitiful and that when he was "face to face, [he could] not stand the sight without attempting to help. But, by then, [he] could not save the poor

[384] Alfred Hermann Fried, *Mein Kriegstagebuch*, 94. This visual distance of 10 feet was corroborated on June 27, 1916 in: Analgen zum Kriegstagebuch Feb-Juli 1916 (LBWK) 456 F 54, 137
[385] Konrad Steuernagel, *Kriegstagebuch 1914/1918 des II. Batls. Ref.=Inf.=Regts. Nr. 221*. From May 23, 1916. Alfred Hermann's *Kriegstagebuch* maintains a similar testing scene.
[386] Wolfgang Foerster, ed, Wir Kämpfer im Weltkrieg: Feldzugsbriefe und Kriegstagebücher von Franktkämpfern aus dem Material des Reichsarchivs. 495
[387] Wilhelm Hartung, *Großkampf Männer und Granaten!*, 59.
[388] Ernst Jünger, *Feuer und Blut*, 132.

people."[389] These retching men added to the strange sense of sudden jerking movement that moved in and out of the soldier's field of vision during a gas attack.

A Deadly Bouquet: The Smells of Gas Warfare

From April 1915 to March 1918, German soldiers increasingly relied on their gasmasks for protection against chlorine, phosgene, and various tear gases. While the mask could prove cumbersome and tiring to wear, it did generally succeed in warding off harmful gases. Most soldier gassings occurred when gas masks were lost, forgotten, or improperly applied. For this reason, veterans with previous chemical warfare experience kept their masks close to hand. These men would disinfect their masks regularly to clean out trace chemicals, thus protecting the rubberized fabric as well as the head straps. During this cleaning process, soldiers applied soap to the eyepieces to prevent eyeglass fogging.[390] They would also make sure that they were packed in their cases in such a way that they could be quickly removed and applied with the filter on. Even more cautious soldiers would simply wear their gas mask around their necks during any potential enemy engagement. Reflecting the importance of the gas mask in 1916, a trench journal wrote, "the soldier is inseparable from her, and so, too, he leads her into the quiet divide…the rifle was his original bride, but he has elevated the gas mask to his cousin. This, too, expresses a very intimate relationship, for the soldier usually attends to his cousin as his second bride."[391] Descriptions of the gas mask that employed female descriptors served to humanize the technology, while also placing it under the male soldier's control.

[389] Otto Hahn, *Mein Leben: Die Erinnerung des grossen Atomforschers und Humanisten*, 132.
[390] Ernst Jünger, *Feuer und Blut*, 102.
[391] Die Gasmaske: Feldzeitung der Armee Abteilung C. vol 20 (2) May 20, 1917: 1.

Soldier writings reported the successful use of the gas mask and the feelings of relief that rushed over them after withstanding a gas attack. Infantryman Hans Burr reported the excellent design and construction of the German gas mask on multiple occasions.[392] In a trench journal dialogue entitled "Do you have your gas mask ready to hand," two soldiers named Fritz and Karl expound the importance of always keeping your gas mask close. Karl claims, "I will never be separated from her [the gas mask], whether I am in the trench or the grave."[393]

With the increasing diversity of chemical weapons in 1916 and 1917, the scientists at Haber's KWI encouraged soldiers to use all their senses in detecting gas. Troops were provided with gas sample cases that could be used for detection training.[394] These were large suitcases that contained vials of various chemical weapons and reactive materials that could alert soldiers to the presence of gas in the air. The soldiers would attempt to identify each gas based on its color, its effect on a small patch of skin, and most importantly, its smell. During this training, gas officers gave lectures about the nature of different gases and their effect on the body.[395] A soldier's sense of smell was particularly important when phosgene was employed because the gas was not visible to the naked eye. The gas sample case claimed that phosgene smelled like musty hay, cut grass, or green corn.[396] While chlorine could usually be seen, it reportedly smelled like flypaper. Tear gases smelled like strong vinegar or bleach, and while blue cross gasses were supposed to be odorless, they supposedly smelled of bitter almonds.[397] Mustard gas

[392] Hans Burr, *Das Württemburgische Infatrie-Regiment Nr. 475 im Weltkrieg, 25*, 54
[393] "Habt euere Gasmaske stets zur Hand!" *Kriegszeitung der 1. Armee*, 148, April 8, 1918: 4.
[394] Richard Dehmel reports receiving a gas sample case in 1916. See: Richard Dehmel, *Zwischen Volk und Menschheit: Kriegstagebuch von Richard Dehmel*, 426.
[395] Carl Zuckmayer, *Second Wind*, 86-87.
[396] Denis Winter, *Death's Men,* 122.
[397] For an encounter with tear gas see: Otto Borggräfe, Mein Tagebuch 1914-1915 (IZS) N10.3-7. For an encounter with blue cross gas see: Ernst Jünger, *Feuer und Blut,* 102.

was the easiest chemical to detect via smell, since it smelled strongly of garlic or horseradish.[398] In one unpleasant encounter with mustard gas, the infantryman Hans Zoeberlein wrote, "My eyes are roaring with the sharp gas and my nose is dripping; it stinks like horseradish and it eats into the mucous membranes."[399]

By 1917, these chemical smells became a regular part of the trenches on the Western Front. The pungent aromas of the gasses were accompanied by the unfamiliar odors of protective chemicals like lime. Carl Werner Müller reported that, in his trench, "Everything smells of gas and counteragent."[400] When enemy gas attacks arrived, soldiers received a fresh burst of such strong aromas. Once they had donned their gas mask, these smells were replaced with a distinctly rubberized scent that could turn a man's stomach.[401] The omnipresence of such discomfort brought many soldiers to appreciate the unremarkable odor of unpolluted air. Fresh air mostly remained unimaginable.[402] Nevertheless, a willingness to embrace the smells of chemical warfare could save a soldier's life countless times. While taking deep whiffs of the battlefield was incredibly unpleasant, a strong sense of smell was a necessary ally in the attempt to survive. The soldier Cornelius Breuninger wryly wrote that in 1916, "suddenly everyone has a wonderfully developed sense of smell."[403]

A Cacophony of Silence: The Sounds of Gas Warfare

[398] The Germans would sometimes try to cover the smell of mustard gas with lilac. Andrew J. Rotter, Hiroshima: The World's Bomb, 19.
[399] Hans Zoeberlein, *Der Glaube an Deutschland*, 481.
[400] Carl Werner Müller, Verzicht auf Revanche" Das Kriegstagebuch 1914/18 des Divisionspfarrers der Landauer Gernison Dr. Anton Foohs, 187.
[401] Rudolf Hoffmann, ed, *Der deutsche Soldat: Briefe aus dem Weltkrieg*, 435.
[402] Ernst Jünger, *Feuer und Blut*, 102.
[403] Frieder Riedel, ed, *Cornelius Breuninger: Kriegstagebuch 1914-1918*. From January 10, 1916.

The sounds of gas warfare were most distinctive in their stark contrasts. In preparation for a gas attack, men would remain as still and silent as possible, listening for the hiss of gas as it was released from cylinders or shells.[404] This unnatural silence heightened the feeling of anxiety over the possibility of a gas attack by emphasizing the near-silent and insidious nature of chemical weapons. Soldiers struggled to detect the gas in both the trenches and their own bodies, as it infiltrated and destroyed its host from the inside out. In his diaries, Ernst Jünger described this sense of impending doom, writing, "In the distance, the ghostly cry of gas echoes through the darkness a few times, but then it becomes very quiet again, and now it almost seems too quiet."[405]

The association between a pregnant silence and gas became so strong that the infantryman Paul Zech reversed the metaphor. He wrote, "And suddenly there was silence...a second-long stillness, which completely upset us like a new, fast, and thoroughly deadly gas."[406] The silence of creeping gas was often juxtaposed against the chaos of gas detection. The German soldier Albert Sagewitz wrote, "the gas seems to come out of the ground. It gets closer and closer, and we can hardly see each other anymore. My eyes begin to hurt and tear up. Something swirls in your nose. Gas! - One roars in the other's ears - GAS!"[407] Similarly, an artilleryman recreated this horrible tear in the silence:

> At 4 o'clock in the morning we were suddenly awakened with the cry: Gas! Gas Mask! And then there was the stupid crash of the grenades that flew against our walls. All light in the trenches was immediately doused. You stood in the dark and tried to find your gas mask. In the room, everyone was calling or shouting for fear of death. One man had no mask, the other had no filter, and one more was looking for his wife and children. Everything was chaos.[408]

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[404] See: Frieder Riedel, ed, *Cornelius Breuninger: Kriegstagebuch 1914-1918*. From March 1, 1916.
[405] Ernst Jünger, *Feuer und Blut*, 99.
[406] Paul Zech, *Von der Maas bis die Marne*, 119.
[407] Rudolf Hoffmann, ed, *Der deutsche Soldat: Briefe aus dem Weltkrieg*, 435.
[408] Wolfgang Foerster, ed, *Wir Kämpfer im Weltkrieg: Feldzugsbriefe und Kriegstagebücher von Franktkämpfern aus dem Material des Reichsarchivs*, 272.

The cacophony of gas alerts increased in volume as the war progressed and the German army formalized its gas drills. While some trenches had sirens that would alert soldiers to the presence of gas, most relied on the gas sentry to bang on pots, pans, or other pieces of metal.[409] Hans Zoeberlein described such a gas alarm when German gas blew back onto his trench. "Gas! Gas! I barked and pulled the mask down over my face – it was already coming in... [the gas sentry] hammered on gongs and bells as if he were mad. A gas alarm—because of our own poison!"[410] Even with all of this sudden noise, some men slept through almost nightly gas alarms and asphyxiated in their sleep.[411]

Once a soldier had applied his gas mask, his auditory sensations became even more foreign. It was difficult to hear noise outside of the mask because the rubberized cotton covered the ears. Instead, soldiers heard their labored breathing and/or their heart beating at an amplified volume.[412] This was uncomfortably deafening, often increasing the soldiers' sense of isolation and vulnerability.[413] Making matters worse, soldiers could not hear their officer's orders and rarely knew how to coordinate their actions. In an attempt to solve this problem, the Kaiser Wilhelm Institute created prototypes of gas masks with internal speakers and microphones.[414] These masks were never made widely available and engineers never found an effective solution to the internal beating that reverberated through the soldier's head.

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[409] See: Richard Dehmel, *Zwischen Volk und Menschheit: Kriegstagebuch von Richard Dehmel*, 422. Gas sentries might also be outfitted with bells or whistles to use as a gas siren.
[410] Hans Zoeberlein, *Der Glaube an Deutschland*, 199.
[411] Die feindlichen Gasangriffe in der Somme-Schlacht 1916 (BA-MA) PH 5-II/19 LSFN 4590F
[412] Rudolf Hoffmann, ed, *Der deutsche Soldat: Briefe aus dem Weltkrieg*, 435.
[413] This auditory isolation is still a military concern today. When commenting on the use of gas masks in the Gulf War, Professor Rick Gabriel wrote, "Clothes and hoods that save a man from lethal gas can make him more vunerable to psychological breakdown. Once you don a chemical suit you increase the isolation of the soldiers; he cannot hear very well, the lenses get fogged, he cannot see, and he cannot feel his body. Moreover, all he can hear is the pounding of his own heart." Anthony Babington, *Shell-Shock: A History of the Changing Atittudes to War Neurosis*, 176.
[414] Armeeoberkommando 6 1917-1918 (BHK) Armeeoberkommando 6 2427

A Burning Sensation: The Feel of Gas Warfare

Soldiers most often associated gas attacks with a sensation of burning or uncomfortable warmth. Most obviously, mustard gas created a burning sensation that could lead to inflamed skin, blistering, and blinding.[415] When mustard gas was first used against the Germans in 1918, many soldiers were so concerned by the burning sensation on their skin that they pulled down their gas masks. Assuming that the mask had failed, they ran from the trenches in chaos.[416] This same burning feeling was also regularly felt in the eyes.[417] Claiming that he had been exposed to mustard gas at Ypres, the then-corporal Adolf Hitler wrote, "Towards morning I began to feel pain. It increased with every quarter of an hour; and at seven o'clock my eyes were scorching as I staggered back and delivered the last dispatch that I was destined to carry in this war. A few hours later my eyes were like glowing coals and all was darkness around me."[418]

The scorching sensation of chemical warfare was not only felt by those exposed to mustard gas. Other gases produced a burning tightness, primarily located in the chest and throat. After exposure to phosgene, Otto Mallebrein reported feeling "chest pains when breathing, so I could only breathe superficially. The slightest effort to breath faster caused bad palpitations."[419] Chlorine and phosgene also created a heavy feeling in the chest, as fluid drained into the lungs.[420] Rudolf Binding described this sensation, writing that "respiration becomes more and more difficult as the lungs fill with liquid instead of with air, and they eventually drowned, so to speak. It is horrible to watch people who have apparently escaped death succumbed to this

[415] Tim Cook, "Creating the Faith: The Canadian Gas Services in the First World War," 771.
[416] Anlagen zum Kriegstagabuch Juli 1916-Aug 1916 (LBWK) 456 F 26, 22
[417] Eva Prase et al, eds, *Überlebe ich, so schreibe ich weiter: Feldpost aus dem Ersten Weltkrieg*, 123 ; Reinhold Maier, ed, *Feldpostbriefe aus dem Ersten Weltkrieg 1914-1918*, 161.
[418] Adolf Hitler, *Mein Kampf*, 151-152.
[419] Otto Mallebrein, Mein Kriegstagebuch 1914-1918 (DTA) Sig 3814. See entry for August 4, 1918.
[420] Tim Cook, "Creating the Faith: The Canadian Gas Services in the First World War," 762.

gradual suffocation."[421] To ward off a mild burning feeling or minor chest pains, soldiers took to drinking warm liquids and schnapps after gas attacks.[422]

Fears over the painful effects of gas inhalation inspired a distinct soldier appreciation for the construction of the atmosphere.[423] While the meteorological services and artillerymen developed a deep knowledge of pressure fronts and wind speeds, infantrymen also began to watch the weather with increased interest. Up until the use of gas shells; static air, wild winds, or a breeze blowing away from the German trenches meant that an enemy gas attack was impossible. Rain, excessive heat, and cold weather could also prevent gas attacks. However, a slight breeze blowing towards the German trench necessitated more gas sentries and raised general levels of anxiety. Thus, the basic sensations of wind in the hair or water on the skin had far more critical implications for the German soldier between 1915 and 1917; these atmospheric perceptions could be the difference between life and death.[424]

In perhaps the most famous literary depiction of gas warfare, the British poet Wilfred Owen described a gas attack as "an ecstasy of fumbling."[425] German soldiers reiterated this sense of physical clumsiness in their own writings. They stressed the panicked searching about for their gas masks and the eventual gripping of the rubberized fabric.[426] These were moments of possible physical salvation, represented by the found object itself. But a similar ineptness could be demonstrated by the gas mask, turning feelings of safety and deliverance into a uniquely horrifying death. The gas mask required a tight fit with the face in order to keep gas out of the

[421] Rudolf Binding, *A Fatalist at War*, 175.
[422] Walter Schmidt, *Das 7. Badische Infanterie-Regiment Nr. 14 im Weltkrieg 1914/18*, 100.
[423] According to a psychological study of soldier perceptions in the Gulf War, the fear of a poisoned environment remains central to the battlefield psyche. Edgar Jones, Ian Palmer, Simon Wessely, "Enduring Beliefs about Effects of Gassing in War: Qualitative Study", 4.
[424] See: Andreas Meyer, It's not the fatherland's fault!? – Keep the letters for later: Dr. Otto Meyer, from gunner to lieutenant, a German-Jewish war career, 102.
[425] Wilfred Owen, "Dulce et Decorum Est"
[426] Ernst Jünger, *Feuer und Blut*, 102.

space between the wearer's skin and the rubberized material. To achieve this, the gas mask had several interior bands that encircled the skull and held the chin. These bands were made tighter and more secure in subsequent versions of the German gas mask. Soldiers were required to shave everything below the upper lip so that no facial hair would break the mask's seal to the face.[427] The mask's airtight seal created an enormous amount of pressure on the wearer's face, particularly around the temples and the bridge of the nose where circulation was impeded.[428] When the mask had to be worn for hours, these pressure points could become unbearable, forcing the soldier to remove the mask at his own risk.[429] Albert Sagewitz described the gas mask as a "deceitful instrument," further writing that "All activities become more difficult with the mask. It is true that breathing is heavier and it puts pressure on the chest."[430] Numerous soldiers reported frequent headaches while wearing the mask.[431]

[427] Abwehr von Stinkgeschossen etc, 1916- (BA) 201-008-001
[428] Geratetechnisches, Konstruktion, Erfindungen, Versuche, Formveranderungen usw. 1933-36 (BA-MA) RH/12/4 sig 84 ort22 mag H3EG reihe 125 Regal 2 Gefach 4
[429] Bericht der Kaiser Wilhelm Isntitut fur Arbeitsphysiologie, 1934 (BA-MA) RH/12/4 sig 87 ort 22 mag H3EG Reihe 125 Regal 2 Gefach 4 ; PH 2 Preussisches Kriegsministerium, 1918 (BA-MA) PH2 282-302 LSFN 4445F
[430] Rudolf Hoffmann, ed, *Der deutsche Soldat: Briefe aus dem Weltkrieg*, 435.
[431] Albrecht Dorn, *Kriegstagebuch der 6. Kompagnie 18. Rgl. Sächs.Inf.Regt. Nr. 192*, 31.

Figure 2: A soldier's lined face after wearing the gas mask. The photograph is part of a set of military studies on the effectiveness of the gas mask.[432]

Gas masks could also prove treacherous allies when they slipped out of position. German military reports claimed that the *Stahlhelm* (or German steel helmet) could push the gas mask out of position and break the airtight seal.[433] Furthermore, the mask trapped body heat against the head, raising the soldier's body temperature and making the wearer's face sweat. This sweat, which was further elicited by the uniquely stressful nature of gas attacks, could also break the seal of the mask. The former soldier Edlef Köppen described this problem, writing, "God, this gasmask! It is soaking wet from the condensation of my breathing. It rubs against my chin while running and sometimes the water sloshes in my mouth. Ugh! The devil! And then the eyepieces fog over and it looks like everything is covered in mist.[434] Difficulties like these could be so

[432] Geratetechnisches, Konstruktion, Erfindungen, Versuche, Formveranderungen usw. 1933-36 (BA-MA) RH/12/4 sig 84 ort22 mag H3EG reihe 125 Regal 2 Gefach 4
[433] Ibid.
[434] Edlef Köppen, *Heeresbericht,* 338

bothersome that soldiers would be forced to remove the gas mask just to functionally move about. Ernst Jünger described one such instance:

> I had scarcely got the mask out before I quickly pulled it down off my face. I had run so hard that the air supply through the gas mask was not enough, and I sweated so much that the eye glasses were fogged and completely opaque, so I just tore the mask off. There was a violent stinging in my chest.[435]

Over the course of nearly three years of intensifying chemical warfare, German soldiers came to increasingly rely on their gas masks. But in the instances of technological failure, the gas mask showed itself as a deceitful ally. Soldiers could never trust that they were fully protected from gas; for it was naïve technological faith that produced the most horrible deaths. Captain Hermann Geyer described this Catch-22: "Mask leaks were often difficult for the layman to recognize. Leaky masks, however, were more dangerous than having no mask at all, because if the defect had not been fixed, the mask provided a false sense of security."[436] If the gas mask slipped or the airtight seal was broken in some way, the mask would fill with gas and begin to asphyxiate the soldier in what had essentially become an individual gas chamber. The painful pressure that the gas mask put on the soldier's face reminded him that while the mask might be his metaphorical second wife, her loyalty remained questionable.

Synthesizing the Chemical Subject: Discipline vs Anxiety

The German soldier's already fraught relationship to the gas mask changed drastically in 1918 as technological failures became more frequent and gas tactics altered. Since the Second Battle of Ypres, German infantrymen had received instructions on their expected conduct during

[435] Helmuth Kiesel, ed, *Ernst Jünger Kriegstagebuch 1914-1918*, 135. This experience is also reported by Stephen Westman: Stephen Westman, *Surgeon with the Kaiser's Army*, 121.
[436] Hermann Geyer, "Der Gaskrieg" in Der Weltkampf um Ehre und Recht: Der Seekrieg, der Krieg um die Kolonien, die Kampfhandlungen in der Türkei, der Gaskrieg, der Luftkrieg, 507.

gas attacks. They were to remain calm whether the gas was blowing towards or away from them, quickly and confidently donning their gas masks and holding their ground. By 1916, these orders were delivered by the regimental gas officers who received formal training in week-long gas courses held at gas schools back in Germany.[437] In these gas schools, gas officers were taught about the chemical nature of the various weaponized gases, correct tactics for troops under gas, and how to drill soldiers to better resist gas attacks. When they had returned to their companies, gas officers would conduct monthly lectures regarding new developments in chemical warfare or new tactical strategies for resistance. They would also regularly order the men to exercise or sing in their gas masks to familiarize them with the strenuous nature of life under the mask.[438] Ernst Jünger served as one such gas officer, finding great satisfaction in calculating the speeds of gas clouds and surprising his men with gas drills.[439] During these drills, the gas officer would enter a trench dugout and scream "Gas!", at which point all the men had to drop what they were doing (or wake up) and put on their gas masks. Men were expected to be able to don their gas masks in about fifteen seconds while holding their breath.[440] Slow soldiers would be proclaimed dead and admonished for their poor performance.

Regular strenuous drilling did not make gas officers popular with the enlisted men. This lack of popularity was compounded by the amount of work required of gas officers, leading some to expressed dissatisfaction with their position. The sergeant Reinhardt Lewald wrote that "the post brings a lot of work with it, as you have to check the regiment's gas protection equipment daily. You have ride and run around a lot and then record all of the results."[441]

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[437] Hermann Knaüer Tagebuch (DTA) 1221.1
[438] Ludwig Steinmetz Kriegstagebuch 1918 (DTA) 402,3 ; Theo Schütter, Feldpostbriefe Kriegstagebuch 1914-1918, 94, 136. ; Albrecht Dorn, *Kriegstagebuch der 6. Kompagnie 18. Rgl. Sächs.Inf.Regt. Nr. 192*, 31.
[439] Helmuth Kiesel, ed, *Ernst Jünger Kriegstagebuch 1914-1918*, 49.
[440] Anhaltspunkte fur die Prufung des Standes der Ausbildung in der Gasabwehr bei Besichtigungen Ubungen usw (BA-MA) RH/11/IV Sig 9 ort 22 Mag H3EG Reihe 124 Regal 1 Gefach 6
[441] Reinhardt Lewald Kriegstagebuch 1914-1918 (DTA) Sig 3502.1

Hermann Boeddinghaus complained, “Today I've checked the fit of the gas mask for all the men in the regiment. This is now my new job. This gas service is quite stupid, but it’s just a so-called necessary job.”[442] One of the more loathsome duties was the requisition or building of gas chambers. The gas officers would either create small airtight shacks or demand troop dugouts in which they could pump tear gas. When requisitioning a dugout, the gas officers often met strong resistance from the men who preferred to keep their quarters gas-free.[443] Once the gas officer had found a suitable gas chamber, he would order the men to don their gas masks and enter the room. When inside, the men would perform mild exercise for ten minutes to test the effectiveness of their masks.[444] Expressing their discomfort with this drill, soldiers call it the *Stinkkurs* (or stink course), while the gas chamber was the *Stinkbude* (or stink shack).[445] Infantryman Richard Dehmel wrote caustically:

> Around noon, the gas officer of the army command came by and confused us brave soldiers with highly distressing questions. Of course, he found fault with all sorts of things, otherwise his arrival would have been pointless. Finally, the “holy man” issued a harsh command that from now on gas drills had to be performed regularly on the front lines, even if accidents might occur.[446]

These new and more frequent drills were a result of the KWI’s belief that the most disciplined army would best be able to resist the chemical weapons that they had first unleashed. Once it was clear that the chlorine cylinders would not win the war for Germany, Fritz Haber argued that he simply needed more time to produce a definitive chemical weapon. An extension of the war required that German soldiers successfully resist gas cylinder attacks through personal determination and the correct use of the gas mask. Thus, while commanders and scientists felt

[442] Ingrid von der Dollen, ed. *Briefe an die Eltern von Hermann Boeddinghaus 1898-1941*, from August 11, 1918.
[443] Wilhelm Wittekindt "Meine Kriegserlebnisse 1916-1918 (DTA) 1229.
[444] Ibid. See also: Die Kriegstagebücher des Sebastian Heinlein, 11 Juli 1916 (IZS) N04.3-6
[445] Theodor Imme, *Die deutsche Soldatensprache der Gegenwart und ihr Humor*, 117.
[446] Richard Dehmel, *Zwischen Volk und Menschheit: Kriegstagebuch von Richard Dehmel*, 424.

that the gas mask provided ample protection against chlorine and phosgene gas, survival still required the cooperation of a human element. As the gas mask manufacturer Bernhard Dräger put it, "Half-understood or unorganized respiratory protection is worth less than none; it is incredibly dangerous. The best respirator cannot change that because its proper application depends on the human being."[447]

The demand for gas discipline was also part of a larger change in German tactics that followed the massive loss of life at Verdun and the Somme. In late 1916, German tacticians wrote both the "Principles of Field Construction" and the "Principles of Command in the Defensive Battle in Position Warfare."[448] As part of these larger tactical manuals, the "Infantry Training Guidelines" stressed the need to quickly train front-line soldiers in the new ways of warfare. The guidelines favored what they called "combat training," meaning that soldiers would receive their training through exposure to frontline battle. German tacticians argued that this would instill personal discipline and force soldiers to continue fighting even under extreme fatigue.[449] When put in mortal situations, soldiers would have no choice but to continue their struggle even without an officer's orders, relying solely on themselves and their comrades. After a certain amount of time at the front, soldiers could then be cycled back behind the lines for more formalized drilling. Historian Michael Geyer described this as "the development of a military practice in which the conscripted soldier is remade into an instinctive warrior, if we understand that 'instinct' is a complex artifact that combines discipline, skills, and experience."[450]

[447] Dräger-Vorträge: Atemschutz Wiederbelebung, 7.
[448] See: Michael Geyer, "German Strategy in the Age of Machine Warfare, 1914-1945." In *Makers of Modern Strategy*, edited by Peter Paret, 2nd ed., 527–97 (Princeton: Princeton University Press, 1986)
[449] Michael Geyer, "How the Germans Learned to Wage War: On the Question of Killing in the First and Second World Wars" in *Between Mass Death and Individual Loss: The Place of the Dead in Twentieth-Century Germany*, 32
[450] Ibid, 33.

These new tactical manuals further stressed the re-mobilization of the Western Front. To achieve this, they argued that German units should no longer hold a line, but control the battlefield through small counterstriking encounters that employed new military technologies like gas.[451] This, again, put great responsibility on small groups of Stormtroopers, who would now act independently on the battlefield. Commander resistance to this loss of hierarchical control delayed the adoption of these new tactics, but with dwindling manpower and supplies in 1918, the Germans began to implement these new measures with surprising success. While the Germans could not match Allied offensive firepower, they put up ferocious resistance in retreat. On the other hand, stranding men in deadly warzones created extreme amounts of mental stress. Continuous gas alarms stretched soldiers' nerves to the breaking point and even the slightest whiff of gas led to regular panic.[452] Most men could not handle this form of fighting, and desertion and trauma cases spiked.[453] In order to urge their soldiers, the German military increased its emphasis on the sacredness of *Heldentot,* or a hero's death.[454] This new stage of brutal warfare would be a test of manhood and martiality in the defense of the homeland. Those few men, like Ernst Jünger, who could withstand and sometimes even thrive in this style of warfare became the first of a new type of mobile soldier.

Physical and psychological resistance to chemical weapons was a necessary requirement for this new man. Changes in gas shelling tactics and a newly mobile battlefield meant that men

[451] Matthias Strohn, *The German Army and the Defense of the Reich*, 60-61.
[452] Ben Shephard, *A War of Nerves: Soldiers and Psychiatrists in the Twentieth Century*, 64-65.
[453] Michael Geyer, "How the Germans Learned to Wage War: On the Question of Killing in the First and Second World Wars" in *Between Mass Death and Individual Loss: The Place of the Dead in Twentieth-Century Germany*, 37.
[454] Brian K. Feltman, *The Stigma of Surrender: German Prisoners, British Captors, and Manhood in the Great War and Beyond*, 21.

could be sitting amidst gas for hours, days, or weeks on end.[455] On July 20, 1918, Infantryman Konstantin Kraatz wrote, "We are bombarded with gas grenades every day. Nevertheless, we have no losses. There is no sleep, food is not available. From this terrible situation, we come out in the evening at 23 o'clock."[456] This life among gas required that men either be continuously prepared for a gas attack or that they permanently wear their gas masks. Reflecting on this situation, Carl Zuckmayer wrote:

> A man in the front-line trenches has a peculiar way of sleeping … he sleeps with 'all his senses,' like an animal whose complete relaxation is not ruffled by reflexes from his blacked-out consciousness … A thin, shrill whistle rapidly swelling to an unbearable pitch, suddenly followed by the dull blast of an explosion. The man springs with both feet from his bunk; his left hand darts for his gas mask, while his right hand snatches his rifle from the wall.[457]

By 1918, the gas mask was no longer just a part of every soldier's immediate tools, but in many ways, it was so ever-present that it became part of the new soldier's unconscious body.[458]

On the other hand, soldiers who failed to meet the demand for constant preparedness and alertness often began to redefine the gas mask. Fritz Ebeling described a scene in which men lost faith in the technological salvation of their masks: "The units break apart and the scattered divisions are not found again in the darkness. The failure of the officers and NCOs adds to the confusion. The onward march is delayed since advancing with gas masks is cumbersome. Some men take off the mask and get sick on the gas."[459] German gas masks increasingly failed in 1918 due to material shortages, further eroding soldier trust in the devices. Some men chose to

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[455] Reichsbund Juedischer Frontsoldaten E.D., *Gefallene Deutsche Juden Frontbriefe 1914-18*, 58. ; Franz Josef Strauss, ed, *Kriegsbriefe gefallener Deutscher Juden*, 58-59. ; "Die Schlacht an der Somme im Monat Juli: Erster Teil," *Militär Wochenblatt* no 39 (1916), 866.
[456] Konstantin Kraatz, Kriegstagebuch 1916-1919 (DTA) Reg 506 Sig 429
[457] Carl Zuckmayer, *Second Wind,* 45
[458] Helmuth Kiesel, ed, *Ernst Jünger Kriegstagebuch 1914-1918,* 135. After being wounded, Ernst Jünger wrote in his diary that all his gear had been taken except for his steel helmet and canteen. He was particularly perturbed by the fact that he no longer had his gas mask, as if it had been amputated from his body.
[459] Fritz Ebeling, *Geschichte des Infanterie Regiments Herzog Friedrich Wilhelm von Braunschweig Nr 78 im Weltkriege*, 161.

intentionally breathe small amounts of gas or to wipe mustard agent in their eyes rather than continue fighting. The gas itself now became a strange ally in the hope that it might earn a man several days in a field hospital.[460] Expressing sentiments of defeat under a week-long gas attack, Carl Zuckmayer wrote, "When daylight came, our fate seemed sealed, but by then I was indifferent to everything...my instinct for self-defense was fading out. I wanted only to sleep. To cease to be. I wanted extinction."[461]

While gas-disciplined veterans often survived gas attacks in 1916 and 1917, the attacks of 1918 claimed men with various levels of battlefield experience.[462] It was not exclusively battlefield knowledge that could save a man in the chemical war of 1918, but rather an acceptance of a world in which fresh air could no longer be taken for granted. In this new world, every place and moment was potentially steeped with deadly poison. As one German gas officer wrote, "The troops were trained to breath under the mask for a short time, but they were not trained to 'live' under the mask, as the war required."[463] The men who could survive best in this environment embraced the gas mask as part of their physical body, thus becoming the first true "chemical subjects" and accepting the chemically precarious nature of life amidst modern warfare. It is not surprising that these new soldiering bodies were often described as supple, lean, and machine-like.[464] Rudolf Hanslian described the culling process that helped to identify such soldiers:

> Chemical weapons placed the highest requirement on the morale and intelligence of the soldier…it separated the wheat from the chafe, the men that maintained gas discipline and accomplished their combat mission from the inferior masses that collapsed mentally

[460] "Literatur, Kriegserfahrungen, Auslandsnachrichten." (BA-MA) RH/12/4. ; Robert Sauter, ed, *Ich setze mich nieder und schreibe. Gregor: Eine Lebensgeschichte zum Ersten Weltkrieg*, 266.
[461] Carl Zuckmayer, *A Part of Myself,* 163.
[462] Fritz Rider, Mit 18 als Freiwilliger an die Front" 1916-1918 (DTA) Sig 3973 Reg 3973. Letter from January 2, 1918. ; Karl Minning Kriegstagebuch von 1916 (DTA) Reg 53 Sig 61
[463] Kriegserfahrungen im Gasschutz 1919 (BA-MA) PH 14/230 LSFN 4875F
[464] Joanna Bourke, "The Body in Modern Warfare: Myth and Meaning 1914-1945", 203-204.

and gave up. Thus, the gas narrowed the circle of people who could survive in a modern struggle into a very special group.[465]

The Pale Horse and the Death's Head: The Significance of Gas Warfare in World War I

Monographs surveying World War I often discuss poison gas use in small sections that deal with the technological changes that occurred throughout the war. This is often justified by the fact that only a small percentage of war casualties (under 5%) were caused by gas. However, some historians admit that gas should not be evaluated by its military effectiveness, but rather by its psychological impact.[466] While this is certainly true, the psychological (let alone embodied) changes that gas produced throughout the war cannot given justice in several paragraphs.[467] Gas was unique from other new military technologies in World War I since soldiers feared artillery and gas more than any other weapons.[468] Highlighting the difference between artillery and gas, Tim Cook asserts that soldiers could bring themselves to sleep through bombardments but not gas attacks. He writes, "Gas destroyed the idea of chance, and that was its terrifying nature. There is a considerable difference between crawling on a trench floor or advancing under fire and praying that a shell or bullet does not get you, as opposed to simply waiting for a death cloud to pass with certainty over you."[469] When the German military employed gas, most soldiers were able to distance

[465] Rudolf Hanslian, *Der chemische Krieg,* 200.
[466] Jörn Leonhard, *Pandora's Box: A History of the First World War*, 265-266. See also: Alexander Watson, *Enduring the Great War: Combat, Morale and Collapse in the German and British Armies, 1914-1918*, 33.
[467] Historian Joanna Bourke cites a clinical study in claiming that a weapon's psychological impact outweighs its military efficacy. Bourke writes: "A report titled 'The Moral Effect of Weapons' (1943) investigated the reactions of three hundred wounded American and British servicemen in North Africa to various weapons. The researchers discovered that there was no correlation between the tendency of these men to fear a weapon and the likelihood of being wounded by it…These men's fears were not 'rational.' Instead, weapons were feared most strongly if the combatant believed that the enemy had an advantage in the use of that weapon. It was the feeling of 'inequality'—often described as 'injustice' by the men—which was at the heart of fear. When they were asked why they were afraid of a particular weapon, the 'inability to retaliate,' the 'feeling of vulnerability' and the 'speed and surprise of the attack' were all as important as 'effectiveness' or 'accuracy.'" Joanna Bourke, *Fear: A Cultural History*, 210.
[468] Denis Winter, *Death's Men,* 121-125.
[469] Tim Cook, "Creating the Faith: The Canadian Gas Services in the First World War", 779.

themselves from the decision-making and implementation carried out by commanders, engineer corps, and artillerymen. Men in the trenches could justify their army's use of gas based on the idea that it was just retribution for Allied violence or mere the reality of war. However, when the Allies employed gas against the Germans, soldiers often lost all conception of themselves as perpetrators, viewing themselves solely as helpless victims. Even the gas pioneer Otto Hahn admitted as much, writing, "Anyway, our enemies had now adopted our methods [of gas warfare], and as they became increasingly successful in this mode of warfare we were no longer exclusively the aggressors, but found ourselves more and more at the receiving end."[470]

As philosopher Peter Sloterdijk has correctly pointed out, chemical weapons had the unique aim of poisoning the enemy's entire atmospheric environment—air, soil, water.[471] Gas could usurp life-preserving air and turn it into inescapable death, creeping undetected into the most intimate spaces.[472] Thus, gas threw all previous conceptions of the rules of war into question. The all-encompassing and unruly nature of gas forced soldiers to reconsider their own agency in warfare.[473] Literary scholar Samuel Hynes writes:

> The minds of the fighting men changed. The new soldiers came to war believing that individual wills would have a role there, that what a man did—his decisions, his actions—would affect whether he lived or died. [Gas] made death accidental. It wasn't the violence of the power or the cruelty of those weapons that made the war different; it was the vast randomness and anonymity of their ways of killing.[474]

The blurring of both fear and anxiety further altered World War I soldiers' psyches. Historian Joanna Bourke maintains that fear is directed towards a distinct and objective threat,

[470] William R. Shea, *Otto Hahn and the Rise of Nuclear Physics*, 170.
[471] John Keegan, *The Face of Battle: A Study of Agincourt, Waterloo, and the Somme*, 307-308.
[472] Margot Norris, *Writing War in the Twentieth Century*, 19. The German soldier Georg Bruchmüller writes of men who attempted to seal the cracks in the walls of their trench to keep out gas. The gas pushed through the sealed cracks and penetrated their gas masks, asphyxiating them in their quarters. Georg Bruchmüller, *Die Artillerie beim Angriff im Stellungskrieg*, 166.
[473] W.M.K. Pfeiler, *War and the German Mind*, 79. ; Santanu Das, "'An ecstasy of fumbling': Gas warfare, 1914-18 and the Uses of Affect", 398.
[474] Samuel Hynes, *The Soldiers' Tale*, 56.

while anxiety is part of the anticipation of an unknown danger.[475] The visible chlorine clouds at Ypres produced fear, but night attacks, invisible gases, and gas shells all heightened anxieties over imminent attack. The infantryman Ludwig Steinmetz wrote, "Of course we are afraid of the gas at night, especially since our artillery is supposed to gas Armentiers again. All of our company has become quite nervous and completely disorganized."[476] Constantin Schneider echoed this sentiment, writing, "Last autumn, someone told us of the use of completely odorless gases that drowned men who never even knew that they had been gassed in just a few hours. Such news, of course, hastened to accelerate the onset of panic."[477] Constant anxiety manifested itself in dreams and hallucinations of gas. Schneider continued, "Suddenly a panic started up before the threat of a gas attack. Each man soon had hallucinations. He saw the hoses through which the gas should flow as well as all the precautions the enemy had taken for the gas attack."[478]

This lack of individual control over gas warfare manifested itself in the metaphors that soldiers chose to describe their fear and anxiety. Scholar Mary R. Habeck has argued that soldiers described warfare technologies using either supernatural (monstrous or demonic), subhuman (machine-like, or force of nature), or human (bodily, anthropomorphic, or animalistic) metaphors. Supernatural metaphors were most commonly used for technologies over which men had no control, while subhuman expressed some level of control, and human metaphors near total control.[479] As the memoirs and diaries in this chapter have shown, gas was usually described in supernatural, often spectral, terms. By 1918, it was the figure of death on his horse, come to reap wild and aimless. Using such spectral language, the soldier Franz Schauwecker

[475] Joanna Bourke, *Fear: A Cultural History*, 188-189.
[476] Ludwig Steinmetz Kriegstagebuch 1918 (DTA) 402,3
[477] Oskar Dohle, ed, *Constantin Schneider: Die Kriegserinnerungen 1914-1919*, 439.
[478] Ibid, 381. See also: Helmuth Kiesel, ed, *Ernst Jünger Kriegstagebuch 1914-1918*, 162.
[479] Mary R. Habeck, "Technology in the First World War The View From Below", 102. See also: Julia Encke, *Augenblicke der Gefahr: Der Krieg und die Sinne. 1914-1934*, 197-218.

wrote that, "gas in its eerie silence and ghostly cloudiness smothered our courage like cloth."[480] The supposed supernatural powers of gas similarly raised questions about divine presence and human fate. In March 1918, a Catholic field vicar wrote that "the difficulties of poison gas and static trench warfare…posed a conceptual stumbling block to notions of discernible divine favor through quick victory."[481]

Contrasting passages most frequently came from soldiers in technical specialties (e.g. gas services, artillery, engineering corps) who could appreciate these deadly technologies for their own sake.[482] For instance, the gas officer Ernst Jünger often thought in scientific terms, writing, "Now I got my first mouth full of gas. Aha! Chlorine! One breath was enough to bring back memories of the physics lessons of yesteryear, so mask on!"[483] Varying levels of technological trust are even better demonstrated in passages detailing the gas mask. For the mask was even closer to the soldier's body, and was thus, more vividly described through sensorial language.

The historian Eric Leed and the literary scholar Santanu Das have enumerated the importance of embodied language for understanding soldier writings. Leed writes, "The impact of the war upon the human sensorium of combatants is the point where one must begin to understand the necessity of illusion, fantasy, and myth."[484] In this case, mediated written language expressed the changing bodily experience with the gas mask from 1915 to 1918 and revealed the ways in which the mask conspired to discipline the soldier's body for chemical warfare. While the mask was essential to survival (and it did in fact save many lives) it was also a constant physical and mental burden. It was always at a soldier's side or neck, constantly hugging

[480] Franz Schauwecker, *So war der Krieg*, 25.
[481] Patrick J. Houlihan, *Catholicism and the Great War: Religion and Everyday Life in Germany and Austria-Hungary, 1914-1922*, 57.
[482] Mary R. Habeck, "Technology in the First World War The View From Below", 118.
[483] Helmuth Kiesel, ed, *Ernst Jünger Kriegstagebuch 1914-1918*, 135.
[484] Eric J. Leed, *No Man's Land: Combat and Identity in World War I*, 117 ; see also: Santanu Das, *Touch and Intimacy in First World War Literature*, 23.

his body and reminding him of an ever-present danger.[485] For the men who could endure this, the mask simply became part of their own bodies, retaining humanistic metaphors (as a wife or cousin) or described in strictly technological terms.[486]

Far more men could not withstand the strict discipline of the mask and most did not survive the war unscathed. Reflecting on the importance of the gas mask to soldier interpretations of chemical warfare, the gas specialist Rudolf Hanslian wrote:

> The soldier's emotional impressions of gas were much less due to the novelty or sensation of the gas itself, than to the feeling of a lack of adequate gas protection. If we ignore isolated cases in the war, where men without any gas protection devices courageously endured deadly gas attacks, then the mental collapse [of 1918] was of course the most frequent everywhere where gas masks were missing or failed.[487]

In these harrowing life-or-death situations, the mask was not merely a technological device, nor was it a pig snout, monkey face, muzzle, carnival veil, or bug eyes. Soldiers rather perceived the gas mask as a death's head, an omen of what was inevitably to come.[488] While normally expressly resistant to the supernatural metaphors of warfare technology, Ernst Jünger's diary expresses one moment in which the gas mask was corporally redefined:

> A pungent stench from behind tempted me to enter the forest. There I found some Indians who we had killed on the first night. I ordered the men to continue searching and we found a whole row of them, too horrid to behold. The sounds of decay emitted from their dead bodies and a sallow head looked out at me in the dark with ghostly outstretched hands. I took off its gas mask, still warm from the rot.[489]

Junger's momentary insight was not singular. An article from the 1936 Swiss military journal *Protar* pointed out that "When the first gas attacks of the Great War took place, the

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[485] For a contemporary study of this phenomenon see: Kenneth T. MacLeisch, "Armor and Anesthesia: Exposure, Feeling, and the Soldier's Body." *Med Anthropol Q.* 26, no 1 (March 2012): 49-68.
[486] Susan Buck-Morss describes these highly disciplined and unfeeling bodies as "anesthetic" subjects. Susan Buck-Morss, "Aesthetics and Anaesthetics: Walter Benjamin's Artwork Essay Reconsidered", 33.
[487] Rudolf Hanslian, *Der chemische Krieg,* 200.
[488] This image is reinforced in Hermann Hesse's famous 1927 novel *Steppenwolf:* "I remembered those terrible photographs from the Front that one saw occasionally during the war—those heaps of bodies entangled with each other, whose faces were changed to grinning ghouls by their gas masks." Hermann Hesse, *Steppenwolf,* 196.
[489] Helmuth Kiesel, ed, Ernst Jünger Kriegstagebuch 1914-1918, 271.

soldiers were in terrible terror and helpless against this dreadful new weapon [the gas mask]…gas masks appeared as horrible, scary-looking devices that appeared to many as the symbol of all the horrors of the modern age."[490]

[490] J.P., "Die erste Gasmaske," 200.

CHAPTER 4: THE LIMITS OF SYMPATHY: THE MEDICAL TREATMENT OF GAS DURING AND AFTER WORLD WAR I

After dropping out of medical school in 1913, the expressionist poet Johannes Becher joined several communist organizations and actively spoke out against the stated German war aims of World War I. As part of his anti-nationalist and anti-capitalist activism, Becher published the novel (*CHCI = CH*)*3* (*Lewisite*) in 1926. Utilizing experimental modernist literary techniques, the book condemned the saber rattling of the First World War through a series of loose vignettes, fictional newspaper reports, and other media of the modern cityscape. Like many communists, Becher saw war as a product of modern capitalism, claiming that the conflict's technological arms race only served to line the pockets of German industrialists. As such, he inculpated all those associated with German science and industry in the oppression of the working classes. This included German doctors, who he saw as the anesthetists of the modern affliction. In describing the role of the military hospital, Becher wrote:

> In the soldier's language, the military hospital was called the "poison scales" and it mainly housed gas-sick men. There was also a separate lunatic asylum, but the patients in the two wards did not differ significantly, especially the paralytics and the stutterers. It was the devastation of their nervous system during the war that triggered the paralytic attack. Remissions rarely occurred due to the adverse nature of the condition and the inept treatment. Thus, they flowed into the graves like waterfalls.[491]

Inspired by his personal struggles with drug use, Becher further wrote that the doctors carelessly "splashed" their patients down with morphine and cocaine to both dull their pain and make them more pliable.[492]

Today, Becher's novel is largely considered unsuccessful due to both its lack of popularity and its often ham-fisted literary techniques. However, the book's prosaic

[491] Johannes Becher, (CHCl=CH)3As (Levisite) oder Der einzig gerechte Krieg, 45.
[492] Ibid, 45, 146-147.

disappointments were the least of Becher's concern, as its publication resulted in his 1926 indictment for "literary high treason" against the Weimar Republic. While Becher's novel remains an unapproachable and highly stilted read, its reproach of the medical profession in World War I is rather unique. In particular, its focus on both the treatment of gas-sick men and the handling of neuroses speaks to an understudied history of the medical treatment of gassed World War I soldiers and veterans.

Recent historical scholarship has succeeded in revealing the role of medicine in shaping the public perception of World War I. Eric J. Leed and Robert Whalen provided early historical examinations of psychological and psychoanalytical interpretations of soldier trauma.[493] Moving these themes into the German national context, historians Wolfgang Eckart, Andreas Killen, Jason Crouthamel, Heather Perry, and Paul Lerner have all explored the specific German methods of treatment and the political contestations over the nature of war wounds and disability.[494] While Eckart has uncovered much of the historical narrative surrounding general medical treatment in the First World War, Killen and Crouthamel have recounted the political debates surrounding the diagnoses of *Kriegsneurotiker* (or war neurotics).[495] In focusing on orthopedics and the boom in prosthetic design after the war, Perry has revealed the ways in which larger medical bureaucracies mediated the relationships between medical professionals

[493] See: Eric J. Leed, *No Man's Land: Combat and Identity in World War I* (Cambridge: Cambridge University Press, 1979) ; Robert Weldon Whalen, *Bitter Wounds: German Victims of the Great War, 1914-1939* (Ithaca: Cornell University Press, 1984)

[494] For a collection of essays dealing with medicine and trauma in World War I Germany see: Hans-Georg Hofer, Cay-Rüdiger Prüll and Wolfgang U. Eckart, eds., *War Trauma and Medicine in Germany and Central Europe (1914-1939)* (Freiburg: Centaurus Verlag, 2011)

[495] See: Wolfgang Eckart, *Medizin und Krieg: Deutschland 1914 – 1924* (Paderborn: Frerdinand Schöningh, 2014) ; Andreas Killen, *Berlin Electropolis: Shock, Nerves, and German Modernity* (Berkeley, University of California Press, 2006) ; Jason Crouthamel, *The Great War and German Memory: Society, Politics and Psychological Trauma, 1914*-1945 (Exeter: University of Exeter Press, 2009) ; Jason Crouthamel and Peter Leese, eds., *Psychological Trauma and the Legacies of the First World War* (London: Palgrave Macmillan, 2017)

and their patients. This fostered the broadly-held belief among doctors that the disabled body could be successfully reintroduced into German society as a productive subject.[496]

Most germane to this study, Paul Lerner's work has provided a specific historical dispute as the locus for the political contestations surrounding the nature of warfare medicine and the treatment of wounded German soldiers. Focusing in on the professional debate between the psychologists Hermann Oppenheim and Robert Gaupp, Lerner argues that, "The question of whether to diagnose war neurotics with hysteria or traumatic neurosis became the greatest controversy in German mental medicine during the war, reaching its climax at the 1916 'War Congress' in Munich."[497] Done largely to reduce pressure on the German pension system, the majority of psychologists, according to Lerner, supported Gaupp in insisting that war hysteria was due to patient predisposition rather than wartime trauma.[498] In turn, the medical profession discarded Oppenheim's belief in traumatic neuroses and labeled both the doctor and his neurotic patients as anti-German, socialistic, and effeminate.[499]

A similar process occurred for those soldiers who had been poisoned by gas. As a central feature of the new *Materialschlacht* (or war of materials), the nearly 80,000 German men who reported gas exposure throughout the war presented medical professionals with previously unseen injuries and deaths.[500] As Wolfgang Eckart has pointed out, the development of gas was intrinsically tied to the attempts to heal or protect against its effects and the real sympathy that

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[496] Heather R. Perry, Recycling the Disabled: Army, Medicine, and Modernity in WWI Germany, 24. For a comparative study that makes clear the distinct concern for work and production in the German case, see: Deborah Cohen, The War Come Home: Disabled Veterans in Britain and Germany, 1914- 1939 (Los Angeles: University of California Press, 2001).

[497] Paul Lerner, "From Traumatic Neurosis to Male Hysteria: The Decline and Fall of Hermann Oppenheim, 1889-1919", in *Traumatic Pasts: History, Psychiatry, and Trauma in the Modern Age, 1870-1930*, 157.

[498] Ibid, 153.

[499] Paul Lerner, Hysterical Men: War, Psychiatry, and the Politics of Trauma in Germany, 1890-1930, 85.

[500] Field hospitals treated approximately 69,212 gas cases. Literatur, Kriegserfahrungen, Auslandsnachrichten. RH/12/4 sig 41 ort22 Mag H3EG Reihe 125 regal2 gefach 2

these injuries elicited.[501] However, with little prior knowledge of Fritz Haber's new chemical weapons, overtaxed doctors and nurses could do very little to treat the countless different symptoms that presented themselves. Consequently, army hospitals became sites of medical experiment and testing, often exciting those doctors who saw gas warfare as a new frontier for medical fields like pulmonology, cardiology, and toxicology. Beyond the physiological symptoms of gas exposure, gassed soldiers increasingly displayed what was termed "gas neurosis." As a subgroup of war neurotics, these men faced similar censure for their inability to cope with the mental stresses of modern warfare. However, the uniqueness of gas warfare significantly altered the medical discussion surrounding these cases. According to German doctors, the cause of gas neurosis was not just weak nerves or a fragile psychological makeup, but also the incapacity to internalize gas discipline. Due to their regular inability to treat new gas symptoms, doctors increasingly relied on the effectiveness of the gas mask as a disclaimer for their own medical failures. The reliance on individual composure and internalized self-control created a distinct discourse surrounding poison gas that then entered wider Weimar society as both a normalized condemnation of the failures of gassed veterans, and as a reassertion of the importance of gas discipline for a national public that remained concerned with large-scale chemical attacks on civilian population centers.

Overburdened and Underprepared: Treating Gassed Soldiers in World War I

Prior to the outbreak of war, the German scientific world maintained significant knowledge of the pharmacological effects of chlorine and phosgene gas. Much of this knowledge was derived from the study of industrial accidents at the major chemical companies' production

[501] Wolfgang Eckart, Medizin und Krieg: Deutschland 1914-1924, 77.

facilities. This was supplemented by animal experiments conducted in the late 19th century by firms like Bayer and BASF.[502] Through such testing, scientists were able to record both the lethal doses for such gases and their physiological effects. However, much of this knowledge remained strictly within the realm of the chemical industry since there was no assumption that large numbers of people would ever be exposed to such gas.[503] Consequently, most German physicians knew little about the chemical companies' medical research and had no familiarity with treating poison gas exposure.

While information on poison gas was eventually funneled through Fritz Haber's Kaiser Wilhelm Institute, the 8,986 German medical doctors mobilized for military service had scarce knowledge of what they were about to face.[504] After the Second Battle of Ypres, frontline doctors were presented with hundreds of men with blue eyes, shortness of breath, chest pain, headache, and bloody expectoration.[505] In April and May of 1915, the field hospitals treated about 200 Germans who complained of gas sickness.[506] These same hospitals maintained several Dräger Pulmotors for this their subsequent treatment. Pulmotors were large apparatuses that could pump air into a small breathing mask. Masks were affixed to afflicted soldiers and often left on for hours at a time. Unfortunately, military doctors did not have enough Pulmotors or oxygen tanks for all of the gas-sick in the spring of 1915.[507] Some men were expected to share Pulmotors, while others were simply placed in a well-ventilated area and told to breathe deeply.

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[502] Kranken Arztenwesen Korperbeschadigte 1915- (BA) 231.012 ; Kranken Arztewesen 1915- (BA) 231-010

[503] The German mining industry was also collecting limited knowledge about the physiological effects of poison gas.

[504] Niko Amend. "Die Sanitätsdienstliche Versorgung Der Gasversehrten Deutschen Soldaten Des Ersten Weltkrieges", 106.

[505] Richard Dehmel, Zwischen Volk und Menschheit: Kriegstagebuch von Richard Dehmel, 424-426.

[506] Literatur, Kriegserfahrungen, Auslandsnachrichten, 1934-36 (BA-MA) RH/12/4 sig 41 ort22 Mag H3EG Reihe 125 regal2 gefach 2

[507] Verwaltungsunterlagen 1917-1918 (LBWK) 456 F 114, 111

Beyond supplying men with the available oxygen, doctors had little notion of subsequent treatment. In desperation, they often gave the men adrenaline or other asthma medications, assuming that the gas induced bronchial muscle cramping.[508] Others administered tetanus shots and intravenous salicylic acid.[509] Still more even attempted to bleed the soldiers, hoping that they could improve oxygen circulation by draining the veins and/or lymph nodes of the poison.[510] In fact, many frontline doctors did not believe that the Pulmotors' provision of oxygen helped gassed men, and they preferred bloodletting and ammonia treatments.[511] The medic Theodor Zuhöne wrote of the desperate situation, "Among our gas patients, we have a lot of serious cases. That's why I have a lot of work to do: oxygen inhalations, intravenous injections, bloodletting."[512]

Further complicating any form of treatment, doctors also struggled to diagnose gas-sick soldiers when they first arrived in the field hospital. Afflicted men presented varying internal symptoms including irritation of the mucous membrane, blood thickening, infection, and lung damage. These differing symptoms could reflect a given soldier's cardiac health, or the different amounts of gas swallowed and the varying time since exposure. Some men who had been lightly gassed could remain on the battlefield from a few hours to a few days, later coming into the hospital complaining of dizziness, shallow breathing, and/or headaches. On arrival, they were required to give an account of their gassing that could sufficiently convince doctors that this was

[508] Zur Kenntnis und Behandlung der Gasvergiftungen, 1917 (LBWH) M 635/1 Nr 963

[509] Tetanus shots and salicylic acid treatments produced favorable results since the antitoxin lowered fever and thinned mucus. Verwaltungsunterlagen 1917-1918 (LBWK) 456 F 114, 111

[510] Gasschutzwesen, Allg.u.Besonderes 1915-1918 (BK) Generalkommando I. Armee-Korps (BHK) 1276 ; K. und K. Kriegsministerium: Therapie der Kampfgasvergiftungen 1918 (MPG) Va 5 524 ; Jürgen Kessel, ed, *"Jezt gehts in die Männer mordende Schlacht..."Das Kriegstagebuch von Theodor Zuhöne 1914-191,* entry for 31.7.18.

[511] Field doctors' resistance to oxygen provision was also a regular resistance to the institutional intrusions of specialists like physiologists and toxicologists. Mark Harrison, *The Medical War,* 108.

[512] Jürgen Kessel, ed., "Jetzt gehts in die Männer mordende Schlacht..."Das Kriegstagebuch von Theodor Zuhöne 1914-1918, entry for 31.7.18.

not a case of malingering.[513] If their story was believed, these men would then be given a fresh bed and hot water heater (if available) and allowed to breathe fresh air for a few days. They might also receive schnapps to fight any coughing attacks and to "boost the spirits." However, other lightly gassed soldiers exhibited more serious symptoms. After falling asleep with his gas mask on, the infantryman Otto Mallebrein wrote:

> The following morning, I had chest pains when I breathed…After about two hours, the condition had not improved, so I moved with slow, small steps…to the medical dressing area. The doctor there explained that I was seriously ill and he forbade me from moving any further. However, then he allowed me to crawl back into my trench dugout. The dressing station had just lost several ambulance drivers and medics, so stretcher carriers were no longer available. So I was left to lie about for three days, gripping my gas mask in case of a new gas attack, only to be tormented by the louses, who didn't seem to be affected by the gas.[514]

While Mallebrein's gas inhalation appears serious, soldiers who breathed in a significant amount of gas immediately began to choke and writhe on the ground. Stretcher bearers were ordered to swiftly remove these men from the field so that they could be provided oxygen through an artificial respirator. Once in the field hospital, seriously ill soldiers were made to inhale alcohol to fight potentially deadly coughing attacks and given caffeine to stimulate cardiac activity before they were allowed to rest in the base hospital for three to four weeks.[515] A hospital report from 1916 stated that "All [gas] patients were initially conscious. Increasing weakness, little and irregular pulse, stinging on the chest, anxiety, severe coughing, spitting blood."[516] Regardless of any initial relief of symptoms, these seriously ill soldiers who made it to the medical tent frequently died two to three hours later as their lungs slowly dissolved. If they did indeed survive initial exposure, they then often experienced nausea, vomiting, general

[513] Mark Harrison, *The Medical War*, 109.
[514] Otto Mallebrein Mein Kriegstagebuch 1914-1918 (DTA) Sig 3814
[515] Zur Kenntnis und Behandlung der Gasvergiftungen, 1917 (LBWH) M 635/1 Nr 963
[516] Analgen zum Kriegstagebucher April 1916- Juni 1916 (LBWK) 456 F 50, 145

weakness, dizziness, and sometimes diarrhea; and required near constant medical attention (primarily from nurses). Two to three days later, the survivors again faced mortal danger, as pneumonia often set in.

Soldiers who breathed pure chlorine or phosgene gas tended to immediately asphyxiate in the field.[517] Even if they survived for half an hour to an hour, they often subsequently succumbed to cardiac arrest. According to first-hand medical reports, these men were difficult to behold, as their breathing could increase to 40, 60, or 70 breaths and their pulse to 160-180 beats per minute. Their face and body would puff up and slowly turn a mixture of blue and red, while their thorax and diaphragm would convulse as their lungs expanded with foamy yellowish fluid.[518] As fellow soldiers transformed into "slimy creatures," witnesses confronted the horrible sights of "white eyes writhing in his face" and "blood…gargling from the froth-corrupted lungs."[519]

Reflecting the lack of medical knowledge at the start of the chemical war, doctors only began to record gas-sickness in January of 1916. In military medical reports and monthly hospital records, doctors recorded gassed soldiers under No. 39 "Other Diseases." About 2,000 German men fell into this category in the first year of gas warfare.[520] As the war progressed, categorization continued to be a problem, as new gases presented vastly different symptoms. Even when doctors finally created a series of best practices for treating chlorine gas exposure, they were then confronted with the effects of phosgene, mustard gas, and Clark, among other battle gases. After receiving gas training and treating gas-sick soldiers on the front, the physician

[517] Anlagen- Englischer Gasangriff Juli 1 1917- September 30, 1918 (LBWH) M 411 Bd. 1276

[518] Zur Kenntnis und Behandlung der Gasvergiftungen, 1917 (LBWH) M 635/1 Nr 963 ; Vorschriften uber Gasschutz 1931-33 (BA-MA) RH/12/4 sig 57 ort 22 mah H3EG reihe 125 regal 2 Gefach 3

[519] Ben Shephard, *A War of Nerves*, 63.

[520] CO2 poisoning was also common during artillery bombardments, further complicating this medical categorization. Literatur, Kriegserfahrungen, Auslandsnachrichten. RH/12/4 sig 41 ort22 Mag H3EG Reihe 125 regal2 gefach 2

Hermann Büscher wrote, "When I was a battalion doctor on the Western Front…I helped the soldiers as best as I could. I was very uncertain about gas diseases, so that I often breathed a sigh of relief when the gas patients were taken away."[521]

Those soldiers who were exposed to gas and reported to the field hospital showing no physical symptoms were often the most difficult to diagnose. Doctors had little time to fully inspect these men, leaving nurses to closely observe them for 24 to 36 hours. Even the worst cases could take time to develop and gas-exposed men could begin to internally asphyxiate at any minute. On the other hand, the psychological fear of being gassed led some soldiers to overestimate their gas exposure, and these men would never experience any symptoms while under supervision.[522] Given the difficulty of categorization and the importance of time, the coordination of medical care was essential in the treatment of gas.[523] Even stretcher bearers and ambulance drivers were provided with some level of medical knowledge about gassed soldiers. By 1917, every company maintained a gas rescue squad comprised of one non-commissioned officers, two ambulance workers, and three substitutes. The NCO was further required to attend a gas course and familiarize himself with gas rescue procedures.[524]

Of course, as new gas protection protocol was created, the introduction of new gases led to a range of symptoms that produced new medical hurdles throughout the war. Phosgene gas produced effects that were most similar to chlorine, although it required less exposure to create serious injuries. Conjecture swirled around the nature of these pulmonary gas symptoms, leading

[521] Hermann Büscher, Grün- und Gelbkreuz: Spezielle Pathologie und Therapie der Körperschädigungen durch die chemischen Kampfstoffe der Grünkreuz- (Phosgen und Perchlorameisensäuremethylester [Perstoff]) und der Gelbkreuz-Gruppe (Dichloraethylsulfid und β-Chlorvinylarsindichlorid [Lewisit]), 8.
[522] Vorschriften uber Gasschutz 1931-33 (BA-MA) RH/12/4 sig 57 ort 22 mah H3EG reihe 125 regal 2 Gefach 3
[523] Hermann Büscher, Giftgas und wir?: Die Welt der Giftgase Wesen und Wirkung, Hilfe und Heilung, 8. ; Akademisches Wissenschaftliches Arbeitsamt, A.W.A. Gasschutz-Lehrgang, 48.
[524] Literatur, Kriegserfahrungen, Auslandsnachrichten. RH/12/4 sig 41 ort22 Mag H3EG Reihe 125 regal2 gefach 2

doctors to believe that phosgene and chlorine gassing regularly brought on colds, influenza, or even latent tuberculosis.[525] In fact, some medical professionals hypothesized that the influenza outbreak of 1917-1918 was a product of mass gas exposure rather than poor hygienic conditions. Blue cross gases (e.g. Clark I and II), on the other hand, irritated the nasal passages and caused vomiting. Its effects were temporary and non-lethal, but there were also reports of paralysis and the loss of "mental control."[526] Mustard gas required entirely different treatment. The mustard agent burned the lungs, skin, and eyes, creating painful blisters and potentially permanent blinding. The effects of the gas were usually felt two to three hours after exposure when men began sneezing, mucus dripped from their noses, their eyelids swelled, and their throat and skin began to burn. Mustard gas patients further experienced severe headaches, a rise in pulse rate and temperature, and red patches forming on the skin, eventually bubbling up into blisters over the course of twenty-four hours.[527] After these initial symptoms subsided, many soldiers subsequently developed pneumonia.

Medics and stretcher bearers were provided with rubberized suits in order to immediately treat men who had been exposed to mustard gas in the field.[528] The medics would first undress the afflicted soldiers and then carry them back to the field hospital for treatment. Any mustard agent remaining on an injured soldier brought the risk of contaminating the entire field hospital. Consequently, upon arrival at the hospital, orderlies and nurses would shear off soldiers' hair and bathe them with hot soap and water for thirty minutes in make-shift showers or tubs.[529] This was excruciatingly painful for men who had already formed skin blisters. Hospital workers then

[525] Knack, "Kampfgasvergiftungen," 1246.
[526] Edgar Jones, "Terror Weapons: The British Experience of Gas and Its Treatment in the First World War," 6.
[527] Denis Winter, Death's Men: Soldiers of the Great War, 122
[528] Mustard gas in sufficient quantities could, in fact, dissolve leather and rubber.
[529] Gerald Fitzgerald, "Chemical Warfare and Medical Response During World War I," 618.

washed the stripped clothing in boiling water and reissued it to healthy men due to material shortages.[530] If the soldier's eyes were exposed to the mustard agent, then they would receive an alkaline eye ointment and paraffin wax to keep their eyelids from gluing together.[531] Not much could be done for the lungs, but antiseptics helped ease coughing and menthol soothed the throat. All of this treatment required a significant amount of work from the field nurses assigned to gas injuries. Perhaps not surprisingly, nurses often described gas wounds as the most difficult to treat. Historian Christine Hallett writes, "Confronted with what they saw as these 'demonic' weapons of mass destruction, nurses expressed their sense of helplessness at how little they could do for their patients."[532]

In his wartime diary, Wilhelm Hartung found it particularly concerning that field hospital surgeons operated in gas masks.[533] All members of the German medical services received gas masks as basic protection against errant chemical attacks or secondary contamination. However, some medical pamphlets encouraged doctors not to put on their gas mask too quickly when doing rounds or operating so as not to frighten their patients.[534] As part of these protective measures, medical professionals were further encouraged to regularly powder their hands with lime, change their clothes, and thoroughly wash their bodies. Even when all these guidelines were carefully followed, hospital contamination remained a serious risk throughout the war. In fact, the slightest spot of mustard gas on a soldier's uniform could taint an entire field hospital. This became a particularly pressing issue in 1918, when both the Germans and the Allies began

[530] Literatur, Kriegserfahrungen, Auslandsnachrichten. RH/12/4 sig 41 ort22 Mag H3EG Reihe 125 regal2 gefach 2
[531] Robert Sauter, ed., Ich setze mich nieder und schreibe. Gregor: Eine Lebensgeschichte zum Ersten Weltkrieg, 277. ; See also: Fiona Reid, Medicine in First World War Europe: Soldiers, Medics, Pacifists, 78-79.
[532] Christine Hallett, *Containing Trauma: Nursing work in the First World War*, 59. ; See also: Henriette Riemann, *Schwester der Vierten Armee* (Berlin: Karl Boegels Verlag, 1930)
[533] Wilhelm Hartung, Großkampf Männer und Granaten!, 216
[534] Zur Kenntnis und Behandlung der Gasvergiftungen 1917 (LBWH) M 635/1 Nr 963.

to fire thousands of mustard gas shells at each other, leading to a chemically saturated battlefield and field hospital overcrowding. The sheer number of lightly gassed men led to the creation of subsidiary medical centers that specialized in gas treatment.[535]

Further Complications: Gas Neurosis

Alongside the wide range of physical gas injuries, soldiers also described certain symptoms that were most likely psychosomatic. One Doctor Knack wrote of men who complained of pain in their legs fourteen days after being gassed. Another soldier was reportedly unconscious for three days and when he awoke, he claimed that one of his legs was paralyzed and that he felt severe arm pains. Reflecting the confusing nature of these complaints, the perplexed doctor Knack wrote that, "The nature of the gas here is completely obscure to me."[536] Men further complained of nasal or lung irritation, even when they had not been exposed to gas. These kinds of cases were difficult to separate from those men who had been gassed but did not yet feel the symptoms as well as those soldiers who developed persistent nervous disorders.[537] The gas officer Reinhard Lewald described the troubling psychological effects of gas after an enemy artillery attack destroyed some nearby German gas cylinders. Lewald wrote, "Forty officers and six-hundred-forty-five men were killed. Hundreds wounded. The few who escaped have all suffered severe emotional shock from the indescribable confusion."[538] These gas-shocked men crowded the field hospitals, presenting symptoms that required psychological specialization that most front-line doctors did not possess. Many were allowed to rest for a few days and were then sent back to the front, regardless of their mental condition.

[535] Ben Shephard, *War of Nerves,* 64.
[536] Knack, "Kampfgasvergiftungen," 1246.
[537] Herstellung und Lieferung von Geschoss-Fullungen 1914- (BA) 201-005-002
[538] Reinhard Lewald, Kriegstagebuch 1914-1918 (DTA) Sig 3502.1

While the effects of poison gas on the body continually confounded medical professionals, the impact of gas on the mind was equally disturbing. In 1915, psychiatrists found no consensus on how to treat the increasing number of soldiers who displayed mental disorders after exposure to poison gas. Any previous medical experience with neuroses stemmed from treating those who had suffered industrial accidents prior to the war, but no medical professionals were prepared for the sheer number of psychiatric issues that weapons like artillery shells, tanks, and poison gas would ultimately create.[539] As historian Paul Lerner has revealed, it was only after a 1916 German Association for Psychiatry conference in Munich that the psychiatric field took a unified position on the diagnosis and treatment of war neuroses. In the wake of the conference, psychiatrists formally categorized war neuroses as a form of hysteria and began to prescribe a wide range of "active treatments" in their therapeutic endeavors.[540] By the end of the war, over 300,000 men (4% of all casualties) were treated for various nervous disorders.

A professor of psychiatry at the University of Tübingen, Dr. Robert Gaupp, was one of the leading psychiatrists recruited to treat the increasing number of German soldiers who displayed some form of war neurosis. Gaupp wrote of the wartime situation, "The immense advances in war machinery, the dreadful destructive force of modern artillery, the rolling barrages, the gas shells, the bombs from the air, the flame-throwers...have accounted for a greater

[539] Paul Lerner, "Psychiatry and the Casualties of War, 1914-18", 16. The historian Götz Aly writes of these men that: "The trauma of having experience artillery barrages, poison gas alarms, splintering grenades, and the deaths of their comrades gnawed at their psyches." Götz Aly, *Why the Germans? Why the Jews? Envy, Race Hatred, and the Prehistory of the Holocaust*, 107.

[540] Paul Lerner, "Psychiatry and the Casualties of War, 1914-18", 20. Psychoanalysts were also interested in war neuroses. Ernst Simmel (1882-1947) produced some of the most widely read psychoanalytic work on war trauma and neuroses. He argued that neuroses were a way of armoring the psyche against the horrible conditions of modern industrial warfare. He stressed that only hypnosis would allow doctors to understand the mental trauma of the war. See: Sandor Ferenczi, Karl Abraham, Ernst Jones, et al. *Psychoanalysis and the War Neurosis*, 32.

accumulation of violent symptoms of shock than has any other war."[541] Through his clinical work with these "gas shocked" men, Gaupp further noticed that many of them claimed to have swallowed imaginary gas or enacted the convulsions of gas poisoning.[542] Medical professionals subsequently termed these specific psychiatric responses to gas as "gas neurosis" or "gas hysteria."

When compared with traditional artillery shells and bullets, chemical weapons seemed to produce disproportionately high numbers of psychiatric issues due to the unique form of terror that they induced. After the war, soldiers routinely claimed that gas destroyed the idea of chance in wartime survival, penetrating all aspects of the soldier's environment and preventing escape or retaliation. Furthermore, the primal fear of asphyxiation routinely led to panic and mental stress. While shrapnel was statistically more dangerous throughout the war, soldiers felt that its dangers were more tangible; it could be seen entering a man's body and thus, it could theoretically be removed. For many men, the flesh wounds of World War I further aligned with previous expectations of war. Thus, many at least claimed that they would rather face the poor survival chances of going over the top of the trench rather than risk inhalation of a gas that could clandestinely creep inside of a man's body and eat its way out.[543] Even though traditional artillery shells had a much greater presence on the World War I battlefield until the final year of the war, it was precisely the psychological burdens of gas that impelled one soldier to state that "gas shock was as frequent as shell shock."[544]

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[541] Wolfgang Eckart, "War, Emotional Stress, and German Medicine," in Great War, Total War: Combat and Mobilization on the Western Front, 1914-1918, 140.
[542] Wolfang Eckart, "The Soldier's Body in Gas Warfare: Trauma, Illness, *Rentennot*, 1915-1933," in *One Hundred Years of Chemical Warfare: Research, Deployment, Consequences*, 220.
[543] Edgar Jones, "Terror Weapons: The British Experience of Gas and Its Treatment in the First World War," 13-14. ; Fiona Reid, *Medicine in First World War Europe: Soldiers, Medics, Pacifists*, 81.
[544] Edgar Jones, "Terror Weapons: The British Experience of Gas and Its Treatment in the First World War," 1. See also: Jeremy Paxman and Robert Harris, *A Higher Form of Killing: the Secret Story of Chemical and Biological Warfare*, 17

Soldiers often displayed the signs of gas neurosis soon after they realized that gas was present on the battlefield. Some manifested symptoms without coming into contact gas; merely the fear and anticipation of the gas elicited various physical signs such as: spasmodic dilation of the nostrils or opening of the mouth, convulsive movements of the throat muscles, gasping for breath, painful paralysis, grasping at the throat or face as if to remove a gas mask, attacks of delirium, permanent facial expressions of horror or anxiety, full body convulsions, and even unconsciousness. Once these gas-neurotic soldiers were brought to the field hospital, doctors further observed stuttering, shallow breathing, repeated sighing, and compulsive moving of the hands or feet. Over the course of their time spent in the field hospitals, gas neurotics regularly experienced insomnia and/or nightmares involving poison gas.[545] In fact, Robert Gaupp treated a soldier who habitually woke up in the middle of the night screaming the word "Gas!"[546]

Most men who displayed signs of gas neurosis remained in field hospitals near the front lines.[547] After a few days of rest, they would be sent back to the trenches, often still displaying minor neurotic tics.[548] A German psychiatric report from 1918 admitted that most front-line medics could not afford to play psychiatrist and that the best form of treatment was to give these men a short vacation during which they might calm their nerves under close supervision.[549] Even when neurotic symptoms did subside in the field hospitals, they usually resumed when the soldier returned to the front. This recurring mental trauma put a great strain on front-line medical professionals and medical resources. Thus, Robert Gaupp wrote that:

> This circumstance, together with the great physical and mental strain of modern warfare, leads to the conclusion that many squads at the front have nervous, especially

[545] Harold S. Hulbert, "Gas Neurosis Syndrome", 213-216. ; see also: Gaupp Akten 1918 (TU) 308/89.
[546] Eugen Plochinger, 1918 (TU) 669/30656 ; Franz Emmel, 1918 (TU) 669/30128
[547] The British and French also kept their gas neurotics in field hospitals due to limited available treatment options. Mark Harrison, *The Medical War*, 106. From July to October of 1916, the French sent 91% of their war neurotics back to the front. Anthony Babbington, *Shell-Shock*, 98.
[548] Gerard J. Fitzgerald, "Chemical Warfare and Medical Response During World War I," 617.
[549] Verwaltungsunterlagen, 1917-1918 (LBWK) 456 F 114, 111

> psychogenic (hysterical and fright neurotic) symptoms, many of which…make a deep impression on the neurologically uncultured doctor. This can unfortunately often mislead him into misdiagnosis.[550]

To combat the overburdening of German field hospitals, psychiatrists and neurologists advocated for the speedy diagnosis and processing of patients. If a soldier was deemed unfit for further military service, then he was usually sent to a nerve clinic that attempted to quickly restore the man's mental health through industrial service.[551] This centralized system of corrective rehabilitation was tailored around German psychiatrists' medical conception of wartime neurosis. By diagnosing war neuroses as hysteria, a term that had traditionally been reserved for female anxiety attacks, German psychiatric consensus denied the importance of the traumatic event in the formation of neuroses. Rather, psychiatrists like Gaupp claimed that neuroses were a product of an individual predisposition to mental weakness. Like other mentally ill soldiers, gas neurotics were thus deemed effeminate and constitutionally weak. As such, psychiatrists implemented harsh therapies that would mentally fortify their patients and allow them to be quickly reintroduced into society as capable German subjects. Treatments included hypnosis, electrotherapy, solitary confinement, mock operations under ether, and the insertion of a laryngo bougie.[552]

Those men, like Gaupp's patients, who were deemed far too mentally disturbed to remain in military hospitals were sent back to German psychiatric sanatoria. While walking through one such sanatorium, a surgeon described the miserable condition of the men who suffered from gas neurosis, writing:

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[550] Gaupp Akten, 1918 (TU) 308/89. Nerve clinics in Germany were similarly overcrowded. See: Prof Gaupp Ruf an die Universität Heidelberg (TU) 308/43

[551] Paul Lerner, "Psychiatry and the Casualties of War, 1914-18", 19.

[552] Wolfgang U. Eckart, "Aesculap in the Trenches: Aspects of German Medicine in the First World War", 188. ; Paul Lerner, "Psychiatry and the Casualties of War, 1914-18", 21.

> The patients were kept in large wards, but the unruly cases were often put in padded cells, where they stood in an agitated state...Others had hallucinations; they were still living through the horrors of an artillery bombardment or a gas attack. They covered their faces with their hands, so as to protect them from the shell splinters. Others cried out for their gasmasks, which they could not find, and still others heard voices under their pillows or under their bed covers, threatening them with death.[553]

While these conditions and their prescribed harsh treatments elicited concern from some medical professionals, a greater distrust of malingering often overrode calls for sympathy.[554] Given that German psychiatrists claimed war neuroses as products of weak mental constitution, they further assumed that many neurotics preferred their condition to frontline service. Admittedly, some soldiers did attempt to fake neurotic symptoms to escape the trenches, but medical professionals exaggerated the frequency of this situation. In fact, the societal stigma against war neurotics and the harsh treatment that they received prevented most men from attempting to imitate neurotic symptoms.

The poor treatment of war neurotics was, of course, not limited to the German context. The British and French similarly viewed soldier expressions of psychosis as a form of malingering, thereby calling into question the masculinity and self-discipline of the afflicted. However, as the war progressed, the British began to create specialty psychological hospitals and a Special Medical Board that evaluated the pension status of the 200,000 "shell-shocked" soldiers who were discharged from service.[555] According to historian Peter Barnham, ten percent of the patients at the Old Manor psychiatric ward were gas neurotics.[556] While some British soldiers made it to such psychiatric hospitals, many other neurotics were court martialed for cowardice or designated "Service Patients" and sent to insane asylums where they faced harsh

[553] Stephen Westman, Surgeon with the Kaiser's Army, 163,
[554] Fiona Reid, Medicine in First World War Europe: Soldiers, Medics, Pacifists, 80.
[555] Anthony Babbington, *Shell-Shock*, 98.
[556] Peter Barnham, Forgotten Lunatics of the Great War, 291.

treatment.[557] These men eventually inspired a reconsideration of the British citizen's right to humane treatment and a reconceptualization of psychiatric therapy throughout the interwar years. After 1917, the majority of British psychological literature began to posit an emotional and psychological genesis of war neuroses.[558] By 1920, Lord Southborough was appealing to "sympathy and care" when addressing the House of Lords to set up the War Office Committee of Enquiry into 'Shell-Shock.' While the government enquiry reasserted somatic causes for "shell-shock" and condemned the shirking of national duty, it also created a space for war neurotics and their supporters to demand both pensions and respect. This led to a distinct interwar movement for war neurotic rights that culminated in the Mental Treatment Act of 1930, which included asylum reform and out-patient treatment.[559]

The German situation was unique in the intensity afforded to the debates over war neurosis. By the end of the war, the fragility of the German nation made the prospect of mass pensions nearly unthinkable for many doctors.[560] Additionally, the loss of the war encouraged Germans to conceptualize war neurosis through a distinctly national lens. Unlike many French and British doctors, who viewed war neuroses as products of the individual's confrontation with modernity, their German counterparts tended to see neuroses as symptoms of the *national state's* inability to successfully confront or navigate modernity. Thus, the psychiatrist Alfred Hoche

[557] In France, war neurotics were subject to harsh treatments, but as the war wore on, more empathetic and psychological approaches gained traction. Julien Bogousslavsky and Laurent Tatu, "French Neuropsychiatry in the Great War: Between Moral Support and Electricity," 150.
[558] Tracey Loughran, "Shell-Shock and Psychological Medicine in First World War Britain", 87.
[559] Ted Bogacz, "War Neurosis and Cultural Change in England, 1914-22", 248-250. ; Eric T. Dean, "War and Psychiatry," 66. ; Martin Stone, "Shellshock and the Psychologists" in *The Anatomy of Madness,* 243-244. ; Fiona Reid, *Broken Men,* 69.
[560] Interestingly, historian Deborah Cohen points out that the German Weimar state actually did more for their veterans than did the British state. The Weimar government provided veterans with significant educational, occupational, and financial rights, while the British handed over much of this work to private charitable organizations. In taking on this massive problem, the Weimar government also absorbed any and all criticism of veterans' programs, eventually leading to major political discontent during the Great Depression. Deborah Cohen, The War Come Home: Disabled Veterans in Britain and Germany, 1914- 1939, 63.

wrote, "It is not the case, as was assumed at the beginning, that it is a matter of simulation, of intentional faking of symptoms that are not there. The individuals are in fact sick, but they would be well, strangely enough, if the [German pension] law did not exist."[561] For Hoche, it was merely the discussion of neuroses and pensions on a national level that weakened and sickened the German mind. The solution to this *Rentenneurose* (or pension neurosis) was a refashioning of the national spirit through labor and productivity.[562] Cures could be found either through a soldier's reentry into the war, which defied the softened femininity of the home front, or placement in the many work programs that the German medical services began to set up. The Army's Chief Sanitary Officer, Otto von Schjerning wrote, "Entire villages for the nervously ill were constructed so that, under the direction of neurologists, they could be enlisted into all kinds of jobs."[563] If these methods did not work, then harsh medical treatments were fully justified in the name of the German nation. While opposition to this treatment arose in the Weimar period, it never achieved the kind of normative legislation that came about in Britain. In fact, pensions for war neurotics were gradually reduced throughout the 1920s. Of the 300,000 German soldiers diagnosed with war neuroses during the war, only 20,000 had received pensions by the Great Depression.[564] This large-scale governmental failure would lead to discontent among veterans, which was given voice through political interest groups and writings from the period. For instance, Joseph Goebbels 1929 semi-autobiographical novel *Michael* discussed the ways in which the psychological trauma of the war persisted in the Weimar Republic. The book advocated for radical political change based on the experiences of one of Goebbels' veteran

[561] Paul Lerner, "Psychiatry and Casualties of War in Germany, 1914-18," 15.
[562] Bruno Cabanes, The Great War and the Origins of Humanitarianism, 1918-1924, 117.
[563] Paul Lerner, "Psychiatry and Casualties of War in Germany, 1914-18," 31.
[564] Jason Crouthamel, "Nervous Nazis: War Neurosis, National Socialism and the Memory of the First World War", 57.

friends. He wrote, “We young men who have been through war have a lot to work through ourselves. The fact that so and so has lost an arm is not half as bad as the internal wounds we bear from war and destruction.”[565]

Prevention versus Treatment: The Medical Value of Gas Discipline

One of the main points of concern for the medical treatment of gas poisoning was the extrication of gassed soldiers from the battlefield, especially since protecting injured soldiers from subsequent gas exposure remained particularly difficult. During extraction, medics and stretcher bearers were ordered to leave injured soldiers in their gas masks if they already had them on, or to put a new one on any unprotected men.[566] However, affixing gas masks on soldiers who had sustained significant head trauma presented a problem. For these cases, the medical services eventually received gas protection hoods, or large bags that inflated with oxygen around a soldier’s head.[567] The distribution of gas protection hoods was part of the medical service’s initial responsibility to distribute gas masks to all soldiers and to prepare them for chemical warfare. However, as the German medical services struggled to keep up with the manifold demands of the war, Fritz Haber’s Kaiser Wilhelm Institute increasingly took over the bureaucratic duties of gas mask distribution and gas protection instruction.[568]

After the spring of 1915, information on the treatment of gassed soldiers gradually trickled down from academic institutes like the Kaiser Wilhelm Institute to front-line doctors.

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[565] Joseph Goebbels’ *Michael* reprinted in Götz Aly, *Why the Germans? Why the Jews? Envy, Race Hatred, and the Prehistory of the Holocaust*, 107.

[566] Therapie der Kampfgas-vergiftungen, 1918. (MPG) Va 5 524

[567] Kriegsmedizin 1918 (BA-MA) PH 2/653 ort 22 mag H2OG Reihe 229. For a literary account of the use of gas masks on injured patients see: A.M. Frey, *Die Pflasterkästen: Ein Feldsanitätsroman*, 184.

[568] Kriegstagebuch Band III 23 Dezember 1915 bis 12 November 1916 (LBWH) M 660/032 Nr 23. For a first-hand account of attending a gas course see: Jürgen Kessel, ed, *"Jezt gehts in die Männer mordende Schlacht..."Das Kriegstagebuch von Theodor Zuhöne 1914-1918*, entry for 7.2.16

Much of this information was provided by Dr. Ferdinand Flury, of KWI Department D, who continued his toxicological studies of poison gas through extensive animal testing.[569] In early 1916, the pathologist Ludwig Aschoff and the senior military doctor Oskar Minkowski published the manual "Zur Kenntnis und Behandlung der Gasvergiftung" ("The Recognition and Treatment of Gas Poisoning").[570] The chief of the medical services, Dr. Otto von Schjerning distributed this manual to all German field hospitals. The booklet detailed how to treat soldiers who had been exposed to chlorine gas, exhorting doctors to quickly and diligently attend to their gassed patients. It covered the administration of oxygen as well as analgesics such as codeine, morphine, and cocaine.[571]

Over the course of the war, the German military released four different versions of "Zur Kenntnis und Behandlung der Gasvergiftung." Toward the end of 1916, Aschoff and Minkowski expanded the pharmacology section and discussed when to end oxygen treatment. In June 1917, they added a quantitative clinical testing section for chlorine, phosgene, and tear gases. And finally, in January 1918, they included a comprehensive section on the treatment of mustard gas.[572] While field hospital doctors received copies of the manual, sanitary officers and stretcher bearers learned these gas treatment guidelines through gas protection schools. Men in the

[569] Niko Amend. "Die Sanitätsdienstliche Versorgung Der Gasversehrten Deutschen Soldaten Des Ersten Weltkrieges", 12.

[570] Gasubungen Sanitätsamt 1918 (BHK) Stv GenKdo I. AK SanA 136. At the start of the war, Ludwig Aschoff (1866-1942) was a respected professor of pathology at the University of Freiburg. He was most known for his work on the pathology and pathophysiology of the heart. Oskar Minkowki (1858-1931) was famous for his work on diabetes at the University of Strasbourg. He surgically removed the pancreases of dogs and subsequently diagnosed them with diabetes. By linking the pancreas to the regulation of blood sugar, he spurred future research on both diabetes and the pancreas. Minkowski was also a leading specialist on poison gas and was made head of field sanitation during World War I.

[571] Only so much of a strong analgesic could be administered to soldiers who were exposed to chlorine or phosgene gas. Too much morphine would dangerously depress the respiratory system.

[572] Niko Amend. "Die Sanitätsdienstliche Versorgung Der Gasversehrten Deutschen Soldaten Des Ersten Weltkrieges", 24.

medical services took week-long trips to Berlin in order to attend such courses. As the war progressed, two more gas schools were set up in Leverkusen and Greppin.[573]

While Aschoff and Minkowski's manual was the definitive source for gas treatment, the medical services gained access to an expanding literature on poison gas.[574] This was particularly the case toward the end of the war, as front-line doctors reported their gas findings and treatments back to the central medical services office and the Kaiser Wilhelm Institute.[575] Even with greater toxicological knowledge, however, curing men of gas-related illnesses remained difficult and a speedy extraction from the battlefield was still the most demonstrably effective action. Ferdinand Flury wrote:

> The first and most important task in gas poisoning is the rescue of the casualty. Since the measures taken in this case usually decide on the fate and life of the victim, every person should know and master the basic concept of first aid in the event of injuries. In gas poisoning, the removal from the area of danger…is the most urgent requirement.[576]

Even in 1918, one-third of all seriously gassed soldiers was dead on arrival at field hospitals, and most of the remaining two-thirds died in the next 72 hours.[577] Given the general inability of doctors to save severely gassed soldiers, resources and manuals strayed from the treatment of symptoms. Focusing instead on prevention, official guidelines pointed to the gas mask and "gas discipline" as crucial prophylactics in the fight against gas poisoning. Ludwig Aschoff noted:

> Doctors' powerlessness against the gravest [gas poisoning] cases…makes it all the more necessary to be mindful of the proper use and maintenance of preventive measures. Ever since troops were equipped with the latest models of the protective mask, only a very small number of severe gas poisoning events have occurred—mostly in special cases

[573] Literatur, Kriegserfahrungen, Auslandsnachrichten 1934-36 (BA-MA) RH/12/4 sig 41 ort22 Mag H3EG Reihe 125 regal2 gefach 2
[574] For an example of gas treatment literature, see: Gasschutz Abteilungen CUF 1918 (MPG) Va 5 526
[575] Armee Oberkommando der 6. Armee Gasschutz 1915-1918 (BHK) Armeeoberkommando 6 1878
[576] Ferdinand Flury and Franz Zernik, Schädliche Gase: Dämpfe, Nebel, Rauch- und Staubarte, 565.
[577] Gasschutzwesen, Allg.u.Besonderes 1915-1918 (BK) Generalkommando I. Armee-Korps (BHK) 1276

where crews did not have their masks at hand, lost them in battle, or put them on too slowly.[578]

By stressing the importance of the gas mask, Aschoff placed the responsibility of a soldier's well-being and survival on his ability to use gas protective devices.[579] As early as spring 1916, calls for "gas discipline" now appeared alongside published guidelines for medical treatment. The first point in one medical leaflet urged men to "Trust your mask, it protects you when it's well taken care of (in good condition, without holes, cracks, etc.) and you know how to use it safely and quickly."[580] Another flyer claimed that gas attacks were only dangerous to soldiers who were not prepared, and that nothing could happen to a soldier who kept his gas mask, gas tarpaulin, skin detox ointment, and eye drops handy.[581]

By the fall of 1916, German medical reports took care to relate the ways in which men had been gassed. Without fail, these reports put the greatest stress on failures to correctly apply gas masks.[582] One such report cited two instances where a soldier took off his mask because he had run too hard, two in which a soldier fell and knocked off his mask, two in which a man was caught between two trenches and did not have a mask, and two in which a man forgot his mask somewhere in the trenches. A final instance described a soldier as "blöde" (or stupid) because he did not notice that his mask has major leaks.[583] A 1917 report estimated that 30% of all cases of gas poisoning were instances in which men were too surprised to put on their masks, 50% of all

[578] Ludwig Aschoff, Über anatomische und histologische Befunde bei "Gas"- Vergiftungen, 18.
[579] Calls for individual responsibility were particularly ironic when coming from the KWI and its associated research institutions, given than the greater aim of toxicological research the highest levels (Flury at the KWI) was to produce more lethal chemical agents rather than finding cures.
[580] 1914=1918 Dokumente M Wolfen (IZS)
[581] RH/12/9 Sig 85, 1916 (BA-MA) Signatur 85, Standort 22, Magazin H3EG, Reihe 20, Regal 4, Gefach 8
[582] Literatur, Kriegserfahrungen, Auslandsnachrichten, 1934-36 (BA-MA) RH/12/4 sig 41 ort22 Mag H3EG Reihe 125 regal2 gefach 2
[583] Gas als Kampfstoff 12 Aug 1916-27 April 1917 (LBWH) M 33/2 Bü 402

cases were due to the mask not being nearby, and 5% were due to the mask being ripped off by explosions or physical activity.[584]

Failed gas discipline and incorrect use of the gas mask quickly became catch-all explanations for instances of gas poisoning, simultaneously eliding the inability to effectively treat gas exposure. Certainly, the gas mask was the best method of protecting against gas, but it was not infallible even if perfect gas discipline was achievable. This is not to say that the military medical services did not hope to find effective remedies for gas poisoning, nor is it to say that they never found moments of success, but it does appear that appeals to personal protection provided a disclaimer for any who would blame medical shortcomings in the treatment of gas. Furthermore, the discourse of "gas discipline" served to normalize the idea of gas protection and to posit poison gas as an acceptable form of warfare. If every soldier could protect themselves against poison gas through supposedly simple preventative measures, then gas really was a more humane weapon than artillery shells or bullets. This argument was particularly important for the Germans, who felt the need to justify their use of gas to international popular opinion throughout the war. In fact, Fritz Haber penned several lectures on the supposed "humanity" of poison gas toward the end of the war, reavealing that even the unrepentant Haber felt the need to avoid post-war censure for the medical outcomes of gassed soldiers. Finally, the idea of "gas discipline" fit nicely within the German medical community's attempt to refashion the German nation according to the hard realities of the modern battlefield. Gassed men had no one to blame but themselves, since a disciplined soldier and a true German man could supposedly resist gas by correctly operating the gas mask. In this way, "gas discipline" served to pathologize the soldiers who failed to embrace and/or survive chemical warfare.

[584] Gasschutzwesen, Allg.u.Besonderes 1915-1918 (BHK) Generalkommando I. Armee-Korps (WK) 1276

Clinical Trials and Tribulations: World War I as a Great Experiment

In an interwar text about the realities of gas warfare, the medical doctor Hermann Büscher wrote:

> …when people came up with the idea of using poisonous gases to kill in the last war, only then did they foretell and feel all the terrible aspects of poison gas. Since then, the poisonous gases are oppressing us like a nightmare. Toxic gases have become a problem, and the war has stamped them into our imagination with that unique power before which we find ourselves almost motionless, impotent, helpless. Are we truly helpless and unprotected against poison gas? Are we no longer masters of the gas? Do we have to bow to the poison gases as to a fate that cannot be avoided? No! We simply must face gas with clear eyes and courage, in order to be able to again master them.[585]

Büscher's bold assertion is representative of two overriding themes in the broader German medical community's conceptualization of gas warfare during and after World War I. First, by positing gas as a problem that could be scientifically solved, Büscher envisioned the chemical war as a grand scientific/medical experiment. With the application of the scientific method to fundamentally solvable problems, humans could develop effective protection against poison gases. In doing so, Büscher claimed, mankind could again master its changing physical environment. While not all medical professionals described gas warfare through the thematic lenses of experimentation and mastery, a substantial number of influential doctors, medical researchers, and poison gas specialists evoked these themes in their writings from during and after the war. Interestingly, many of these men were involved in the medical specialty services like toxicology that grew in importance over the course of the war.[586]

Undeniably, the war presented medical professionals with entirely new forms of human destruction. Prior to 1915, few doctors had seen men blown apart, burned beyond recognition, or

[585] Hermann Büscher, *Giftgas und wir?: Die Welt der Giftgase Wesen und Wirkung, Hilfe und Heilung*, 7.
[586] Mark Harrison, *Medicine and Victory: British Military Medicine in the Second World War*, 279. The war also brought significant growth to the fields of psychology and psychiatry. Tracey Loughran, "Shell-Shock and Psychological Medicine in First World War Britain," 90-91.

asphyxiated by poison gas. While these were undoubtedly distressing sights that created their own form of psychological trauma for those in the medical services, they also presented army doctors with nearly limitless opportunities to advance medical science. Physicians in numerous medical fields could now study the effects of modern explosives and chemical substances on the human body, while also testing various drugs, prophylactics, and therapies on injured soldiers without significant oversight. It was within this context that many doctors believed that they were bound to invent a distinctly humane gas weapon—one that would merely put soldiers to sleep and spare future bloodshed.[587]

Admittedly, one could claim that the German medical services lacked the time, manpower, and resources to conduct rigorous medical experiments in the field during World War I.[588] While rigorous testing of new treatments was indeed rare, desperate experimental treatment, especially in the case of gas poisoning, was not uncommon. The medical professionals who often worked tirelessly and without much guidance in the field hospitals saw these unproven medical applications as their only option.[589] Furthermore, much of the information gathered from field hospitals and wartime studies did advance the therapeutic knowledge and abilities of medical specialists in fields such as cardiology, dermatology, and internal medicine.[590] If nothing else, the desperate wartime situation of German medicine inspired many doctors' conception of the

[587] For a similar argument from a regular German soldier see: Berndt Ulrich and Benjamin Ziemann, *German Soldiers in the Great War: Letters and Eyewitness Accounts*, 82.
[588] Derek Linton, "The Obscure Object of Knowledge: German Military Medicine Confronts Gas Gangrene during World War I", 316.
[589] For instance, see the blood tests of Professor Thiele. Erkrankungen durch Kampfgas 1916 (LBWK) 456 F 115, 67
[590] Historian Wolfgang Eckart has revealed the medical importance of wartime experimental open-heart surgery. See: Wolfgang Eckart, "Aesculap in the Trenches: Aspects of German Medicine in the First World War", 183-184. Derek Linton has performed similar research on gas gangrene treatment. See: Derek Linton, "The Obscure Object of Knowledge: German Military Medicine Confronts Gas Gangrene during World War I." *Bulletin of the History of Medicine* 74, no. 2 (2000): 291–316. Stefanos Geroulanos and Todd Meyers' recent historical monograph reveals the importance of World War I experimental medicine for the field of physiology. Stefanos Geroulanos and Todd Meyers, *The Human Body in the Age of Catastrophe*, 37.

war as a new and untamed medical frontier. A German specialist in hygiene and tropical medicine, Karl Mense, summed up the situation, writing:

> …right behind the lines and back home, each doctor—even the one who does not practice any more, but who is peacefully doing research—is now fervently trying to heal the wounds of the war…Directly in front of us, an experiment, so extensive that it could hardly derive from imagination is taking place...The people of the globe are taking part in an epidemiological experiment so huge, scientists would have never dreamed of it.[591]

Mense's sense of a grand medical experiment was certainly central to the treatment of poison gas. As early as June 1915, Doctor Hans von Pezold expressed the excitement of treating new symptoms when he examined men who had been exposed to their own chlorine gas at Ypres:

> In the morning, I first visited our *most interesting* patient, the pioneer Herzog, who had been poisoned by his own gas bomb at Ypres. He came to us with shortness of breath and constant vomiting, even though he was poisoned fourteen days ago. Now he is doing much better.[592]

Ferdinand Flury also reflected on the experimental nature of poison gas treatment during the war, writing: "With the daily growing danger of gas hazards, the experience of the war…has also been a great teacher in this field."[593]

As a member of Fritz Haber's Kaiser Wilhelm Institute, Ferdinand Flury collected much of the pre-war industrial knowledge on poison gases in order to conduct formal research into the nature of gas sickness. At the outbreak of the war, Flury entered military service as a staff pharmacist. This position only lasted until 1916, when Fritz Haber hand-selected him to serve as the head of his KWI's department of toxicology, animal testing, and industrial hygiene.[594] Once

[591]Karl Mense, "Zum neuen Jahre." *Archiv für Schiffs und Tropenhygiene* 19 (1915), 1.
[592] Kriegstagebuch Band II- 11. August bis 22. Dezember 1915 (LBWH) M 660/032 Nr 22
[593] Ferdinand Flury and Franz Zernik, Schädliche Gase: Dämpfe, Nebel, Rauch- und Staubarte, 595.
[594] Ferdinand Flury (1877-1947) had studied pharmacology, chemistry, and biology at the University of Erlangen from 1892 to 1901. After concluding a year of required military service, he received his doctorate in pharmacy in 1902. For the next three years, Flury worked as an *Assistent* in the Chemical Laboratory of the University of Erlangen, passing an exam in food chemistry in 1904. The subsequent year, he returned to the military and served as a staff pharmacist for a garrison hospital while studying medicine at the University of Würzburg. After receiving his medical doctorate and producing a habilitation on pharmacology, he found a position as an associate professor at Würzburg in 1915.

in Dahlem, Flury combined previous industrial studies with new experimental data in an attempt to observe and record the effects of Haber's battle gases. He conducted both human and animal experiments in which he recorded blood pressure, body temperature, and pulse rate during gas exposure. These tests were augmented by information from the front, allowing Flury to draft large tables in which he would record the various ways in which soldiers were gassed, their first recorded symptoms, and any later developing complications.[595] Flury concurrently studied the impact of the gas mask, recording the length of time that filters lasted and the influence of the mask on bodily fatigue.

Viewing his work as of the utmost importance, Flury saw scientific and medical knowledge as the only avenue towards the mastery of chemical weapons. He wrote, "Matters surrounding gas warfare would be much enhanced if the knowledge of the use of the new weapon penetrated deeper into the army during major actions. The overwhelming majority of the troops…had no idea of the extent of gas warfare."[596] Flury was not the only scientist or medical doctor undertaking such research. The major German chemical companies, gas mask manufacturers, and various pharmacological and toxicological laboratories also conducted clinical trials with poison gases. Repeating many of Flury's animal tests, the Elberfelder Laboratory was particularly involved in this research. The scientists there recorded the changes in oxygen levels, the thickening of blood, and the time of death after exposure to all of the major battle gases.[597]

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[595] Friedel Pick of the KWI also conducted such studies. See: Friedel Pick. "Über Erkrankungen Durch Kampfgase." *Zentralblatt Für Innere Medizin* 39, no. 20 (1918): 305–10.

[596] Bericht uber Beobachtungen an Gaskranken an der Westfront, 1917 (BA-MA) PH/2/ sig 1791 ort 22, mag H2OG Reihe 229 Regal 2 Gefach 3

[597] Much of this war research was written in military language, revealing the extent to which medical knowledge was mobilized for German military ends. Brief an den Feldsantitätschef, August 3, 1916 (BA-MA) PH/2/ sig 1785 ort 22, mag H2OG, Reihe 229, Regal 2, Gefach 3. See also: Wolfgang Eckart, "Aesculap in the Trenches: Aspects of German Medicine in the First World War" in *War, Violence and the Modern Condition*, 193.

By repeatedly arguing that knowledge was the best way to combat gas exposure, Flury was one of the many doctors and scientists who insisted on a mental mastery of the chemical construction of the environment. According to Flury, the men who could best understand the physical characteristics of poison gases could also best survive and control them. Given that treatments for extended gas exposure were still mostly ineffective, this call for scientific and medical knowledge extended to a scientific understanding of protective technologies like the gas mask and a familiarity with their use. This body of knowledge was part of the newly mechanized and mobile military tactics that were imposed on German soldiers in 1918. However, Flury was not just concerned with surviving poison gas exposure; his desire for chemical mastery also focused on the effective offensive deployment of the most fatal gases. For scientists like Flury and his boss Fritz Haber, control of the chemical environment implied the harnessing of aggressive power and the achievement of battlefield domination.

In the postwar world, many German scientists continued to view gas warfare as an experimental branch of toxicology that sought total mastery over the chemical construction of the environment. Flury continued to work in the field and to foster this view, writing in 1931 that:

> The use of gases and gas protection gained extraordinary importance in the last war–no branch of war technology has met such interest as the gas battle, nothing has filled army leaders with such concern, nothing so much preoccupies scientists' thinking and research. Nothing has so influenced the public imagination as the gas battle.[598]

Other doctors and medical scientists echoed Flury's claims, molding gas protection research into both a formalized branch of scientific study and a public concern. Joining the interwar military theorists who claimed that all future wars would include aero-chemical attacks, toxicologists and related medical professionals insisted that the study of poison gases would better prepare the

[598] Ferdinand Flury and Franz Zernik, Schädliche Gase: Dämpfe, Nebel, Rauch- und Staubarte, 17.

German nation for the supposedly imminent attack. By the mid-1920s, such doctors were writing in everything from professional journals to the *Militär Wochenblatt* to call for nationwide preparedness against poison gas attacks.[599]

Many of these medical professionals who became distinctly involved in poison gas protection disseminated their ideas through small interconnected networks that persisted through the 1920s and 30s. Ferdinand Flury and Oskar Minkowski continued to publish on gas protection, and Flury furthered his research on poison gas through animal testing as a professor of pharmacology at the University of Würzburg. Flury also became the one of the Reichswehr's primary contacts for questions related to chemical weapons in 1924.[600] Before writing several tracts on poison gas, Hermann Büscher elected to remain in the postwar medical services, treating gassed industrial workers when a train carrying gas shells exploded outside of Hugo Stoltzenberg's gas plant in 1919.[601] Younger medical professionals joined these so-called "gas specialists" in their interwar endeavors. After receiving a doctorate in chemistry and passing his pharmacy exam, Rudolf Hanslian served as an army pharmacist and a gas officer during the war. In the 1920s, after serving as the Reichswehr's head of the laboratory for medical supplies, he was selected as a government specialist on poison gas and the German representative to international commissions aimed at negotiating future gas warfare. Otto Muntsch studied medicine under Ferdinand Flury at the University of Munich and then served as a wartime medical officer. After the war, Muntsch returned to work under Flury and published several

[599] Dr. W. Schweisheimer. "Die Medizinischen Grundlagen Des Giftgaskrieges." *Militär Wochenblatt*, November 4, 1925, 17 110 Jahrgang. For similar calls for preparedness against biological weapons see: RH/12/9 Sig 27, 1924 (BA-MA) Signatur 27, Standort 22, Magazin H3EG, Reihe 125, Regal 5, Gefach 2
[600] Helmut Maier, Chemiker in "Dritten Reich," 263.
[601] Se: Hermann Büscher, *Giftgas und wir?: Die Welt der Giftgase Wesen und Wirkung, Hilfe und Heilung* (Leipzig: Johann Ambrosius Barth, 1937)

toxicological studies of poison gas.[602] In 1937, he would be made the head of the gas protection therapy department in the Military Medical Academy.

Medical studies on the effects of gas masks also continued after the war, often under the supervision of the Auer and Dräger gas mask manufacturing companies.[603] One such study argued that, "In our time, when more and more people are forced to wear a gas mask—be it for professional reasons or to work in air defense—it is of utmost importance to know what influences the gas mask has on cardiac activity."[604] Much like interwar studies of poison gas, this research made normative appeals, calling for a mastery of gas knowledge and technical protection. Furthermore, such work on all of the various facets of chemical warfare retained the nationalist overtones that were born in the war. Thus, the "gas specialists" appealed directly to their fellow Germans in their calls for chemical mastery. While admitting the dangers of the predicted aero-chemical war, Hermann Büscher was already proclaiming a future German victory during the interwar years:

> And if iron fate again imposes a new war against our will, then we will bow before it. But we, as a race of men and of heroes who know how to make world history on battlefields, will be vigorous and victorious and go through this difficult journey for Germany's legacy and greatness. Perhaps millions of us will be destroyed. Our faith remains unshakeable: Germany will not perish. Germany will always exist. Germany will be eternal. 'Eternal Germany!'[605]

[602] See: Dr. Otto Muntsch, *Leitfaden Der Pathologie Und Therapie Der Kampfstofferkrankungen* (Leipzig: Georg Thieme, 1939) ; Otto Muntsch, "Beiträge Zur Behandlung Der Hautschädigungen Durch Dichloräthylsulfid." In *Med. Dissertationen Der Bayer Julius-Maximilians-Universität Zu Würzburg*, 1–41 (Würzburg: C.J. Becker Universitäts-Druckerei, 1928)
[603] See: Harald Schuster, *Die Aufnahmeleistung von Atemfiltern und ihre Bedingtheiten* (Lübeck: Heinr. & Bernh. Draeger, 1936)
[604] Karl Graus aus Schmechten, *Elektrokardiographie Untersuchungen bei Belastun älterer Personen unter der Gasmaske*, 5. See also: Karl Schneider, *Blutgase und Kreislauf bei Arbeit under der Gasmaske* (Würzburg, Universitätsdruckerei H. Stürtz A.G. Würzburg, 1939) ; "Wochenschrift für die gesamte Heilkunde", Vierteljahrsschrift für gerichtliche Medicin und öffentliches Sanitätswesen vol 59, 1 (January 1920)
[605] Hermann Büscher, *Giftgas und wir?: Die Welt der Giftgase Wesen und Wirkung, Hilfe und Heilung*, 219-220.

Excising Pain: The Medical Translation of Wartime Suffering into Interwar Fear

The third section of Hermann Broch's celebrated 1930 novel *The Sleepwalkers* used the interactions between injured soldiers and medical professionals to reveal what he saw as the physical and mental decay of German society during World War I. In the novel, a small-town clinic in the Moselle valley is transformed into a military hospital as injured men stream back from the front. One particularly poignant scene contrasts the cultural militarization of medicine with its lack of preparation for the modern methods of war. Broch writes, "Dr. Friedrich Flurschütz was making his round of the wards. He was wearing a military cap with his doctor's white overalls; a combination which Lieutenant Jaretski characterized as absurd." Approaching a wounded soldier, the doctor tells him that they will have to amputate his arm. Casually, the doctor says, "Don't worry about it, it's only the left," to which the soldier replied, "Yes, all you want to do is cut things off." Flurschütz then shrugs his shoulders and retorts, "Can't be helped; this century has been devoted to surgery and rewarded by a world-war with guns...now we're beginning to find out about glands, and by the time the next war comes along we'll be able to do wonders with these damned gas-poisonings...but for the present the only thing we can do is cut."[606]

Broch used this brief scene to express both the changing nature of warfare and medicine's inability to keep pace, especially in relation to poison gas. But even more importantly, Flurschütz's shrug conveys a certain callousness in the doctor's relationship to his patient. Historians like Paul Lerner and others have already shown the moments in which an objective sense of national medical duty outweighed personal compassion in studies of German First World War psychiatric treatment, surgical operations, disability rehabilitation, and pension

[606] Hermann Broch, *The Sleepwalkers*, 354-355.

allocation. Certainly, in these instances, many soldiers and veterans viewed military doctors as unsympathetic or even malevolent. This was sometimes evident in the appellations used for medical spaces and tools. For instance, operating rooms were called "bone mills" or "torture chambers," while the chloroform hood was the "gas mask" and the use of anesthesia was a "gas attack."[607]

In the case of military pensions, Lerner has shown how psychiatrists used the diagnosis of hysteria to deny benefits to certain veterans with psychiatric disorders.[608] This refusal to acknowledge the psychological damages of war was justified as a required step in the salvation of German masculinity and citizenship and the preservation of an overtaxed pension system.[609] In fact, throughout the war, some psychiatrists were far more concerned with exposing malingerers than developing effective psychiatric therapies. Their so-called Kaufmann-Kur comprised a series of horrifying tests, aimed at forcing fraudulent neurotic claimants to confess their deception. This included taking x-rays in dark rooms, making patients swallow their own vomit, and pretending to conduct unnecessary surgical operations.[610] Unsympathetic doctors justified these tests in the terms of Social Darwinism, opining the possibility that the mentally strong would be wiped out while the deceitful, frightened, weak, and truly neurotic would survive.[611]

Field hospital doctors and gas specialists harbored similar skepticism for gassed soldiers both during and after the war. Given the unseen, internal manifestations of both mental illness

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[607] Theodor Imme, *Die deutsche Soldatensprache der Gegenwart und ihr Humor*, 132.
[608] In Munich and the surrounding areas, 66.4% of all war pension claims based on psychological trauma were denied throughout the 1920s and 30s. Wolfgang Eckart, "The Soldier's Body in Gas Warfare: Trauma, Illness, *Rentennot*, 1915-1933," in *One Hundred Years of Chemical Warfare: Research, Deployment, Consequences*, 224.
[609] Paul Lerner, *Hysterical Men*, 234. See also: Robert Whalen, *Bitter Wounds: German Victims of the Great War, 1914-1939*, 163-164.
[610] Wolfgang U. Eckart, "Aesculap in the Trenches: Aspects of German Medicine in the First World War", 188.
[611] Ibid, 186.

and gas poisoning, soldiers most commonly used these two afflictions to avoid frontline service. Since it was difficult for medical professionals to determine if a soldier had, in fact, inhaled small amounts of gas, doctors and company commanders were forced to either observe the men who claimed to be ill for several days or send them back to the front with the hope that they were lying. In a 1917 letter home, one infantryman Birzer claimed that he had been gassed. However, when he reported this to his company commander, he was denied medical leave. Birzer wrote, "Instead he locked me up. Here you go and see how they act. He would be happy if I were *kaputt*. Then he told me off like no one did before. He called me a coward and a malingerer and did not let me go and see the doctor."[612]

In the immediate post-war years, a similar skepticism confronted the steadily increasing pension claims for gas exposure. Veterans asserted a variety of respiratory diseases including bronchitis, emphysema, and asthma.[613] Others complained of dizziness and sleeplessness that they believed stemmed from gas exposure, even though the symptoms appeared years after the war. The overwhelming majority of these cases were denied war pensions after medical authorities claimed that there was no proof of causation. Furthermore, several German research studies from the 1910s and 20s took great pains to deny any connection between gas exposure and subsequent tuberculosis.[614]

The reliance on gas discipline and the gas mask as the best form of gas protection encouraged this often-harsh view of veterans who claimed to have been gassed. According to the logic of gas discipline, gassed men were those who could not master themselves or their environment. Through some personal deficiency, they failed in a rote task like cleaning their gas

[612] Berndt Ulrich and Benjamin Ziemann, German Soldiers in the Great War: Letters and Eyewitness Accounts, 83.
[613] Vorschriften uber Gasschutz 1931-33 (BA-MA) RH/12/4 sig 57 ort 22 mah H3EG reihe 125 regal 2 Gefach 3
[614] Günter Hänsel, Die Spätfolgen von Kampfgasvergiftungen an den Lungen und ihre versorgungsrechtliche Bewertung, 3-4.

mask, hanging it from their neck, or sleeping with it affixed. As per this interwar logic, which resonated with staunch German nationalists and Social Darwinists, gas effectively weeded out those who could not exist in a modern world that would now be permeated by atmospheric poison. These were victims of their own insufficiencies; men who were no longer needed or desired in an imagined Germany comprised of both individually and collectively disciplined subjects who were ready to enter the imminent, violent struggle for national survival.

Of course, not all German medical professionals were so callous towards their gassed patients. As historian Christine Hallett points out, "Some of the most powerfully emotive writings of First World War nurses were those in which they described their experiences of combating the effects of innovative weapons of war. All seemed to agree that the worst of these were the poisonous gases."[615] Such expressions of sympathy eventually spurred on real political action; it was the medical community's first-hand experience with gas victims that inspired the International Committee of the Red Cross to call for a battlefield ban of poison gas in 1918. This appeal was met with some enthusiasm from the Allies, but the German government rejected a complete ban, claiming that their use of gas was only a retaliation against Allied tear gases. Nevertheless, this international dispute sparked a February 1918 debate in the Reichstag over the use of gas in a pre-planned German offensive for later that year. Only the Independent Social Democratic Party (USPD) supported ending Germany's military use of gas, and the German public remained unaware of such political discussions due to strict government censorship.[616]

While many doctors were appalled by gas warfare and deeply committed to their patients' recovery, condemnations of gas from the German medical community were either

[615] Christine Hallett, *Containing Trauma: Nursing work in the First World War*, 59.
[616] Wolfgang Eckart, "The Soldier's Body in Gas Warfare: Trauma, Illness, *Rentennot*, 1915-1933," in *One Hundred Years of Chemical Warfare: Research, Deployment, Consequences*, 222-224.

censored or ignored. Historian Joanna Bourke has argued that over the course of the 19th century, the development of new medical technologies and the increasing disdain for the importance of affect in healing established the appreciation for "detached concern" as an idealized mode of medical comportment. According to many doctors, this normative relationship to a patient would allow medical professionals to balance emotional engagement with a scientific demeanor that "encouraged the confidence of patients."[617] But in the case of gas poisoning, it proved extremely difficult for doctors and nurses to ignore this unique form of physical anguish. The unseen nature of gas and gas poisoning often made medical staffs feel particularly helpless in treating men who had inhaled gas. Coughing and retching until they died, these men proved that medical treatment did not always keep pace with the scientific and technological advances of war. Thus, while doctors could do little to alleviate the suffering of these men during the war, they were well positioned to lobby for restrictions on gas weapons in the postwar period.[618]

Scholars Elaine Scarry and Joanna Bourke have both studied the difficulty, if not impossibility, of narrativizing pain.[619] As Scarry points out, pain (especially pain derived from a terror weapon like poison gas) is a deconstruction of language.[620] If true, it was quite conceivably impossible for medical professionals to translate their patients' pain into an interwar voice that could fully express the dangers of poison gas. It is also symbolically (if sadly) fitting that gassed men were often unable to speak after gas exposure, as the lining of their throats burned away.[621] On the other hand, German medical professionals were able to craft the lessons of chemical weapons from World War I by either arguing for the relative "humanity" of an

[617]This ideal was important in the continual process of medical professionalization. Joanna Bourke, "Pain, sympathy and the medical encounter between the mid eighteenth and the mid twentieth centuries", 450.
[618] Leo van Bergen, "The poison gas debate in the inter-war years," 175.
[619] Joanna Bourke, "Bodily Pain, Combat, and the Politics of Memoirs: Between the American Civil War and the War in Vietnam", 46.
[620] Elaine Scarry, The Body in Pain: The Making and Unmaking of the World, 72.
[621] Vorschriften uber Gasschutz, 1931-1933. (BA-MA) RH/12/4 sig 57 ort 22 mah H3EG reihe 125 regal 2 Gefach 3

imperfect and underutilized weapon or arguing against the use of a weapon for which there was little known medical treatment. This second argument was frequently tied into pacifistic and Left-leaning political positions that frequently argued for greater distribution of war pensions, especially to war neurotics.[622]

In the end, most medical attempts to convey the effects of gas warfare inspired interwar fear, rather than real empathy for soldier pain. The growth of chemical fear throughout the 1920s and 30s had major implications for subsequent debates over the stockpiling and use of poison gas in Germany. Ultimately, these wild fears forced all political deliberations onto the rhetorical ground of national protection. Interwar gas politics often ignored the real capabilities of poison gas, instead relying on the gas specialists' invocation of German national discipline or near-hysterical prophecies of doom and destruction to frame their arguments. At the same time, the Weimar Labor Ministry, the National Committee on War Victims, and several high-profile psychiatrists worked to reduce pensions over the course of the 1920s.[623] In a moment of real introspection, the gas specialist Dr. Otto Muntsch attempted to describe the problem of expressing wartime experience in the post-war world: "Many a word has been said about the humanity of gas warfare: Anyone who has ever seen a gas-sick person at the height of lung damage must, if he still has a spark of humanity, fall silent."[624] It was precisely this problem of

[622] The Reichsbund der Kriegsbeschadigten, Kriesteilnehmer und Hinterbliebenen was Weimar's largest war victims' organization with over 600,000 members. An organ of the Social Democratic Party, it regularly lobbied for greater pension distribution. Jason Crouthamel, "War Neurosis versus Savings Psychosis: Working-Class Politics and Psychological Trauma in Weimar Germany," 165.
[623] Jason Crouthamel, "War Neurosis versus Savings Psychosis: Working-Class Politics and Psychological Trauma in Weimar Germany," 173.
[624] Otto Muntsch, *Leitfaden der Pathologie und Therapie der Kampfstofferkrankenungen*, 43. See also: Ernst Simmel, *Psychoanalysis and the War Neurosis*, 32. "One must have experienced the war occurrences themselves or their recapitulation under analytical-cathartic hypnosis in order to understand to what attacks the mental life of a man is exposed in time of war."

representation and a subsequent lack of empathy in the rhetorical framing of arguments that would set the parameters of the interwar debates surrounding chemical warfare.

CHAPTER 5: APPARITIONS IN THE HAZE: THE POISON GAS DEBATES IN THE WEIMAR REPUBLIC

In his 1930 essay "Die totale Mobilmachung" (or "Total Mobilization"), the now established German writer Ernst Jünger reflected on the changes in warfare tactics and military industrial production that had taken place since World War I. Jünger wrote that his essay attempted to "capture the energy that had turned the belligerent nations into volcanic blacksmith shops."[625] In contemplating the mobilization of the German home front during the war, he argued that the gradual transformation of the entire nation into a collective army was an inevitable process of technological modernity. Jünger admitted that while the collective arming of Germany offered unforeseen military power, it also changed the face of warfare. Battles would no longer be won by the bravery of individual soldiers, but through wars of material that required physical and mental fortitude from every citizen. As part of the industrialization of warfare and its corresponding social structures, each and every man, woman, and child now became a soldier, contributing to the national war effort through various forms of organized production.

According to Jünger, the militarization of civilians further changed the means and rules of warfare. Modern wartime violence would now target both battlefield soldiers and civilians, attempting to cripple national production and destroy the will of the people. Aerial bombing and aero-chemical attacks were naturally suited to disabling and terrorizing civilians within the borders of a belligerent country.[626] As engineers created military airplanes that could fly further distances at higher altitudes, the formerly safe interior of every nation now became a potential battlefront. In turn, the proliferation of gas shells in 1918 allowed for a denser diffusion of

[625] Ernst Jünger, *Sämtliche Werke*, Band 7, 126.
[626] For more on Jünger's "Total Mobilization" and its prescience for civilian terror in modern American wars see: John Armitage, "On Ernst Jünger's 'Total Mobilization': A Re-evaluation in the Era of the War on Terrorism", *Body and Society* 9,4 (2003): 191-213.

chemical weapons at greater distances. Reflecting on the possible combination of interwar airpower and chemical weapons, Jünger wrote:

> The warrior who commands night-time bombardment knows no difference between combatants and non-combatants, and the deadly gas cloud moves like an element above all living things. But the possibility of a such a threat is still only partially realized. It presupposes a total mobilization, which, in its own right, frightens even the child in its cradle.[627]

Jünger's writings serve as a representative entry point into the larger interwar preoccupation with the socio-political alterations that stemmed from the Great War. Discussions of new warfare tactics, technologies, and existential threats expressed a sense of break from the past. As historian Peter Fritzsche has argued, Weimar political discourses were deeply impacted by the attempt to toss aside an invalidated history.[628] This allowed for a national reconstruction that could trouble all preconceptions of "contingency, possibility, and necessity," including national defense against chemical attacks.[629] As Fritzsche reminds us, in the interwar period:

> the proliferate images of gas war and the gas mask, which civilians, particularly women and children, were shown using, demonstrated the reach of this militarized new time into the household goods and private lives of contemporaries, just as had the descriptions of "the new life" (das neue Leben) and "the new times" (die neue Zeit).[630]

Certainly, thinkers and politicians across Europe re-conceptualized the most intimate aspects of life following the cataclysmic reverberations of World War I.[631] But in Germany, this

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[627] Ernst Jünger, *Blätter und Steine,* 134.
[628] Peter Fritzsche, "The Economy of Experience in Weimar Germany", in *Weimar Publics/ Weimar Subjects,* 362. Rüdiger Graf, Reinhart Koselleck and Niklas Luhman have constructed similar arguments, positing the widening gap between the space of experience and the horizon of expectation as constituent of the modern temporal orientation. Rüdiger Graf, "Anticipating the Future in the Present: "New Women" and Other Beings of the Future in Weimar Germany," 649. ; Reinhart Koselleck. *Zeitschichten: Studien zur Historik* (Frankfurt am Main: Suhrkamp, 2000) ; Niklas Luhman, "Temporalisierung von Komplexität. Zur Semantik neuzeitlicher Zeitbegriffe," in Luhman *Gesellschaftsstruktur und Semantik: Studien zur Wissensoziologie der modernen Gesellschaft,* vol 1. (Frankfurt am Main: Suhrkamp, 1980). 235-300.
[629] Peter Fritzsche, "The Economy of Experience in Weimar Germany", in *Weimar Publics/ Weimar Subjects*, 363.
[630] Ibid, 375.
[631] For interwar British concerns over aero-chemical attacks see: Susan R. Grayzel, "The Baby in the Gas Mask: Motherhood, Wartime Technology, and the Gendered Division Between the Fronts During and After the First World War", in *Gender and the First World War*, 129. See also: Susan R. Grayzel, *At Home and Under Fire: Air Raids and Culture in Britain from the Great War to the Blitz* (Cambridge: Cambridge University Press, 2012) ; Michele

process took on a greater sense of urgency, primarily driven by the continued realization of imminent contingency and risk stemming the loss of World War I.[632] With a significantly weakened air force and a geographic position that made aerial attack possible from any side, Germany sat expectant for an aero-chemical attack on a major population center. Reflecting on this situation in 1931, the gas scientist Ferdinand Flury wrote, "No state today may deny the possibility that in future wars the militarily uninvolved population will be threatened by gases, especially in air raids."[633] Indeed, such claims inspired various reactions from regular Germans, including both a great amount of futile hand-wringing and significant attempts at social and political reform. In this period of intense German uncertainty, Peter Fritzsche has pointed out that "the more serious the emergency, the more legitimate social reform was considered to be."[634] To be sure, many Germans perceived aero-chemical gas attacks as one of the most serious and pressing emergencies in the Weimar period. For, as historian Jonathan Wright has pointed out, "fear of war—in extreme cases even psychosis—was a recurrent theme [in interwar Germany], particularly given the preparations everywhere to be seen not simply in the build-up of the armed forces but in classes on air defense and gas warfare."[635]

A variety of pacifist critiques of First World War chemical warfare and industrialized armament arose amidst these interwar fears of aero-chemical attack. Criticisms of the German

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Haapamaki, *The Coming of the Aerial War: Culture and the Fear of Airborne Attack in Inter-War Britain* (New York: I.B. Taurus, 2014) ; Brett Holman, *The Next War in the Air: Britain's Fear of the Bomber, 1908-1941.* (London: Routledge, 2014). For a French treatment see: Roxanne Panchasi, *Future Tense: The Culture of Anticipation in France Between the Wars* (Ithaca: Cornell University Press, 2009). Reflecting on interwar British fears, the eminent historian Eric Hobsbawm wrote, "The image of fleets of airplanes dropping bombs on cities and of nightmare figures in gas masks tapping their way like blind people through the fog of poison gas, haunted my generation: prophetically in one case, mistakenly in the other." Eric Hobsbawm, The Age of Extremes: A History of the World, 1914-1991, 35.

[632] Peter Fritzsche, "Did Weimar Fail?", 655.

[633] Ferdinand Flury and Franz Zernik, Schädliche Gase: Dämpfe, Nebel, Rauch- und Staubarte, 565.

[634] Peter Fritzsche, "Did Weimar Fail?", 653.

[635] Jonathan Wright, Germany and the Origins of the Second World War, 71. See also: Robert G. Moeller, "The Bombing War in Germany, 2005-1940: Back to the Future?" in Bombing Civilians: A Twentieth-Century History, 31.

war effort stimulated both attempts to reform the state through effective international peace and disarmament treaties and to dismantle the state through communist revolution. These distinct calls envisioned vastly different ends, but pacifists and communists alike realized the need to not only rid Germany of chemical weapons, but also to expose the impossibility of national gas protection in a future war. This meant concurrently critiquing both active militarists and those nationalists who claimed to provide a defense against chemical weapons through devices like the gas mask. However, while pacifists of all varieties aimed to reduce the possibility of aero-chemical attack by tearing the links between science, industry, and the military painstakingly forged by Fritz Haber during the war, they did so on the rhetorical grounds of war and violence. Repeatedly relying on apocalyptic visions and xenophobic fears, few pacifists offered a solution for chemical defense that appeared viable to the German public.

On the other hand, scientists and engineers involved in chemical warfare during the First World War offered seemingly instantaneous protection. Men like Ferdinand Flury and Rudolf Hanslian applied their wartime knowledge of poison gases to interwar political problems. Just as they called for a mix of technological solutions and gas discipline in the trenches, they argued that German civilians could survive an aero-chemical attack if they were supplied with both the necessary technology and knowledge. Realizing that European militaries still could not create a dense enough gas cloud to kill from the air, these gas specialists advocated for both a variety of techniques for survival and a reshaping of the German subject to ultimately heighten the general public's concern for national security against aero-chemical attack. At the same time, they assured the public that these national security measures were the best way of insuring real international peace, thereby positing themselves as the true pacifists.

According to the gas specialists, civilian Germans would now need to internalize the gas discipline of World War I soldiers, always prepared to don a gas mask or run for a gas shelter. However, it remained unclear whether the oftentimes unruly civilian subject would be able to act as the idealized self-controlled soldier. For, as the pacifist Waldus Nestler pointed out in 1930:

> To wear a gas-mask requires extraordinary discipline; people put them on with teeth clenched. If discipline is difficult for trained soldiers, how much more so with civilians. A mother could not endure to hear her child crying under its mask. Women and children will certainly not be able to make full use of a protective apparatus; every gas attack would cause a panic.[636]

With these problems in mind, pacifists and the gas specialists remained at odds over the viability of gas protection throughout the Weimar era. Through various political and scientific publications, they vied for dominance over the future of German chemical policy and national rearmament. The pacifists' international treaties and disarmament appeared the most visible solution to avoiding a future chemical war in the early and mid-1920s. However, in 1928, a poison gas leak in Hamburg seemed to justify long-standing calls for increased gas preparedness among civilians and a stronger national defense against aero-chemical attack.

Poison Gas Research and Production after the War: The Travails of Hugo Stoltzenberg and his Competitors

The Treaty of Versailles, signed on June 28, 1919 to formally end World War I, maintained several articles that concerned chemical warfare. For instance, Article 171 reiterated the ban on poison weapons that the earlier Hague Conventions had set, while simultaneously blaming the Germans for the breaking of those conventions during the war. The article read:

> The use of asphyxiating, poisonous or other gases and all analogous liquids, materials or devices being prohibited, their manufacture and importation are strictly forbidden in

[636] Waldus Nestler, "Collective and Individual Protection," in *Chemical Warfare,* 77.

> Germany. The same applies to materials specially intended for the manufacture, storage and use of the said products or devices.[637]

Article 172 intended to ensure that the Germans would abide by these restrictions, while also attempting to requisition sophisticated German chemical production processes for Allied industries. The article read:

> Within a period of three months from the coming into force of the present Treaty, the German Government will disclose to the Governments of the Principal Allied and Associated Powers the nature and mode of manufacture of all explosives, toxic substances or other like chemical preparations used by them in the war or prepared by them for the purpose of being so used.[638]

Alongside these articles on poison gases, the treaty further prohibited the manufacture or purchase of all German air protection technologies such as airplanes, anti-aircraft guns, and searchlights.[639] The treaty went into effect on January 10, 1920, and in that same year, the Military Inter-Allied Control Commission (MICC) under Marshal Ferdinand Foch began to formally assess the German chemical industry. The previous year, the British chemist Sir Harold Hartley had written a report in order to assist in this endeavor. The Hartley Report attempted to document the wartime activities of Fritz Haber and the major German chemical companies in the British sector of occupation. The 1921 publication of French chemical liaison officer Victor Lefebure's *Riddle of the Rhine* further sparked international debate over the strength of the German chemical industry. Lefebure wrote, "The IG is, if you will, a huge and cleverly disguised mine in the troubled waves of world peace…The existence of this gigantic monopoly raises vital military and economic questions that can truly be called 'the riddle of the Rhine.'"[640]

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[637] The Treaty of Versailles, Article 171, page 119. https://www.loc.gov/law/help/us-treaties/bevans/m-ust000002-0043.pdf

[638] The Treaty of Versailles, Article 172, page 119. https://www.loc.gov/law/help/us-treaties/bevans/m-ust000002-0043.pdf

[639] Erich Hampe, Der Zivile Luftschutz im Zweiten Weltkrieg: Dokumentation und Erfahrungsberichte über Aufbau und Einsatz, 9.

[640] Victor Lefebure, *The Riddle of the Rhine*, 1921 (BA) 201-043. The title of Lefebure's novel is a play on Erskine Childers' *The Riddle of the Sands* (1903), a spy novel that dealt with a secret German plan to invade England.

While the Allies intended to shut down chemical factories that produced military-related products, the MICC ultimately struggled to differentiate between military and civilian applications in German factories that were intentionally set up to produce chemicals for both purposes.[641] Furthermore, German chemical companies and the Kaiser Wilhelm Institute attempted to hide much of their production and research activities before 1920. While the demilitarization of the Rhineland allowed French officials to harass companies like BASF, Hoechst, and Bayer, the Allies failed to permanently hamstring German chemical production. The MICC ended its inspections in 1924 and left Germany in 1927.

Only a few months into 1919, the Allies also stopped attempting to try Fritz Haber for war crimes. With this reprieve, he returned to Germany and again took up his post at the Kaiser Wilhelm Institute for Physical- and Electrochemistry. There he resumed his role as an elder statesman in the world of German science. He continued to try to lure high-profile chemists and physicists to Berlin by providing the "satisfactory conditions" necessary to produce world-class research. For Jewish scientists like Albert Einstein, this meant combatting the anti-Semitism that continued to circulate in the German academy.[642] For others, Haber provided research funds through his new role as the driving force behind the Emergency Committee for German Science, an organization that solicited research funding from the federal and state governments as well as private industry. The majority of these funds came from private sources and Haber remained adept at greasing the wheels of largescale scientific endeavor. Indeed, historian Fritz Stern wrote

[641] Chemische Abteilung II 1927 (BA-MA) RH/12/4 Sigantur 4, Ort 22, Magazin H3EG, Reihe 125, REgal 2, Gefach 2. See also: Jeffrey A. Johnson and Roy Macleod, "The War the Victor's Lost: The Dilemmas of Chemical Disarmament 1919-1926," in *Frontline and Factory: Comparative Perspectives on the Chemical Industry at War, 1914-1924*, 230-238.
[642] Fritz Stern, Einstein's German World, 130-131.

of Haber, "He had contacts everywhere—with officialdom, with politicians...and with people of rank in the private world."[643]

In his own laboratories, Haber understandably claimed that he had completely turned away from chemical weapons research. In a later statement to the Rockefeller Foundation, Haber wrote, "after the Armistice, I have cancelled every such work [on poison gases] and fully declined to renew it in whatever form."[644] Instead, he turned his attention to pesticides, applying his knowledge of poison gases to the extermination of the head lice, fleas, mosquitoes, and mites that had plagued soldiers throughout the war. Since early 1914, the German army had operated large sanitation centers at railway junctions where soldiers could bathe and have their clothing deloused with sulfur dioxide.[645] However, the Germans rarely had a sufficient supply of sulfur dioxide and the delousing treatment often damaged the soldiers' uniforms. Seeking a solution, the military turned to the Degussa company, whose 1916 academic trials had shown that poison gas was effective for killing insects.[646] With military contracts in hand and the support of Fritz Haber, Degussa began to successfully treat lice-infested military areas with hydrocyanic acid gas (a stronger variant of blue-cross gas).[647] Over time, Degussa turned their de-lousing operations into a science, timing their exterminations for different insects and measuring the necessary quantity of gas per square meter.

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[643] Fritz Stern, Einstein's German World, 134.
[644] Ibid.
[645] The German army also maintained delousing trucks that could provide similar services just behind the front lines. Margit Szöllösi-Janze. "Pesticides and War: The Case of Fritz Haber", 100.
[646] Bruno Heymann of the Berlin Hygiene Institute has also conducted successful trials with hydrocyanic gas. Paul Weindling, Epidemics and Genocide in Eastern Europe, 1890-1945, 92. Degussa was brought to the attention of the German military through its work with the Society for Applied Entomology. In 1916 Degussa conducted gassing tests with members of the Agricultural College of Berlin, hoping to set up an institute for applied entomology in Berlin or Frankfurt. While this institute was never created, chemists at the Berlin Hygiene Institute introduced Degussa's work to the German military and to Fritz Haber.
[647] Degussa also teamed with Ferndinand Flury to develop a gas mask filter for hydrocyanic fumes. Paul Weindling, Epidemics and Genocide in Eastern Europe, 1890-1945, 93.

As early as February 1917, Haber began to stress the importance of his gas research for military and civilian pest control. He claimed that pest control represented the most promising future for the application of his newfound chemical technologies. However, there is reason to believe that Haber's attempt to position gas as an integral part of scientific and human progress was merely part of his desire to continue his poison gas research after the war.[648] While Haber's first proposed Kaiser Wilhelm Institute for civilian gas research was rejected by the Kaiser Wilhelm Society, he was able to organize a formal conference in which various research institutes and Degussa presented on the effectiveness of pesticides. This led to the February 1917 creation of the Technical Committee for Pest Control, a team of volunteers under Haber that advocated for pest control research under the control of public law.[649] In cooperation with Haber and Degussa, the entomologist Albrecht Hase (1882-1962) first erected a major hydrocyanic acid delousing center outside of Kattowitz in 1917. This was followed by the construction of several more centers in the final two years of the war.[650]

Civilian mills and storehouses also required pest control during the war. In response, Haber staffed pest control companies with former gas pioneers and sent them on regional gassing assignments.[651] This helped to establish pest control as both a lucrative market and a scientific discipline in the post-war years.[652] But by 1919, the Weimar government had outlawed the

[648] Of course, Haber also believed that pest fumigating would indeed benefit humanity, focusing on its possible applications in large-scale agriculture. Margit Szöllösi-Janze. "Pesticides and War: The Case of Fritz Haber", 102. A similar argument for pesticide research was crafted by Amos Fries, the second chief of the U.S.'s Chemical Warfare Service. Leo van Bergen, "The Poison Gas Debate in the Interwar Years," 175-176.
[649] The Technical Committee for Pest Control (or TASCH) was a branch of the Chemical Department of the Prussian War Ministry. While the TASCH committee maintained entomologists, it also created political strife between Haber and entomologists at the Society for Applied Biology, who sought sole legal control over the use of hydrocyanic gas. Paul Weindling, Epidemics and Genocide in Eastern Europe, 1890-1945, 95.
[650] Margit Szöllösi-Janze. "Pesticides and War: The Case of Fritz Haber", 103
[651] Jürgen Kalthoff and Martin Werner, Die Händler des Zyklon B Tesch & Stabenow Eine Firmengeschichte zwischen Hamburg und Auschwitz, 17-18.
[652] This is the generation of the concept of *Biotechnik*, or the concerted application of biology for the German war effort.

civilian use of the incredibly volatile and deadly hydrocyanic acid.[653] In response, Haber set up the Deutsche Gesellschaft für Schädlingsbekämpfung (or Degesch), a unique non-profit company that was allowed to continue its experimental use of hydrocyanic acid under public law.[654] Originally set up in Berlin, Degesch moved to Frankfurt in 1920 and became a private company. This relocation strengthened Degesch's ties to Degussa, which would eventually buy the company in 1922.[655] Once in Frankfurt, the firm developed a highly effective type of hydrocyanic acid called Zyklon-A, but the liquid chemical remained unstable and dangerously undetectable.

Haber also furthered poison gas research at his Kaiser Wilhelm Institute by setting up a pharmacological department under Ferdinand Flury and Albrecht Hase.[656] This department continued Flury's wartime toxicological studies, using code words for various war gases to skirt the Allies' armament restrictions. Flury and Hase tested mustard gas on cockroaches, created arsenic bombs, and even considered using airplanes for pesticide dusting.[657] In 1920, when the Military Inter-Allied Control Commission began to enforce the chemical restrictions of the Treaty of Versailles, the KWI dismantled all chemical production that was strictly related to warfare. Haber first disbanded his pharmacological department, but was then able to move much

[653] Even during the war, Degussa primarily conducted its delousing in the Oberost, since the Ministry of Agriculture had restrictions on the use of hydrocyanic gas in Germany proper. In the East, the gas proved extremely useful in fumigating "gypsy dwellings and infested railway carriages." Paul Weindling, Epidemics and Genocide in Eastern Europe, 1890-1945, 94.
[654] Due to these new restrictions on hydrocyanic gas, Haber came into conflict with Degussa, which also wanted to maintain its rights to develop and employ the gas. Peter Hayes, From Cooperation to Complicity: Degussa in the Third Reich, 7.
[655] Paul Weindling, "The Uses and Abuses of Biological Technologies: Zyklon B and Gas Disinfestation Between the First World War and the Holocaust," 293.
[656] Kampfstoff Forschung Beiheft: Sitzungberichte 1925-1931 (BA-MA) RH/12/4, Sig 37, ort 22, mag H3EG, Reihe 125, Regal 2, Gefach 2
[657] Flury was instrumental in taking Fritz Haber's old equations for determining the lethality of different poison gases and testing it for Zyklon-B. He and Wolfgang Heubner developed the idea of a safe threshold for gas exposure. Scott Christianson, *The Last Gasp*, 96. For Flury and Hase's other interwar research, see: Versuche mit Nebelgerat Ausfuhr vom Nebelgerat 1930-31 (BA-MA) RH/12/4 sig 101 ort 22 mag H3EG Reihe 125 regal 2 gefach 4. ; Margit Szöllösi-Janze. "Pesticides and War: The Case of Fritz Haber", 105.

of the research to the newly restructured Reich Institute of Biology. By 1926, Haber had raised funds from the Reichswehr to staff the pharmacological laboratory with four chemists and four assistants.[658] As such, it is generally suspected that the laboratory worked on both civilian and military applications for gas throughout the Weimar era. Indeed, in 1924, Ferdinand Flury became the central contact for the Reichswehr in "coordinating weapons research."[659] Among his various research projects, Albrecht Hase worked on stabilizing Zyklon-A with supplementary funds from Degesch. In 1924, the scientists Walter Heerdt and Bruno Tesch succeeded in producing Zyklon-B in Hase's laboratory. Stabilized in pellet form, Zyklon-B was more easily detected and came neatly packed in sealed canisters.[660]

Contrary to his later claims, Fritz Haber remained active in poison gas research through the 1920s by arranging the funding for pesticide studies with potential military applications. Historian Fritz Stern has speculated that Haber may have even been involved in several military discussions about the future wartime applications of poison gas throughout the interwar period.[661] Furthermore, Haber maintained even more intimate connections to the chemical industry through his former employee Dr. Hugo Stoltzenberg. Stoltzenberg was born in 1883 in the Tirol region of Austria. After moving to Germany in his childhood, he attended the University of Halle to study law, later switching to chemistry and completing his dissertation in 1911. At the start of World War I, Stoltzenberg served as an infantry lieutenant on both the western and eastern fronts. After suffering five different war wounds, he was then selected by Haber to serve in the pioneer troops due to his pre-war work in chemistry. While installing a gas cylinder during one of Haber's chlorine test trials, the chlorine drum exploded, blinding

[658] Margit Szöllösi-Janze. "Pesticides and War: The Case of Fritz Haber", 107.
[659] Helmut Maier, Chemiker im "Dritten Reich", 263.
[660] Rh/12/9 Sig 26 1926 (BA-MA) Signatur 26, Standort 22, Magazin H3EG, Reihe 125, Regal 5, Gefach 2
[661] Fritz Stern, Einstein's German World, 134.

Stoltzenberg in the left eye. This prevented him from serving in combat positions through the remainder of the war, although he did participate in the first chlorine attack at the Second Battle of Ypres. After his injury, Stoltzenberg worked in Department A of Haber's KWI under Olivier Herzog.[662] Stoltzenberg also served as the director of the newly-built Adlershof shell filling plant before he was chosen to oversee the Klopper Works shell filling plant at Breloh.[663]

Because the Breloh plant was only fully operational in early 1918, it served the German military effort for less than a year. Stoltzenberg left Breloh in August 1918 and returned to the KWI where he worked under Professor Heinrich Wieland in Department D to synthesize new forms of mustard gas. After the final German military defeat, a train carrying gas shells exploded outside of the Breloh gas plant, effectively destroying much of the facility. German authorities reported this explosion as an accident, but it was more likely a method to prevent the Allied appropriation of the chemical facility.[664] This act of sabotage was part of a larger German military concern for post-war national security. With the German army's chemical production capacity vastly reduced, Stoltzenberg's future as a chemical weapons specialist appeared uncertain.

Since the Treaty of Versailles had reduced the size of the German military to 100,000 men and disbanded the General Staff, interwar national security in its broadest sense appeared increasingly concerning to many Germans. To oversee the changes required by the treaty, General Hans von Seeckt was appointed the Chairman of the Committee for the Organization of the Peacetime Army.[665] Seeckt had served under General Mackensen during the war and was

[662] Department A worked on gas mask material technology and inspected finished gas mask face-pieces. Jürgen Kalthoff and Martin Werner, *Die Händler des Zyklon B Tesch & Stabenow Eine Firmengeschichte zwischen Hamburg und Auschwitz*, 22.
[663] Gasschutz Lummitzsch, Otto: Meine Erinngerung an Geheimrat Haber, 1955 (MPG) Va 5 534.
[664] Rolf-Dieter Müller, "Die deutschen Gaskriegsvorbereitungen 1919-1945. Mit Giftgas zur Weltmacht?", 26.
[665] James S. Corum, The Roots of the Blitzkrieg: Hans von Seeckt and German Military Reform, 93.

central in planning Mackensen's victories on the Eastern Front. Several of these victories involved the use of Haber's gas cylinders, and Seeckt vocally supported new offensive military tactics that took advantage of modern technologies.[666]

While Seeckt oversaw the reduction of the German military, he remained deeply committed to monarchist politics, ensuring that the army retained connections to its imperial past. As such, he expressed the broadly shared militarist anger over the terms of the Treaty of Versailles and rejected the idea of Germany joining the League of Nations.[667] By 1920, Seeckt has created a special group (Sondergruppe R) in the Reichswehr that sought to continue the German arms industry in Soviet Russia. Such clandestine measures, Seeckt believed, would avoid confrontation with the French, who still controlled and aggressively policed the demilitarized Rhine. After the signing of the Treaty of Rapallo in 1922, these Reichswehr discussions on the outsourcing of military industries to Russia gained traction. As part of his general disregard for the terms of Versailles and his overwhelming concern for national security, Seeckt supported the secret continuation of German chemical weapons research and production.[668] A German military report from 1919 expressed the importance of continued training with chemical weapons:

> It can be said that the training has been enough, but a uniform management of gas protection is necessary for the whole empire in the event of a war on German soil. Even if

[666] James S. Corum, *The Roots of the Blitzkrieg: Hans von Seeckt and German Military Reform*, xiii. Seeckt was also an advocate for the new German military tactics that emerged at the end of 1918. These tactical changes attempted to force German soldiers into offensive mobile warfare. See: Michael Geyer, "How the Germans Learned to Wage War: On the Question of Killing in the First and Second World Wars" in *Between Mass Death and Individual Loss: The Place of the Dead in Twentieth-Century Germany*, 32

[667] Wolfram Wette, The Wehrmacht: History, Myth, Reality, 144

[668] In 1923, Seeckt created the Kommission für chemische Frage (or the commission for chemical questions) in the Reichswehr Ministry. This military commission, in coordination with Ferndinand Flury, attempted to conceptualize future chemical warfare, spending significant time and effort on the development of "artificial fog" during the interwar years. Kunstnebel "or artificial fog" was often a code term for poison gas, although commanders also hoped that particulate fog could create large smoke screens for hiding troops or ships. The Bundesarchiv-Militärarchiv holds numerous documents detailing the development and testing of artificial fog. For just one example, see: Versuche mit Nebelgerat usw Ausfuhr von Nebelgerat usw 1923-28 (BA-MA) RH/12/4 sig 99 standort 22 mag H3EG reihe 125 regal 2 gefach 4

> we do not want to employ chemical weapons in the future, the need to outfit troops with gas shell projectors and train them in gas protection still exists since there is no certainty that our future opponents would refrain from using gas.[669]

German commanders who shared Seeckt's sentiments believed that chemical warfare would be part of any future European war.[670] Thus, they had their soldiers train with gas shells and gas masks throughout the 1920s.[671] Gas training schools remained covertly operational and the sanitary services carefully documented and stored old rubber and leather gas masks from World War I (now referred to as Gas Mask 17 and 18 respectively).[672] At these gas schools, men practiced the gas mask training operations developed during the war at least twice a year.[673] Gas officers had the men enter gas chambers and sing or exercise for ten minutes to test the air-tight seal of their gas mask.[674] The successful use of the gas mask was meant to inspire soldier trust in its ability to resist chemical weapons.

Seeckt was not only intent on readying the Reichswehr for protective measures, but also wished to restart the military production and stockpiling of poison gases. A 1924 report from first lieutenant Joachim von Stülpnagel expressed the perceived importance of producing offensive chemical weapons. "Only when we are capable of covering enemy cities with the same amount of gas, will the enemy reconsider using chemical weapons....In a plethora of thoughts and questions, confusing and oppressive, strikes the historical responsibility for the liberation of our Land."[675] In order to jumpstart a weapons program, Seeckt turned again to Fritz Haber, who

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[669] Allgemeine Erfahrungen im Gaskampf 1919 (BA-MA) PH 14/226 LSFN 4875F.
[670] Hans von Seeckt, Vortrag von Gaskrieg (BA-MA) RH 2/2207, File HL 27 1923 1A.
[671] Gasschutzgerät 1919-1920 (BHK) Reichswehrbrigade 23 127.
[672] Bestimmungen Ausstattung des Heeres mit Gasschutzgerat 1920-24 (BA-MA) RH/12/4 sig 75 ort 22 Mag H3EG Reihe 125 Regal 2 Gefach 3.
[673] Befehle zum Schutz gegen Gas 1925 (BA-MA) RH/12/4 sig 135 ort 22 mag H3EG Reihe 125 Regal 2 Gefach 5
[674] Konstruktion, Erfindungen, Versuche, Formweranderungen 1931-32 (BA-MA) RH/12/4 sig 83 ort 22 mag H3EG Reihe 125 regal 2 gefach 4
[675] Jürgen Kalthoff and Martin Werner, Die Händler des Zyklon B Tesch & Stabenow Eine Firmengeschichte zwischen Hamburg und Auschwitz, 22.

suggested contacting Hugo Stoltzenberg in 1920.[676] Under the direction of Seeckt, Stoltzenberg began to sell chemicals from the now-defunct Breloh plant to foreign countries like the United States and Sweden. The Allies allowed this as a necessary post-war "cleaning-up process" that also involved Stoltzenberg dumping dangerous chemicals in the North and Baltic Seas and the peat bogs near Münster.[677] Between 1920 and 1925, Stoltzenberg's new Hamburg-based chemical factory, the *Chemische Fabrik Doktor Ingenieur Hugo Stoltzenberg*, served as the clearing house for still more chlorine, mustard gas, and ethylene.[678] Stoltzenberg's company began setting up offices in Berlin, Madrid, Moscow, New York, and Constantinople in order to sell German chemical weapons or chemical production systems to foreign militaries.[679] The large-scale movement between German chemical weapons depots, Stoltzenberg's seemingly legitimate factory, and international buyers also allowed for a certain level of clandestine chemical work. In 1924, Stoltzenberg established a second, larger factory at Gräfenhainichen, north of Leipzig, where he began to illegally produce mustard gas and chlorine for the German army.[680]

Stoltzenberg's first international obligation was a contract to serve as the chief engineer at Spain's new La Marañosa mustard gas plant, starting in 1921. The Spanish military used Stoltzenberg's mustard gas between 1922 and 1927 to subdue Abd el Krim's Rif rebellion in

[676] Haber suggested Stoltzenberg because the IG Farben factories were still carefully watched by the Allies in the demilitarized Ruhr zone and thus, they could not produce military gases without detection.
[677] Benjamin Garrett, "Hugo Stoltzenberg and Chemical Weapons Proliferation," 11.
[678] In 1923, Stoltzenberg's factory held about one tenth of the chemical weapons that Germany produced in 1918. Hans Günter Brauch and Rolf-Dieter Müller, Rolf-Dieter Müller, *Chemische Kriegführung--Chemische Abrüstung: Dokumente und Kommentare*, 27. During this period, Stoltzenberg repeatedly tried to obtain government approval to begin the production of hydrocyanic acids like Zyklon A and B. Paul Weindling, *Epidemics and Genocide in Eastern Europe 1890-1945*, 134.
[679] Hugo Stoltzenberg, Anleitung zur Herstellung von Ultra Giften, 3-8.
[680] Jürgen Kalthoff and Martin Werner, Die Händler des Zyklon B Tesch & Stabenow Eine Firmengeschichte zwischen Hamburg und Auschwitz, 23.

Morocco.[681] The Spanish crown viewed chemical weapons as an ideal tool for the suppression of colonial uprisings, and the aerial deployment of mustard gas against Moroccan rebels went nearly unnoticed by the rest of the world until the late 1920s.[682] After manufacturing new gas masks, designing new gas bombs, and creating the strategy for the first aerial gas attacks, Stoltzenberg was even granted Spanish citizenship in 1923. That same year, he received a contract from the Soviet Union to modernize their chemical industry and produce 35 million Reichsmark worth of chemical weapons. This contract was directly tied to Seeckt's desire to outsource German armaments production to Russia.[683] With Colonel Max Bauer serving as one of the primary liaisons in the endeavor, Stoltzenberg set about creating a joint German-Russian chemical factory at the Volga River town of Saratov.[684] Named Bersol AG, the collective project aimed at turning an old chlorine plant into a modern mustard gas facility.[685] The Reichswehr subsequently sent German engineers and chemists to Russia in order to undertake government directed chemical weapons research, with special emphasis on the aerial delivery of chemical weapons. At the same time, these technicians were instructed to impart their specialized knowledge to their Russian counterparts.

[681] In 1924, the Spanish ordered thirty tons of mustard gas from Stoltzenberg's German factory. Sebastian Balfour, *Deadly Embrace: Morocco and the Road to the Spanish Civil War*, 147

[682] Between May and Semptember 1924, the Spanish dropped 24,104 bombs on the Moroccan rebels. Over the course of 21 days in May 1925, the Spanish dropped 3,000 mustard gas bombs on the town of Anjera alone. The German Captain Ulrich Grauert and Lieutenant Hans Geschonnek were sent to study of Spanish use of gas bombs. The ultimate report was that these attacks "measured by German standards, [were] completely unsystematically carried out." Daniel R. Headrick, Power over Peoples, 323. See also: Aram Mattioli, "Entgrenzte Kriegsgewalt. Der italienische Giftgaseinsatz in Abessinien 1935-1936", 317. ; Rudibert Kunz and Rolf-Dieter Müller, *Giftgas Gegen Abd El Krim: Deutschland, Spanien und der Gaskrieg in Spanisch-marokko, 1922-1927*, 72.

[683] Vasilis Vourkoutiotis, Making Common Cause: German-Soviet Secret Relations, 1919–22, 172-173.

[684] The Reichskabinett gave the military 60 million Reichsmarks for the project in Russia. This was part of the larger GEFU (Gesellschaft für Förderung gewerblichr Unternehmungen) deal, which attempted to create German industrial sites for the manufacture of airplanes and chemicals in Russia. German General Kurt von Schleicher set up GEFU in 1921 and funneled 75 million marks into Russia. Rolf-Dieter Müller, *Das Tor zur Weltmacht: Die Bedeutung der Sowjetunion für die deutsche Wirschafts- und Rüstungspolitik zwischen den Weltkriegen*, 141.

[685] Benjamin Garrett, "Hugo Stoltzenberg and Chemical Weapons Proliferation," 11.

The Bersol factory succeeded in producing mustard gas, but Stoltzenberg's role in the endeavor ended in 1927 when the Soviets expressed a desire to take over all aspects of production. After four years of joint work, both the Germans and the Russians soured on the deal, describing each other as unreliable partners. This fallout was further precipitated by the IG Farben concern, who leaked the Bersol project to the foreign press in order to reduce Stoltzenberg's chemical business competition. The *Manchester Guardian* reported the project on December 3, 1926, forcing the Germans to scale down their involvement in order to avoid international confrontation.[686] After 1927, the Reichswehr removed Stoltzenberg from his position in Russia, liquidated the project, and dismantled Stoltzenberg's Gräfenhainichen factory. After Stoltzenberg's professional failure, Fritz Haber cut ties with his former protégé and he was left in financial ruin. For the remainder of his career, Stoltzenberg was compelled to seek independent armament contracts from foreign countries.[687]

Regardless of the Bersol failure, the German military continued other chemical weapons projects in the Soviet Union, including the Tomka chemical test school, located to the northeast of Saratov. The school was erected in 1927, and by 1929, thirty-three expert German chemists resided and worked there. Up until 1933, these men tested everything from the chemical resistance of rubber clothing to the feasibility of aero-chemical attacks.[688]

While the Reichswehr would have undoubtedly preferred to conduct these tests on German soil, Allied supervision prevented direct cooperation with the major German chemical companies. Separated from government contracts in the wake of World War I, these chemical

[686] Schweer, Die Geschichte der Chemischen Fabrik Stoltzenburg bis zum Ende des Zweiten Weltkrieges, 79.
[687] Stoltzenberg received contracts from Yugoslavia and Brazil in the late 1920s and 1930s. See: Zahlungsschwierigkeiten der chemischen Frabrik Dr Hugo Stoltzenberg, 1926. (BArch-B) R 43-I/420
[688] Tomka 1930-31 (BA-MA) RH/12/4 sig 54 ort22 mag H3EG reihe 125 regal 2 gefach 3 ; Tomka Bericht V 1931-33 (BA-MA) RH/12/4 Sig 55 ort 22 mag H3EG Reihe 125 Regal 2 Gefach 3

companies sought protection and stabilization on the reopened world market. Escaping mostly unscathed from the disarmament of the Military Inter-Allied Control Commission, Bayer, BASF, and Hoechst remained giants in the world of chemical production. Nevertheless, they chose to merge their smaller regional alliances into IG Farben in 1925. As part of the merger, BASF, Bayer, and Hoechst now made up 27.4% of the interest group's holdings. Agfa represented 9%, Chemische Fabrik Griesheim-Elektron 6.9%, and Chemische Fabrik vorm. Weiler Ter Meer 1.9%.[689] Primarily under the leadership of BASF's Carl Bosch and Bayer's Carl Duisberg, the IG generated two thirds of all German chemical industry profits from 1925 to 1929.[690] Valued at 1.4 million Reichsmark and maintaining a workforce of about 100,000 people in 1926, the chemical group was the largest enterprise in all of Europe and the fourth largest in the world. The IG factories returned to their pre-war focus on dye production, but they retained the ability to manufacture large amounts of chemical weapons out of their raw materials and byproducts. They also forged connections to the pesticide industry, buying 42.5% of Degesch in 1930 and contributing a stabilizing agent to the production of Zyklon-B.[691] Throughout the early 1930s, Degesch sold Zyklon-B as an industrial delousing product that was released in their own patented sealed chamber. None of this activity, however, raised significant Allied suspicion that the IG companies might renew their production of chemical weapons. In a discussion with the German journalist Harry Graf Kessler, a French chemical weapons inspector proclaimed that "Everything is all right with the German chemical industry… There can be no question of it manufacturing poison gas or being in any way not completely back on a peace-time footing."[692]

[689] Helmuth Tammen, Die I.G. Farbenindustrie Aktiengesellschaft (1925-1933), 195.
[690] Peter Hayes, *Industry and Ideology*, 17. ; Peter Hayes, "Carl Bosch and Carl Krauch: Chemistry and the Political Economy of Germany, 1925-1945", 353-354. Hugo Stoltzenberg's factories were some of the IG's major competitors.
[691] Peter Hayes, From Cooperation to Complicity: Degussa in the Third Reich, 275.
[692] Harry Kessler, *Berlin in Lights*, 249.

During this same period, the German gas mask companies also sought to stabilize their business. With the reduced demand for gas masks, the Auergesellschaft focused more intensely on the production of lightbulbs through the cooperative OSRAM company, which coordinated the production of Auer, Siemens & Halske, and AEG in 1923. Starting in 1926, OSRAM manufactured incandescent mantles in Auer's Oranienburg factory, located outside of Berlin. While lightbulbs became their primary focus, Auer also continued a reduced level of gas mask production. In fact, in 1920, Auer created the Industriemasken-Vertriebs-GmbH with the Hanseatischen Apparatebau and the Drägerwerks to organize the repurposing of World War I gas masks for industrial purposes. Dr. Karl Quasebart joined Auer's managing board in 1922 and succeeded in increasing industrial demand for Auer gasmasks, especially in the mining industry.[693] Formerly an engineer in a mirror factory and a member of the commission that organized the surrender of German heavy machinery after the war, Quasebart received his doctorate in chemistry from the Technical University in Aachen.[694] He then became a professor of metallurgy at TU Aachen and helped to found the German Glass Technology Society before joining Auer.[695]

At the end of World War I, the Dräger company was forced to lay off most of its employees and end its gas mask production. The company lost its international patents and inflation continued to hurt its profits through 1923. In order to remain solvent, the company produced linens, clothing, and curtains until 1924 when its profits stabilized and it was able to return to respirator production with 200 employees.[696] Dräger then began to market their

[693] Peter Hayes, From Cooperation to Complicity: Degussa in the Third Reich, 127.
[694] Wilhelm Haase-Lampe, Handbuch für das Grubenrettungsweser Sauerstoffretttungswesen und Gasschutz, Gerätebau und Organisation seit 1924, 692.
[695] Karl Quasebart (1882-1949) would be made the chairman and chief of military production for Auer in 1937. Helmut Maier, Chemiker im "Dritten Reich", 113.
[696] Michael Knoll, Die Drägerwerke im Dritten Reich, 6.

products more exclusively to the mining industry, thus coming into direct competition with the Auergesellschaft.[697] Throughout the 1920s, the two companies entered into numerous cartel agreements, patent disputes, contracts, and legal battles in the process of negotiating the reduced gas mask market.[698] Looking beyond of the borders of Germany, Dräger maintained a greater focus on rebuilding its international markets, and by 1928, Heinrich Dräger had reopened offices in the United States and the Soviet Union.[699] Alongside these legitimate enterprises, both Dräger and Auer received several small contracts from the Reichswehr that violated the terms of the Treaty of Versailles.[700] Taking these contracts without much compunction, Auer developed a new military gas mask in the mid-1920s (the Gas Mask 24 or GM 24).[701] They further created a gas training grounds at their factory in Oranienburg and provided ancillary products for the production of mustard gas.[702]

Anticipating future conflict over military contracts, Auer and Dräger negotiated the division of the gas mask market in 1929. In all forthcoming government contracts, Auer would produce 65% and Dräger 35% of gas masks ordered by the Rsichswehr. The two companies would split all contracts for other gas protection devices equally and Dräger would produce 65% of all other oxygen-providing equipment. Dräger further retained sole rights to all contracts for

[697] Wilhelm Haase-Lampe, Sauerstoffrettungswesen und Gasschutz Gerätebau und Organisation in ihrer internationalen Entwicklung: Gerätebau, 13.
[698] Bernhard Lorentz, Industrieeltie und Wirtschaftspolitik 1928-1950: Heinrich Drüager und das Drägerwerk, 151.
[699] Bernhard Lorentz, Industrieeltie und Wirtschaftspolitik 1928-1950: Heinrich Drüager und das Drägerwerk, 39.
[700] Chemische Abteilung II 1927 (BA-MA) RH/12/4 Sigantur 4, Ort 22, Magazin H3EG, Reihe 125, REgal 2, Gefach 2
[701] Peter Hayes, *From Cooperation to Complicity: Degussa in the Third Reich*, 127. The Gas Mask 24 allowed for greater movement, featured a longer-lasting filter, and reportedly reduced the interior temperature of the mask. RH/12/9/20 1930 (BA-MA) Signatur 20, Standort 22, Magazin H3EG, Reihe 125, Regal 5, Gefach 2
[702] Bestimmungen Ausstattung des Heeres mit Gasschutzgerat- Beschaffung, Versendung, Verwaltung und Unterbringung 1920 (BA-MA) RH/12/4 sig 77/b ort 22 mag H3EG Reihe 125 Regal 2, Gefach 4

medical respirators.[703] The anticipation of future military contracts would prove decisive in keeping the two companies afloat during the Great Depression.[704]

Since 1916, the German government had seriously discussed the protection of civilians in the event of a large-scale gas attack. But in the 1920s, it remained unclear whether the gas mask served as the best form of civilian defense. A military report from 1925 read:

> Gas protection for the population is urgently needed wherever enemy air raids are most likely to take place. The gas protection device for the civilian population must be easy to handle and durable. The gas mask does not meet these conditions; the mass provision of the various sizes, the ease of losing them, the need to check them in gas chambers for a good fit, the periodic tests for gas impermeability, and their ineffectiveness with the slightest damage to the mask fabric make them unsuitable as protection for the masses. This does not mean that it is not the best individual protection for certain population groups, in particular for those who cannot stop their activities in gas such as public security officers, the fire brigade with its detachment troops, doctors, public transport authorities, etc.[705]

Regardless of the mask's imperfections, the Reichswehr Quartermaster Wilhelm Groener renewed large military gas mask contracts with Dräger and Auer in 1928. The first contract would pay 1.45 million Reichsmark for the fabrication of 170,000 new Gas Mask 24s.[706] The reintroduction of large-scale standardized gas mask production further encouraged renewed gas training courses. Both Auer and Dräger provided these courses at their factories and through traveling seminars.[707] The companies advertised their courses and products in their respective trade journals; the Dräger company produced the triannual *Drägerheft* under the management of the director of the literature department, Wilhelm Haase-Lampe, while the Auergesellschaft

[703] Peter Hayes, From Cooperation to Complicity: Degussa in the Third Reich, 127.
[704] Auergesellschaft Oranienburg, 1929. (BL) Rep 43 Eberswalde Nr 129
[705] Bestimmungen Ausstatlung des Heeres mit Gasschutzgerat (BA-MA) RH/12/4 Sig 76/a ort22 reihe 125 regal 2 Gefach 4
[706] Berichte Korrespondenz von Bauer an Letcher und Strauss (Röhm Bestand) 1928-33 (EA) RHT.2./6. See also: Bernhard Lorentz, *Industrieeltie und Wirtschaftspolitik 1928-1950: Heinrich Drüager und das Drägerwerk*, 149.
[707] Ausbildung der Johanniterschwestern im Gasschutz 1932 (LBWH) P 7/2 Bü 466. This source describes a travelling Dräger course that is given to a group of nuns in Stuttgart in 1932.

began producing a monthly sales publication in 1919 called *Die Gasmaske*.[708] By 1929, *Die Gasmaske* had become a full trade journal, complete with articles on firefighting, industrial gas exposure, and mining. However, both the *Drägerheft* and *Die Gasmaske* dedicated the majority of their pages to civilian gas protection. In doing so, they helped to make potential gas threats a national concern and to reignite debates over civilian gas mask distribution.

Restriction or Resistance: Waldus Nestler, Gertrud Woker, and the Pacifist Response

Regardless of the pervasive militarism in Wilhelmine Germany, German pacifists and pacifist organizations did maintain a small public presence prior to World War I. Most notably, Alfred Fried founded the *Deutsche Friedensgesellschaft* (or German Peace Society) in 1892. The society gained a modest membership, especially in the southwest of Germany, but many Germans remained skeptical of any political group that called for the self-imposed weakening of the German state.[709] The Wilhelmine government held a similar view and kept a close watch on the German Peace Society's activities. Despite state supervision and financial difficulties, the organization maintained a membership of ten thousand Germans by 1914, with just under one hundred different local chapters.[710] However, most of these members and chapters were not particularly active; only a few hundred dedicated members drove the society's mission to eradicate war through disarmament and international arbitration. With public meetings, petitions, and publications, the German Peace Society's committed cadre attempted to curry favor with politicians and the general public. These attempts were largely met with ambivalence or scorn, in

[708] Welf Böttcher and Martin Thoemmes, *Heinrich Dräger: Eine Biographie,* 59-60.
[709] Roger Chickering, "The Peace Movement and the Religious Community in Germany, 1900-1914", 301.
[710] Ibid.

part due to a broad societal respect for the German military.[711] While the Social Democrats were the most sympathetic to such calls for peace, even they viewed the pacifists as naïve, and chided them for failing to understand the realities of international relations. German clergymen also mostly chose to avoid the ranks of the Peace Society primarily due to the nationalist tone of the Evangelical Church and the prevalence of Jews and women among the pacifist chapters.[712]

In the years leading up to World War I, the revisionist socialist Eduard Bernstein observed that the European powers were engaging in a "cold war" that could lead to great tragedy.[713] The international arms race, conducted most aggressively by Great Britain and Germany, would unleash a massive and deadly war if sparked by violence.[714] Clearly this concern was largely ignored when the German state went to war in 1914. In fact, most Germans unequivocally supported the declaration of war, rallying around the state's decision to declare itself "under siege" and placing nearly all public control in the hands of the military. In the first months of the war, this centralization of state power had little effect on the German Peace Society, which still faced the same low level of censorship that it did in the 1890s. However, when the war continued through 1915, pacifists became more vocally committed to an immediate armistice. In fact, in April of that year, German pacifists attended an international peace conference at the Hague that created both the Central Organization for Durable Peace and the International Committee of Women for Permanent Peace.[715] Both of these international

[711] See: Ute Frevert, *A Nation in Barracks*, 77.
[712] Roger Chickering, "The Peace Movement and the Religious Community in Germany, 1900-1914", 305. ; Roger Chickering, *Imperial Germany and a World Without War: The Peace Movement and German Society, 1892-1914*, 397.
[713] The pacifist author Wilhelm Lamzus also foretold of the carnage of World War I: See: Wilhelm Lamzus, *Das Menschenschlachthaus*, 75.
[714] John A. Moses, "German Bourgeois Pacifists and World War I", 71-72.
[715] Internationale Freuenliga für Frieden und Freiheit, *Bericht des Internationalen Frauenkongresses*, 1919. Women were an integral part of the peace movement both during and after the war. While formal pacifist activities were banned in Germany after 1916, pacifist art constructed the image of German women as bereaved and suffering mothers. Artists like Käthe Kollwitz helped to galvanize the sense of pain that the war had caused and to raise

organizations aimed at stopping forced annexations, respecting the rights of national minorities, and arbitrating international disputes.

The platform of these larger international organizations inspired members of the German Peace Society to publicly question the German annexation of the territory gained in the early stages of the war. This motivated a harsh backlash from the state, which began to actively suppress the pacifist groups in 1916.[716] State authorities banned the printing of pacifist journals and intercepted correspondence throughout the remainder of the war. At the same time, pacifists distanced themselves from the normally peace-promoting Social Democrats due to the SDP's willingness to fund the German war effort. This led to the creation of the much smaller Independent Social Democratic Party, which housed many of the more radical pacifists. While the state surveillance of peace groups eased off in 1917, the formal restrictions on pacifists were not lifted until the end of the war.

Many pacifists saw the end of World War I as a new beginning, and they officially reformed the German Peace Society in 1919.[717] However, much work remained to be done in disarming European nation-states. In a forward to the pacifist Wilhelm Lamszus' 1919 book *Das Irrenhaus,* Carl von Ossietzky wrote:

> The old archenemy of all civilization and all human happiness is still not dead. The dragon drifted back into the cave full of red human blood. For how long? The atmosphere is still filled with poisonous and stuffy gases. Not yet enough hands are ready to fling new torches.[718]

Ossietzky served as the secretary for the German Peace Society during the 1920s, but his commitment to pacifism made him skeptical of the Social Democrats' commitment to old

questions on the home front about the war's larger rationale. See: Claudia Siebrecht, *The Aesthetics of Loss: German Women's Art of the First World War,* 196.
[716] James D. Shand, "Doves Among Eagles: German Pacifist and their Government during World War I", 98.
[717] Shelley E. Rose, "The Penumbra of Weimar Political Culture: Pacifism, Feminism, and Social Democracy", 317.
[718] Wilhelm Lamszus, *Das Menschenschlachthaus,* 89.

governmental structures. Thus, Ossietzky could be described as part of the "homeless left," a term used to explain the fractured nature of leftist politics in the Weimar Republic and the difficulty of merging pacifism with preexisting political parties.[719]

The immediate post war years saw an uptick in German interest and support for pacifist political groups.[720] Indeed, in 1920, pacifists began to stage so-called "No-More-War demonstrations," which attracted hundreds of thousands of supporters across the nation.[721] These rallies began the process of both galvanizing transnational pacifist networks and linking individual pacifists to sympathetic organizations of feminists and Social Democrats across Germany. One such group was the International Committee of Women for Permanent Peace, renamed the Women's International League for Peace and Freedom in 1919, which could count such well-known peace activists as Jane Addams and Helene Stöcker as members. Through publications like the Women's International League's *Pax et Libertas*, the German Peace Society's *Völker-Friede,* and the Social Democrats *Vorwärts*, pacifists throughout Germany were able to advocate for total disarmament, the end of conscription, and the banning of the right to declare war.[722] However, the domestic instability caused by the 1923 French occupation of the Ruhr district encouraged the German government to prohibit all public demonstrations, thus

[719] Anton Kaes, Martin Jay, Edward Dimendberg, eds., *The Weimar Republic Sourcebook*, 86-87. Ossietzky's journalism was crucial in uncovering Hans von Seeckt's plans to continue German arms production in Russia. See also: Istvan Deak, *Weimar Germany's Left-wing Intellectuals: A Political History of the Weltbühne and its Circle*, 121.
[720] Regina Braker, "Helene Stocker's Pacifism in the Weimar Republic: Between Ideal and Reality", 72. This uptick is support also saw a greater geographical diversity in pacifist movements. For instance, the founders of the German-speaking Alsatian journal *Der Eiserne Mann* " plead for post-war pacifism, especially noting the terrible impact of poison gas in the last war and that future wars would only be more horrendous as weapons technology advanced." Chritopher J. Fischer, Alsace to the Alsatians? Visions and Divisions of Alsatian Regionalism, 1870-1939, 158.
[721] Shelley E. Rose, "The Penumbra of Weimar Political Culture: Pacifism, Feminism, and Social Democracy", 317.
[722] In the pages of Vorwärts, for instance, SDP Reichsbanner veterans supported the broader movement of pacifism. Reflecting on their experience in World War I, one wrote that when he looked "through the wire entanglements, and barrages, the clouds of gas and uniforms," he did not see "enemies" but rather "the human being, the brother." Benjamin Ziemann, Contested Commemorations. Republican War Veterans and Weimar Political Culture, 241. Internationale Freuenliga für Frieden und Freiheit, *Bericht des Internationalen Frauenkongresses*, 1919.

turning No-More-War rallies into much smaller private gatherings. By 1925, the No-More-War movement had lost its public recognition and the Social Democrats turned away from independent pacifist activities towards a greater concern for Marxist-inflected class struggle.[723]

As such, Germans with pacifist sympathies remained politically divided throughout the 1920s. The major point of contention was whether the ultimate arrival of socialism or communism justified the use of violence. Clearly the communists believed so, as did many of the more radical socialists, but those committed primarily to pacifism disagreed, often completely unconcerned with Marxist theory. This ideological divide frequently fell along class lines, with more middle-class activists gravitating towards pacifist-first and moderate Social Democratic policies and more working-class activists drawn towards the Communist Party. This difference also had major implications for the rhetorical arguments surrounding disarmament throughout the 1920s.

While public concerns over disarmament had lulled briefly in 1923, the momentous 1924 publication of Ernst Friedrich's *Krieg dem Kriege!* visually reminded Germans of the cost of industrialized war. Friedrich's photobook presented images of dead, dying, and mutilated World War I soldiers in order to refute the typical postwar stories of soldier honor and bravery that attempted to make sense of the fighting.[724] The gruesome images of death and destruction helped to make Friedrich's book a national sensation and to designate the ten-year anniversary of mobilization the "anti-war year."[725] The first 70,000 copies of Friedrich's book sold out in the first few minutes of availability and the leftist journalist Kurt Tucholsky wrote of the book, "no written work can come near the power of these images....Whoever sees these and does not

[723] Shelley E. Rose, "The Penumbra of Weimar Political Culture: Pacifism, Feminism, and Social Democracy", 319. The SDP's return to a stronger commitment to Marxism was partly due to the reunion with the USPD in 1922.
[724] Ernst Friedrich, *Krieg dem Kriege!*, 130
[725] Dora Apel, "Cultural Battlegrounds: Weimar Photographic Narratives of War", 49.

shudder is not a human being, but a patriot."[726] Friedrich claimed that his photobook could reveal the true horrors of war and inspire Europeans to shun future warfare. Photography, he argued, maintained the ability to evoke greater emotion and was a more honest medium than text. Friedrich's self-proclaimed anarcho-pacifism was not strictly Marxist in nature, and his book spoke directly to pacifists without alienating those on the political left.[727] Following the success of his book, Friedrich opened the International Antiwar Museum in Berlin, which was then quickly shut down by the Berlin police. Highlighting the German state's attempt to control the memory of the war, the police deemed Friedrich's images of destruction far too shocking for public exhibition.

While the publicity surrounding Friedrich's book began to die down in 1925 and nationalist authors presented heroic counter-narratives of the war that had great public appeal, *Krieg dem Kriege!* focused pacifist attention more acutely on the deadly methods of modern warfare. A significant part of Friedrich's condemnation was levied at poison gas, one of the most feared and mythologized weapons of World War I. Interestingly, not all pacifists agreed with Friedrich's technological critique. For instance, Ludwig Quidde, a prominent member in the German Peace Society, argued that modern military technology could actually dissuade nations from waging future wars. In his summarizing essay "Landfriede und Weltfriede" Quidde took a rather optimistic stance by proposing that it was precisely the horror of weapons like poison gas that would prevent future conflict.[728] Regardless of dissenting voices like Quidde's, by 1924, a small but dedicated anti-gas movement had developed out of the larger pacifist call for disarmament. Reformers rightly claimed that European chemical companies and militaries still

[726] Kurt Tucholsky, "Waffe gegen den Krieg." *Die Weltbühne* (23 Feb. 1926).
[727] Dora Apel, "Cultural Battlegrounds: Weimar Photographic Narratives of War", 54.
[728] Echoes of Quidde's belief in the peaceful assurances afforded by modern weapons of mass destruction can be found in Ronald Reagan's Strategic Defense Initiative and the concept of mutually assured destruction.

held massive quantities of chemical weapons from the war. The fighting on the Western Front had shown how these weapons could kill men immediately or slowly destroy the human body from the inside out.

The development of a semi-formalized anti-gas movement led to a slew of fiction and non-fiction publications that attempted to awaken the German public to the dangers of chemical weapons.[729] Pacifists who wished to appeal to the public's sense of reason called for international legislation that could ban future chemical warfare. This reflected a belief in the international and transnational networks that had helped to build the formal pacifist groups before and after World War I. However, many Germans were skeptical of the effectiveness and fairness of international cooperation. Certainly, the 1899 and 1907 Hague Conventions' attempts to preemptively ban chemical weapons did little to prevent the outbreak of gas warfare in World War I. Even the pacifist Karl Helmut Pfuhl admitted, "The danger of the violation of such a [gas warfare] prohibition would not be great; every city, due to its preparation for civilian gassing, would be able to respond to an attack on its civilian population without having to make any special arrangements."[730]

In the quest to provide popular support for international arms limitations, anti-gas pacifists regularly criticized the monetary cost and difficulties associated with gas protection. Relying on the public's distrust of war profiteering, the pacifist Franz Carl Endres claimed that the chemical industry stood to make immense sums of money by outfitting Germans with gas protection devices like the gas mask. According to Endres, gas protection was a big scam that could never protect civilians in the event of a gas bombing. He wrote, "Industry dictates, and

[729] Andreas Pehnke, Der Hamburger Schulreformer Wilhelm Lamszus (1881-1965) und seine Antikriegsschrift "Giftgas über uns" : Erstveröffentlichen des verschollen geglaubten Manuskipts von 1932, 52.
[730] Karl Helmut Pfuhl, *Gaskrieg und Völkerrecht*, 57.

scholars and militants are not astute enough to realize that they are just puppets of big business."[731] In the end, Endres wrote, only broad international cooperation could truly protect civilians from chemical attacks.

A second major rhetorical strategy for German disarmament relied on scare tactics that made more dubious assertions. Reflecting on the technological advancement of airplanes during and after the war, several anti-gas reformers argued that gas could now be aerially dropped into any major civilian population center, effectively wiping out large numbers of innocent people. For instance, the pacifist Kurt Hiller wrote:

> One should not sing about heroes who put on the uniform in barbaric compulsion. The poison gas war of the future will overshadow the uniform and the fronts. Air squadrons will thrust to the center of a country and gain access to big cities. Nobody will be immune to the annihilation any more—not women, not the elderly, and not children.[732]

While European militaries certainly sought the ability to conduct devastating aero-chemical raids, scientific studies from the 1920s revealed that gas bombs struggled to create dense enough clouds to effect people on the ground. As military engineers learned in World War I, gas clouds had to be extremely thick in order to hang together and have any deleterious effect.[733] Furthermore, weather and topography still had major impacts on the effectiveness of gas attacks.[734] One German chemical weapons report from 1923 read:

> Experiments in the test area, however, had already shown that with the materials so far discovered it would be almost impossible to spray a whole town with the chemical in such a way that a sufficient number of mouths would be reached simultaneously causing a panic-like terror.[735]

[731] Franz Carl Endres, Giftgaskrieg: die grosse Gefahr, 39.
[732] Kurt Hiller, *Der Sprung ins Helle*, 95.
[733] Dräger Gasschutz im Luftschutz: Individual-Gasschutz Kollektiv-Gasschutz; Charakter des Chemischen Krieges Chemische Kampfstoffe; Organisation des Luftschutzes Städtebau und Luftschutz, vol 2, 50-51.
[734] Hugo Stoltzenberg Fabrik, "Gibt es ein Gaskampf?"
[735] Alexander Kluge, *The Air Raid on Halberstadt on 8 April 1945*, 121.

Regardless of the realities of poison gas, pacifists often relied on apocalyptic visions like Hiller's to express the dire consequences of chemical warfare. In another instance, Hans Harder-Hamburg wrote:

> Only a few today doubt, despite some melodious declarations, that a future war will feature the use of poison gas. Nevertheless, some still argue that war is uglier and more brutal for all of civilization when poison gas is not used. In our opinion, there can be no doubt that the advances in toxic gas chemistry and aircraft technology since 1918 are so great that the brutal effects of a poison gas can hardly be understood.[736]

Indeed, two of the most strident anti-gas reformers, Waldus Nestler and Gertrud Woker, took a similar approach that utilized apocalyptic imagery to inspire pacifist sentiment. However, Nestler and Woker were uniquely perceptive of the fact that gas protection posed an equally dangerous threat to international peace. With their assurances of national security through seemingly no-loss technological solutions, gas protection scientists and engineers offered Germans a tenuous peace that relied on a defensive arms race. Only the nation that could produce the most gas masks, air raid shelters, anti-aircraft weapons, etc. would be able to survive the inevitable chemical war. Nestler wrote in his pacifist tract, *Giftgas über Deutschland*, that "the air raid people are the biggest enemies of our security today, because they calm us down with silly gimmicks that prevent humanity from becoming aware of the tremendous danger and to take corresponding measures against it."[737] Nestler further pointed to the absurdity of training civilians to use gas masks:

> Imagine children turning to the psychic discipline that the battle-hardened men sometimes lacked—the children crying, moaning, wheezing. I would like to see the mother staying calm and not losing her head! They will pull the mask from their faces to comfort the little ones, and death will seize the infants! For the babies, you need to

[736] Hans Harder-Hamburg, "Der Gaskrieg im Völkerrecht", 137

[737] Waldus Nestler, Giftgas über Deutschland, 28. See also: Andreas Pehnke, Der Hamburger Schulreformer Wilhelm Lamszus (1881-1965) und seine Antikriegsschrift "Giftgas über uns" : Erstveröffentlichen des verschollen geglaubten Manuskipts von 1932, 57. Waldus Nestler was born in 1887 in Meissen. He studied theology at several universities before serving as a gas protection officer in World War I. After the war, he taught Latin, German, and Practical Philosophy in Leipzig while increasing his participation in religiously-minded pacifist organizations.

> construct a gas-safe box with filter and ventilation in which you can put their cribs. And the poor mother then stands by for hours and pumps air in and out, unaffected by the screaming and whimpering. No, the emotional situation will be so terrible that few people will cope with it.[738]

Pacifist appeals like Nestler's often relied on gender norms in order to make their case for international peace. By describing women and children as completely helpless, Nestler could point to the impossibility of complete gas protection and call on German men to defend a patriarchal hearth and home through the only means available, namely international legislation. Such arguments elided the experiences of the thousands of female nurses who regularly and effectively dealt with poison gas in the field hospitals of World War I.[739] These women were fully aware of the misery of gas death, and had used the gas mask with sufficient skill to avoid a similar fate.

Not all anti-gas activists who appealed to patriarchal and familial protection were men. The chemist Gertrud Woker also used rhetorical tropes the featured the suffering of women and children under gas. Harkening back to the World War I ideal of the "motherly heroine," Woker posited all German women as mothers, only valued insofar as they served a reproductive and nurturing purpose during the moment of attack.[740] In 1915, Woker, by then a professor of chemistry at the University of Bern, co-founded the Women's International League for Peace and Freedom (or WILPF) at the Hague Conference.[741] She then served as the co-leader the Swiss

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[738] Waldus Nestler, *Giftgas über Deutschlan*d, 17. For similarly gendered interwar language in Austria see: *Giftgas über Österreich.* (Wien: Verlag der Wiener Volksbuchhandlung, 1932)

[739] Women's war service was frequently elided in pacifist writings from the interwar period. Writers often contrasted the "pure" image of the soldier with the "corrupting" image of the whore to express the dangers of war. Dora Apel, ""Heroes" and "whores": the politics of gender in Weimar antiwar imagery," 366, 379.

[740] The use of children for a gendered rhetorical strategy was also commonly employed in British interwar discussions of aero-chemical war. See: Susan R. Grayzel, "The Baby in the Gas Mask: Motherhood, Wartime Technology, and the Gendered Division Between the Fronts During and After the First World War," in *Gender and the First World War*, 130.

[741] Gertrud Woker was born in 1903 in Bern, Switzerland. The daughter of a theology and history professor, Woker received an exemplary education and was able to study organic chemistry at the University of Bern. She was the first Swiss woman to earn a doctoral degree in chemistry and then the first women to obtain a university position in

branch with Clara Ragaz.[742] Given her background in chemistry, Woker was particularly qualified to discuss the nature of poison gases, and she remained especially dedicated to the eradication of chemical weapons. After visiting the American Gas Armament Center during the 1924 WILPF Conference in Washington D.C. and realizing the dire threat of national chemical arsenals, Woker served on the WILPF's Committee on Chemical Warfare. This committee sent memorandums to delegates at international disarmament conferences in the attempt to create legislation that might limit future chemical weapons use. While the WILPF normally advocated for the end to all violence, Woker convinced the organization to support international legislation that merely sought limitations on poison gas. Woker believed that such pointed action was required since chemical weapons were such a uniquely horrifying form of warfare.[743]

Reflecting her scientific training, Woker's writings and presentations spoke directly to the gas specialists who came out of World War I with expert knowledge on poison gas. She accused these men of downplaying the dangers of chemical weapons and providing false promises of gas protection. In fact, in 1925, Woker argued that the structures of the increasingly specialized German scientific community were inherently tied to militarism, nationalism, and war.[744] She further pointed out that gas protection for an entire nation was still unavailable, writing that, "Anyone who is able to grasp the great importance of this question for the future of the human race will be convinced that we must try to explain to all people the fearful dangers of

a German-speaking country. While she pioneered the study of biochemistry in her scholarly pursuits, Woker remained deeply committed to both women's suffrage and pacifism.

[742] For more on Gertrud Woker's life see: Gerit von Leitner, Wollen wir unsere Hände in Unschuld waschen? Gertrud Woker (1878-1968) Chemikerin & Internationale Frauenliga 1915-1968 (Berlin: Weidler Buchverlag, 1998)

[743] Jo Vellacott, "Feminism as if All People Mattered: Working to Remove the Causes of War, 1919-1929", 390.

[744] Gertrud Woker, *Wissenschaft und wissenschaftlicher Krieg*, 3.

the future war."[745] Ultimately, Woker claimed that offers of gas mask distribution and other forms of gas protection only served to normalize and justify a future aero-chemical war.

Woker further chastised any scientist who maintained Fritz Haber's claim that chemical weapons were more humane than traditional explosives. Based on her trip to the American Gas Armament Center, Woker was convinced that effective aero-chemical attack was indeed possible. In scientific literature reviews, she argued that research from World War I supported this belief.[746] Furthermore, Woker correctly stated that gas casualties from the war were underreported because many gassed men were sent back to the front with mild symptoms and many of the asphyxiation casualties were recorded as shell deaths. In her largest text on chemical warfare, *Der kommende Giftgaskrieg* (or *The Future Gas War*, 1925), Woker claimed that scientists who downplayed the pain and suffering of poison gas did so out of personal shame. According to Woker, these specialists had personal financial interest in the continued development of poison gas and they chose to soothe the public's conscience in order to resume their work.[747]

During a 1926 WILPF conference in Frankfurt, Woker passed a resolution on chemical warfare that unequivocally stated that: there was no effective gas protection for civilian populations, that international agreements were not guarantees against chemical warfare because nations continued to produce chemical weapons, and that a future gas war would destroy all civilization. In coordination with this resolution, the WILPF proclaimed its intention to educate civilians about the dangers of gas, express the impossibility of civilian gas protection, and wake

[745] Gertrud Woker, "Die Gaskampfinteressenten", 42. ; Clara Ragaz, Frida Perlen, Hortense Rathgeber, eds, *Die modernen Kriegsmethoden und der Schutz der Zivilbevölkerung*, 28.
[746] Gertrud Woker, "Die Wahrheit über den Gaskrieg", 6.
[747] Gertrud Woker, *Der kommende Giftgaskrieg*, 243.

people to the desperate need for lasting peace.[748] This ambitious agenda appears to have influenced the discussion of chemical weapons bans in international peace talks during the 1920s. For instance, after receiving a memorandum from the WILPF, the U.S. delegate to the League of Nations Conference on Control of Traffic in Arms initiated an unscheduled discussion on chemical weapons that ultimately led to the 1925 Geneva Protocol's prohibition of the future use of chemical weapons[749]

Interestingly, gender was not the only embodied category that Woker employed to create public fear of poison gas. Rallying Germans around an essentialized ethno-racial concept of the nation, Woker warned of future global gas warfare. In a 1923 article, she wrote, "The agents that will play the most central role in the self-destruction of the white race are poison gas and modern aviation technology."[750] Further playing on long-standing German fears of Social Darwinian ethno-racial competition, Woker claimed that it was poison gas that would lead to the political rise of the "black race." This tapped into doubt about the German ability to completely control poison gas, whether it be on the political level of national, ethnic, and/or racial conflict. She made this explicit in a subsequent article from 1925, writing:

> From his first-hand knowledge of colonial troops [in World War I] Haldane stated that Negroes are relatively immune [to mustard gas]. It may be comforting for the colored population to know that once the European and American cities are transformed into Negro villages, the citizens no longer need to worry too much about mustard gas. It is only a matter of time before the negro and other colored people realize the import of their immunity while the white race destroys itself. Poor white folks! It is not the height of your culture that determines your fate, but the mustard immunity of your black slaves. You have introduced the blacks to your murderous tools; when will these murderous tools be directed against you?[751]

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[748] Clara Ragaz, Frida Perlen, Hortense Rathgeber, eds, *Die modernen Kriegsmethoden und der Schutz der Zivilbevölkerung,* 116. See also: Gertrud Woker, "Im Zeichen der Wissenschaft dem Abgrund entgegen. (Betrachtungen zum chemischen Krieg)", 20.
[749] Jo Vellacott, "Feminism as if All People Mattered: Working to Remove the Causes of War, 1919-1929", 390.
[750] Gertrud Woker, "Ueber Giftgaskrieg," 393.
[751] Getrud Woker, "Erwiderung," 268. The idea that black skin was immune to the effects of poison gas has a long history. It was most fully developed in the United States during World War II, when the military tested mustard gas

Clearly, pacifists like Woker and Nestler used the gendered and racialized images of supposedly helpless Germans in an attempt to sue for international peace and the end of chemical warfare. While they correctly realized that calls for national gas defense inspired further chemical weapons production, their apocalyptic visions left little room for political agency and fed into certain societal divisions based on essentialized categories. Even if German civilians could resist the offers of military protection in these future visions, their lives would hang in the balance, requiring a similar level of utopian disarmament in every other industrialized world power. The Honorary Secretary of the War Resisters' International, H. Runham Brown, expressed the difficulty of this kind of pacifist message in a critique of Albert Einstein's antiwar platform. Runham wrote:

> war will by no means be abolished if 'two percent of the population of the world refuse to fight.' Einstein seems to overlook the fact that the technique of war has changed since 1914, and is still changing. The tendency has been to employ small armies of technicians who know how to run air squadrons armed with gas and bacteriological torpedoes and other weapons of mass destruction.[752]

Like Einstein, Woker and Nestler provided very little real hope for peace in a new age in which total war could be waged by the few who embraced it. In the end, these pacifists were caught between the pincers of the German militarists and nationalists. They could either appear as traitors to the German state and the German people by denying the right to any form of poison gas protection, or they could accept a certain level of nationalist rhetoric to assert the need to

on African American soldiers. See: Susan L. Smith, *Toxic Exposures: Mustard Gas and the Health Consequences of World War II in the United States* (New Brunswick NJ: Rutgers University Press, 2017)

[752] Albert Einstein, *Einstein on Politics: His Private Thoughts and Public Stands on Nationalism, Zionism, War, Peace, and the Bomb*, 242.

resist any form of rearmament.[753] Ultimately, they most commonly chose the latter option, but in doing so, they cut off the possibility of a real commitment to international cooperation.[754]

Conversely, radical socialists and communists argued more stridently for armed resistance, calling on the proletariat to rise up and destroy the German chemical industry. For instance, the communist Günther Reimann wrote, "Chemical weapons are becoming the most important weapons of war for the future. Already, the horrors of the past chemical war imperiously demand that the leaders of the working class…stop the new war preparations of the imperialists."[755] These Marxist-inspired anti-war supporters tended toward similarly dramatic and nightmarish depictions of future chemical warfare. Envisioning a gas attack, the novelist Johannes Becher wrote:

> Thousands of gas-poisoned people are now slowly burning to death in the heat. Many corpses began to seethe. Flies buzzed, beetles and lizards crawled over them. There lies such a fleshy heap: the intestines from the belly poured down next to him: a strange life begins to stir in the carcass.[756]

Of course, such horrible descriptions ran the risk of destroying any sense of human agency in the fight to end chemical warfare, but communist writers like Becher juxtaposed such scenes against powerful depictions of the proletariat, often described as a collective machine of justice. So while Hans Alexander stated that gas warfare would be "the last day for everything that means life, whether plant, animal or human," Erich Mühsam countered with a call for

[753] In many ways, the British writer H.G. Wells foresaw these pacifist political dilemmas in his 1913 novel *The World Set Free.* Reflecting on the human tendency towards technological development and military application, Wells put his faith in working class revolution, which he admitted "may be very bloody." However, according to the novel's preface, it was in the "labour class alone that any conception of a world rule and a world peace has so far appeared." H.G. Wells, The World Set Free, Preface.
[754] Karl Jaspers produced an interesting reading of this political choice in his 1922 book *Man in the Modern Age.* Karl Jaspers, *Man in the Modern Age,* 109-110.
[755] Günther Reimann, *Giftgas in Deutschland: Die Machtstellung der I.G. Farbenindustrie A.G.,* 5. Ludwig Renn described a similar dynamic in which imperialist capitalists devised chemical weapons to oppress and kill the working class. Ludwig Renn, *Krieger, Landsknecht und Soldat,* 179.
[756] Johannes Becher, (CHCl=CH)3As (Levisite) oder Der einzig gerechte Krieg, 164-165.

struggle, writing: "Proletarian, remember! In the German sky, the fascist phosgene cloud hangs threateningly!"[757] Appeals to proletarian resistance like Mühsam's inspired leftist surveillance of both German chemical companies and gas mask manufacturers. In 1929, the communist newspapers *Freiheit* and *Neue Arbeiter-Zeitung* correctly reported that the Dräger company was producing gas masks for the Reichswehr. Both Dräger and the German government denied this accusation and pressed charges against the newspapers.[758]

Ultimately, communists who sought to prevent future chemical warfare relied on the redemptive value of collective violence to chart a course of action. While the proletarian revolution would require brutality, it would eventually lead to a lasting peace. This call appealed to those who desired immediate action or already harbored communist sympathies, but it also created deep political divisions among anti-war supporters by alienating strict pacifists who abhorred any form of violence and by sowing doubt over the ultimate motivations for international peace conferences, which many communists viewed as bourgeois platitudes.[759]

[757] Hans Alexander, *Der Völkermord im kommenden Giftgas-Kriege*, 26. ; Erich Mühsam, "Phosgen", 210. Communist propaganda also stressed the idea of struggle against militarism. For instance, the October 1932 edition of the KPD's women's magazine *Der Weg der Frau* featured a picture of a woman in a gas mask changing a baby in a gas mask. Referring to restrictive abortion laws, the heading read "In the Third Reich every woman will have a man." Helen Boak, "Mobilizing Women for Hitler: the Female Nazi Voter," in Working Towards the Führer. Essays in Honour of Sir Ian Kershaw, 76. This image of women and children in gas masks would be important for Nazi propaganda and for global environmental movements in the late 20th century. Finis Dunaway, "Gas Masks, Pogo, and the Ecological Indian: Earth Day and the Visual Politics of American Environmentalism," 77.

[758] Justizministerium Untersuchungsverfahren, 1929 (GStA) I. HA Rep 84 a Justizministerium Nr 52373

[759] After 1926, war neurotics increasingly supported the Communist party after the SPD assented to an advisory committee set up to deny pensions for war neuroses. In many ways, this represented a shift in which the political voice of the war veteran migrated towards radical parties, including the Communists and the Nazis. Jason Crouthamel, "War Neurosis versus Savings Psychosis: Working-Class Politics and Psychological Trauma in Weimar Germany," 179. See also: Nils Löffelbein, Ehrenbürger der Nation: die Kriegsbeschädigten des Ersten Weltkriegs in Politik und Propaganda des Nationalsozialismus (Essen: Klartext, 2013) ; Deborah Cohen, The War Come Home: Disabled Veterans in Britain and Germany, 1914- 1939 (Los Angeles: University of California Press, 2001).

A Suspicion of Cooperation: International Disarmament Treaties in the Age of Air-Minded Geopolitics

The Treaty of Versailles was the first international agreement that treated chemical weapons after World War I. However, it only banned German chemical weapon production and air protection, leaving the Allies free to continue their chemical research and manufacturing.[760] Theoretically, the Hague Conventions still prohibited the use of chemical weapons, but the recent experience of World War I had shown the weakness of those prewar agreements. The German government and its people were not especially concerned with aero-chemical protection in the years immediately following the war.[761] They were more preoccupied with the tangible and often financial difficulties that the war had brought. It was not until 1921 that the *Verein ehemaliger Angehöriger der Flugabwehr e. V.* (the Association of Former Members of the Air Defense) replaced the Reichswehr as the central authority in educating the German public on air defense.[762] Over the course of the 1920s, this private interest group held lectures, wrote essays for various newspapers, and published their own journal, the *Luftschutz-Nachrichtenblatt,* to express the importance of air and gas protection.[763] In 1927, leadership of the group was taken up by the former General of flak artillery, Hugo Grimme.

[760] General J.F.C. Fuller and the military theorist Basil Liddell Hart were the chief chemical weapons proponents in Great Britain. Throughout the interwar period, the British continued to stockpile arsenic agents and mustard gas. In 1919, the British opened the Sutton Oak Chemical Defense Research Establishment and in 1937 the Imperial Chemical Company built another new mustard gas factory in Cheshire. Peter J. Hugill, *Global Communications Since 1844: Geopolitics and Technology*, 168.
[761] Regardless of the lack of open political concern, the German military did expect an aero-chemical attack on German cities in 1919. Furthermore, perhaps revealing the ubiquity of poisons in the interwar period, the right-wing Organizational Consul attacked the SPD politician Philipp Scheidemann with prussic acid on June 5, 1922.
[762] Concerns over national air protection stretched back into World War I. However, early military air protection was not a major civilian concern. Bernd Lemke, *Luftschutz in Grossbritannien und Deutschland 1923 bis 1939*, 125-126.
[763] Erich Hampe, *Der Zivile Luftschutz im Zweiten Weltkrieg: Dokumentation und Erfahrungsberichte über Aufbau und Einsatz*, 9.

Other nations also began to express concerns over both air and chemical protection in 1921.[764] An American subcommittee on suffocating gases initiated discussions surrounding the impact of chemical weapons in World War I with the intention of suggesting international restrictions on chemical weapons. This culminated in President Warren G. Harding's 1922 Washington Arms Conference, which served as a response to the greater public's appeal for lasting peace.[765] The conference, attended by delegates from the U.S, Britain, France, Japan, and Italy, attempted to craft a disarmament treaty that would prohibit the wartime use of asphyxiating, poisonous, or any other form of gas. However, the French refused to ratify the treaty, viewing its clauses related to submarine warfare as far too favorable to the English and Americans.[766] Nevertheless, concern over chemical weapons and aero-chemical attacks remained an important part of interwar international diplomacy.

The 1922 publication of Italian General Giuilo Douhet's treatise on air power, *The Command of the Air,* reinforced the belief that both airplanes and chemical weapons would play a central role in any future war.[767] Douhet's influential book pointed out that air power opened a third dimension on the battlefield, allowing attacking forces to entirely skirt land defenses. Because air space is so vast, Douhet claimed that effective defensive measures were nearly impossible. Rather, nations would have to establish command of the air by preemptively

[764] The International Committee of the Red Cross had already attempted to ban all uses of poison gas through the League of Nations in 1920.
[765] In fact, according to a 1922 survey, 99.9% of Americans apparently favored the abolition of gas warfare. Joris Mercelis, Beyond Bakelite: Leo Baekeland and the Business of Science and Invention, 119.
[766] Donald S. Birn, "Open Diplomacy at the Washington Conference of 1921-22: The British and French Experience", 319. ; For German fears over the failure to ratify the treaty see: Chemische Fabrik Stoltzenberg, "Instruktionskasten fur chemische Kampfstoffe und ihren Sanitatskoffer fur Kampfgaserkrankungen"
[767] Douhet's prognostications were supported by many other contemporary air-war theorists. Most notably, the English former captain Basil Liddell Hart, sometimes referred to as "the Clausewitz of the 20th century," wrote his *Paris, or the Future of War* in 1925. In the book, Liddell wrote "speed, on land as in the air, will dominate the next war, transforming the battlefields of the future from squalid trench labyrinths into arenas where surprise and maneuver will reign again." Liddell Hart popularizes his writings in several widely read British newspapers throughout the 1920s, including the *Daily Telegraph.* Peter J. Hugill, Global Communications Since 1844: Geopolitics and Technology, 168.

destroying an enemy air force.[768] Once they controlled a contested air space, they could then methodically bomb the military, industrial, and civilian centers of an enemy nation until it was forced into submission. Fanning fears over this future war of attrition, Douhet's book stressed the commonly restated idea that "the bomber will always get through," thus terrorizing civilian populations at will.[769]

In order to give his claims a sense of reality, Douhet ended his book with a fictional scenario in which the French air force bombed the German cities of Cologne, Mainz, Koblenz, and Frankfurt until they were reduced to rubble.[770] Douhet argued that air forces would undoubtedly drop gas bombs in this envisioned future war. He wrote, "First would come explosions, then fires, then deadly gases floating on the surface and preventing any approach to the stricken area. As the hours passed and night advanced, the fires would spread while the poison gas paralyzed all life."[771] Douhet dubiously claimed that a major city could be completely enveloped with only 80-100 tons of poison gas, effectively shutting down all urban services and slowly choking out life. Playing on the fundamental fears of gas, Douhet further wrote:

> the poison gas is silent and often invisible but poison gas penetrates, expands, enters any crack or crevice, permeates the element man cannot do without for a moment, and can therefore kill simultaneously masses of men over wide stretches of ground. When we consider that everything in this world undergoes improvement, it is clear that the atrocious gas attack of April 25, 1915, will be child's play to soldiers and civilians of tomorrow.[772]

Douhet's apocalyptic vision inspired greater concern throughout Europe over this imagined future aero-chemical war. In 1923, the German Ministry of Defense responded to this

[768] For the importance of air power in Weimar-era military and intellectual thought see: Ernst Jünger, *Luftfahrt ist Not!* (Leipzig: Wilhelm Andermann Verlag, 1930)
[769] This phrase was used by the British statesman Stanley Baldwin in a 1932 speech to Parliament entitled "A Fear for the Future." In it, Baldwin expressed the importance of Douhet's tract for national protective measures.
[770] Giulio Douhet, *The Command of the Air*, 390.
[771] Giulio Douhet, *The Command of the Air*, 58.
[772] Ibid, 181.

concern by writing the first comprehensive instructions for civilian air protection. The government envisioned a central ministry for air protection that would serve as a nationwide warning service in the case of aerial attacks. The ministry would distribute protective devices and educate the public on correct protective actions during an attack.[773] The Ministry of Defense added to this plan in 1925, splitting responsibilities between military and civil air protection organizations.[774] While Germany could not legally build a protective air force due to the disarmament stipulations in the Treaty of Versailles, it could organize evacuation routines and create bomb shelters.

Alongside such national planning, disarmament talks intensified across the international arena.[775] The U.S., France, and Italy discussed restricting chemical weapons at a 1924 conference in Paris and then again in 1925 in Geneva. The 1925 meeting produced the Geneva Protocol, which formally prohibited the use of chemical and biological weapons in all future international armed conflict.[776] Thirty-eight nations, including Germany, signed the Protocol in

[773] Erich Hampe, *Der Zivile Luftschutz im Zweiten Weltkrieg: Dokumentation und Erfahrungsberichte über Aufbau und Einsatz*, 10.
[774] Ibid, 11.
[775] The Luftwaffe officer Robert Knauss has been described as the German "Douhet" due to his publication of similar air tactic predictions in the 1920s. Erhard Schütz, "Wahn-Europa. Mediale Gas-Luftkrieg Szenarien der Zwischenkriegszeit," 138.
[776] The International Committee of the Red Cross contributed directly to the drafting of the Geneva Protocol, which included the banning of tear gas in military combat. The protocol said nothing about stockpiling poison gas or using chemical weapons within a state's own borders. Rudolf Hanslian, *Die internationale Gasschutzkonferenz in Brüssel*, 30. Further weakening the protocol's power, several signatories only viewed the restrictions on chemical warfare as applying to treaty members. This encouraged the continued use of chemical weapons against nations outside of the Western political order and against colonial populations. For instance, Winston Churchill was a notable supporter of testing gas on colonial populations, once stating "I am strongly in favor of using poison gas against uncivilized tribes." Consequently, Britain dropped irritant gas bombs on Russia in 1919 and seriously considered using tear gas shells in Iraq in 1920. Throughout the 1920s, British colonial governors requested that bans on poison gas use be lifted in order to quell unrest. See: R.M. Douglas, "Did Britain use Chemical Weapons in Mandatory Iraq", 861, 871, 881. In 1923 and 1927, Italy used phosgene and mustard gas shells against tribal Libyans and then dropped at least 500 tons of various poison gases in the Second Italo-Ethiopian War between 1935 and 1939. The then emperor of Ethiopia, Haile Selassie, said of the Italian attacks, "This horrifying tactic was successful. Humans and animals were destroyed. All those touched by the rain of death fell, screaming in pain. All those who drank the poisoned water and ate the contaminated food succumbed to unbearable torture." Daniel R. Headrick, *Power over Peoples*, 327. See also: Aram Mattioli, "Entgrenzte Kriegsgewalt. Der italienische Giftgaseinsatz in Abessinien 1935-1936", 311. The United States signed the Geneva Protocol but the Senate refused to ratify it until 1975.

June 17, 1925; however, not all signatories ratified the agreement.[777] The Geneva Protocol was followed by three more conferences convened by the International Committee of the Red Cross in 1928 (the Hague), 1929 (Rome), and 1930 (Brussels). These meetings aimed at clarifying the language of the original Protocol and creating more protections for civilians. The 1928 conference at the Hague was particularly focused on the measures that states could take to protect civilians against chemical weapons. Delegates created suggestions for participating nations to build gas protection shelters, train sanitary troops, provide gas protection technologies, and educate people about poison gas.[778] They even commissioned scientific studies of poison gas to determine the level of danger in an aerial bombing attack.[779] All of these chemical weapons talks were part of a larger movement for diplomatic peace that fed into the 1928 signing of the Kellogg-Briand Pact, which attempted to end the use of war as a means for solving international disputes.

In light of public fears over the future of warfare and the growth of general pacifist sentiment, legislation on limiting on chemical warfare held a prominent place in international diplomacy. The Geneva Protocol represented a firmer restatement of the ban on chemical weapons in the earlier Hague Conventions, relying on the experience of World War I to close potential future loopholes in international law. Non-communist pacifists and the governments of the major world powers seemed to agree that international legislation and arbitration was the best way to avoid a future chemical war. However, there were considerable public doubts about the efficacy of international law, substantiated by the failure of both the Hague Conventions and the

[777] The Germans ratified the agreement on April 25, 1929.
[778] Prizes were awarded for the best protective tools like gas masks, gas shelters, and retarding chemicals. Leo van Bergen, "The poison gas debate in the inter-war years," 181.
[779] Rudolf Hanslian, *Die internationale Gasschutzkonferenz in Brüssel*. 30. The gas specialist Rudolf Hanslian served as one of the German representatives to the Brussels conference.

weakness of the League of Nations. These doubts came not only from communists and socialists who doubted the justice of the established world order, but also from the interwar right.

Radically conservative suspicions of liberal international diplomacy can best be seen in the works of the German jurist and political theorist Carl Schmitt. In his 1923 essay, *The Crisis of Parliamentary Democracy,* Schmitt argued that liberal politics only justified itself through an undeserved faith in rational decision-making.[780] He followed this critique with his 1926 book, *The Concept of the Political,* in which he argued that sovereignty was solely defined by a state's hostile position against that which was deemed alien or enemy.[781] Thus, according to Schmitt, states jeopardized their own existence by failing to advocate for their best interests against those of their rivals. As such, Schmitt's work helped to legitimize a growing belief in a zero-sum form of geopolitics that often pulled from the language of Social Darwinism to present the international arena as a world of constant struggle.[782] In essence, Schmitt posited territorial protection, and even expansion, as the right of the German nation.[783] Elaborating on these ideas, Ernst Jünger addressed pacifists directly, claiming, "we are human, and that connects us. But indeed because we are human, the moment will come again and again, where we must attack each other. The occasion and means of struggle will change, but the struggle itself is eternal; it will always remain the same."[784]

[780] Carl Schmitt, *The Crisis of Parliamentary Democracy*, 52.
[781] Carl Schmitt, *The Concept of the Political*, 27.
[782] David Thomas Murphy, *The Heroic Earth: The Flowering of Geopolitical Thought in Weimar Germany, 1924-1933*, 19. Schmitt's work also recognized the importance of technology in international sovereignty. Air traffic, electricity, and other forms of technological connections allowed for larger sovereign states. The professor of political geography, Karl Haushofer (1869-1946) espoused geopolitical schemas that appeared similar to those of Schmitt. Haushofer was a former artillery commander who directed gas shelling in World War I. He would have significant influence in the shaping the Nazi concept of Lebensraum. Holger H. Herwig, The Demon of Geopolitics How Karl Haushofer "Educated" Hitler and Hess, 51-52.
[783] Joseph J. Benderensky, *Carl Smith: Theorist for the Reich,* 253.
[784] Ernst Jünger, *Der Kampf als inneres Erlebenis,* 45.

A 1920 military report that tapped into this kind of thinking made it clear that German civilians could not rely on international treaties to protect them from new weapons:

> It is unlikely that militaries would stop shooting gas due to feelings of humanitarianism. If a chemist succeeds in inventing a gas which not only causes terrible injuries, such as mustard gas, but also death, then history shows that humans will use it. If human rights legislation did not protect us from dum-dum bullets, then it will not protect us from poison gases in the future, and we will only be disadvantaged to rely on an illusory international law.[785]

If international treaties were not to be trusted, then ardent German nationalists asserted that the state had the duty to prepare itself for a future war. In fact, as Schmitt made clear, the state was defined by its ability to defend its borders. The right-wing author Ernst von Salomon attempted to remind Germans that, indeed, "Germany was where swords were unsheathed for her; she was there where armed bands were threatening her existence…Germany was at her frontiers."[786] Douhet's *The Command of the Air* made it quite clear, however, that Salomon's desired border defense would feature a new type of war, one fought with airplanes and gas bombs.[787] Pointing to the strategic problems that this new war created, the military engineering officer Karl Henke wrote in 1923 that, "Gas has proved to be a formidable, extremely effective weapon. It has made the old chivalrous fighting style based on personal courage and strength obsolete by increasing the long-range effect of the artillery."[788] General Hermann Geyer elaborated, writing that "war is becoming more complicated due to the use of gas. We must accept this. This is a logical consequence of scientific and technical developments. The old idea that simplicity is best in warfare is now outdated."[789] However, contrary to these claims, it had

[785] Erfahrungen im Gaskampf, 1920 (BA-MA) PH 14/229 LSFN 4875F
[786] Ernst von Salomon, *The Outlaws,* 58.
[787] Stig Förster, *An der Schwelle zum Totalen Krieg: Die militärische Debatte über den Krieg der Zukunft 1919-1939*, 342.
[788] Karl Henke, "Der Gaskampf", 6.
[789] Hermann Geyer, *Der Weltkampf um Ehre und Recht: Der Seekrieg, der Krieg um die Kolonien, die Kampfhandlungen in der Türkei, der Gaskrieg, der Luftkrieg*, 528.

yet to be proven that aero-chemical attack was a truly effective form of warfare. The former soldier George Soldan claimed that German interwar military theorists "were in the middle of a Jules Verne fantasy battle. Gas is their new weapon in a time of our nation's weakness."[790] Much like Ernst Jünger, Soldan remained ambivalent about these new technological developments. While the embrace of gas and other warfare technologies was necessary for the future of the nation, Soldan felt that it also robbed the battlefield of individual quests for bravery and spiritual meaning.[791]

Not surprisingly, even after the signing of the Geneva Protocol in 1925, German military theorists and fervent nationalists remained concerned by the continual development of chemical weapons abroad.[792] The minutes from a military discussion on chemical disarmament claimed that enemy nations were still outfitting their troops with poison gas weapons and therefore, "international regulation is impossible."[793] Such assertions encouraged General Seeckt to continue both the secret development of German gas and military gas protection training.[794] Indeed, Germany's geographic position in the center of continental Europe created the sense among both military men and the German public that the nation was surrounded by potential enemies. If war was to break out, then enemy aircraft could immediately fly over German cities and bomb them at will.[795] In 1929, the aviation magazine *Die Luftwacht* ran stories about aerial

[790] Georg Soldan, *Der Mensch und die Schlacht der Zukunft*, 74.
[791] Ibid, 75. ; Ernst Jünger, *Die totale Mobilmachung*, 134.
[792] RH/12/9 Sig 21 1931-1933 (BA-MA) Siganture 21, Standort 22, Magazin H3EG, Reihe 125, Regal 5, Gefach 2. For a study of French interwar gas production see: Olivier Lepick, "Le Programme Français De Guerre Biologique: 1919-1945". For American production see: Hugh R. Slotten, "Humane Chemistry or Scientific Barbarism? American Responses to World War I Poison Gas, 1915-1930" ; Thomas Ian Faith, *Behind the Gas Mask*, 79. For British debates on chemical production see: Marion Girard, *A Strange and Formidable Weapon*, 163-178.
[793] Gas und Nebel im Volkerrecht, 1933-36 (BA-MA) RH/12/4 sig 42 ort22 Mag H3EG Reihe 125 Regal 2 Gefach 2
[794] RH/12/9 Sig 33 (BA-MA) Signatur 33, Standort 22, Magazin H3EG, Reihe 125, Regal 5, Gefach 2
[795] Erich Hampe, *Der Mensch und die Gase: Einführung in die Gaskunde und Anleitung zum Gasschutz*, 35. ; Friedrich von Tochenhausen, ed., *Wehrgedanken: Eine Sammlung wehrpolitischer Aufsätze*, 59. While German military strategists believed that the next war would feature planes and poison gas, they also stressed the future importance of the tank as the primary site of land combat. For more on the tank in interwar prognostication see:

bombings in World War I, listing the number of dead Germans in each year of the war.[796] One article claimed that 8,000 war planes were ready to invade Germany from the surrounding countries, and that any location in the country could be reached in under two hours.[797] Assessing the danger of the geopolitical situation, the chemist Hermann Staudinger wrote:

> In my opinion, the great danger of the war is not only the poisonous gases, but the extent and possibilities afforded by the development of technology, and that is a point to emphasize, namely, that by means of airplanes, the defenseless inland population is drawn into the war so that the army at the border is no longer the protection of a country.[798]

Those who supported gas and air protection justified the rearmament of Germany with the same arguments that Haber first used in World War I. While proponents of gas protection asserted that gas was an existential threat to the national population, they simultaneously argued that it was far less harmful than most pacifists claimed. The gas scientist Carl Besse wrote, "Without underestimating the dangers of an aerial gas attack, one cannot warn the public enough about exaggerated pacifist claims. Aided by sensational magazines, the pacifists create turmoil among the population, leading to irresponsible action."[799] The former artilleryman Albert Benary agreed, claiming that pacifists relied too much on apocalyptic visions and not enough on the practical knowledge gained in World War I. To illustrate this point, Benary argued that a successful gas attack on Berlin would require an unfathomable 1000kg of gas bombs and about 5,400 aircraft.[800] The former gas-school teacher Dr. Julius Meyer still called poison gas a more

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Mary R. Habeck, *Storm of Steel: The Development of Armor Doctrine in Germany and the Soviet Union, 1919-1939* (Ithaca: Cornell University Press, 2003)

[796] Die Luftwacht: Zeitschrift für das Weltflugwesen, Heft 10 (Oct 1929), 499. Die Luftwacht was the magazine of the Flakverein, a private organization that lobbied for greater national air protection in the 1920s.

[797] K. Gemeinhardt, "Gasschutz und Luftschutz der Zivilbevölkerung", 232.

[798] Prof Hermann Staudinger, 1925. (IZM) ED 142/24. See also: Carl Besse, *Gaskampf und Gasschutz*, 22.

[799] Carl Besse, *Gaskampf und Gasschutz*, 22.

[800] Albert Benary, *Luftschutz*, 22, 24. See also, Paul Polaczek, *Was musst du wom Luftschutz wissen?* (Berlin: P.Polaczek, 1930)

humane weapon, furthering the claim that the effects of gas were overstated,.[801] Fritz Haber also continued to maintain this argument into the interwar years, writing in 1924 that, "Gas as a weapon is no crueler than flying pieces of metal. To the contrary, the percentage of fatal gassings is comparably small and there are no mutilations. Based on these objective arguments, one would not easily ban gas warfare."[802] Still others maintained that weaponized gas was a German invention, and that Germans had the right to use it for their own protection.[803] This assertion also attempted to assuage feelings of doubt raised by anti-gas activists like Gertrud Woker over the German ability to control chemical weapons. By assuring Germans that they were the masters of the chemical battlefield, gas protection advocates attempted to spur national pride and confidence in the chemical armaments industry.

As part of the geopolitical concerns surrounding a future war in the air, the German military collected substantial files on chemical weapons development in foreign countries. Comprised primarily of foreign press clippings and diplomatic reports, these files described both the chemical weapons capabilities and the level of civilian protection in countries like Great Britain, France, the Netherlands, Italy, and Poland.[804] However, the largest files concerned chemical weapons in the United States and the Soviet Union. Since the end of World War I, the Americans had drastically scaled up their chemical weapons research at the Edgewood Arsenal in Maryland. American scientists isolated and produced 20,000 tons of the new gas Lewisite in 1918. A stronger version of mustard gas, Lewisite inspired great anxiety among German military

[801] Julius Meyer, *Der Gaskampf und die chemischen Kampfstoffe*, 275.
[802] Fritz Haber, *Fünf Vorträge aus den Jahren 1920-1923*, 37.
[803] Nederland I, 1924-29. (BA-MA) RH/12/4 sig 133 ort22 mag H3EG reihe 125 regal 2, gefach 5
[804] See for example: Polen IV 1929-31 (BA-MA) RH/12/4 sig 43 ort 22 mag H3EG Reihe 125 regal 2 gefach 2 ; Nederland I 1924-29 (BA-MA) RH/12/4 sig 133 ort22 mag H3EG reihe 125 regal 2, gefach 5.; Berichte, Korrespondenz Berufsberichte Dr. Bauer (Röhm Bestand) 1932 (EA) RHT.2./6. In 1928, the French government ordered 15 million gas masks for civilians. Rudolf Krohne, *Luftgefahr und Luftschutzmöglichkeiten in Deutschland*, 78.

theorists. While the American government demonstrated an ostensible desire to avoid the use of chemicals weapons in the 1920s through international treaties, the Americans continued to increase their budget for chemical weapons research and production.[805] The Germans reported that the American military even conducted war games in which planes dropped mustard gas on participating soldiers.[806] At the same time, American military theorists continued to defend the use of chemical weapons, relying on many of the same rhetorical arguments that the Germans had first employed. For instance, the Chief of the American Chemical War Service, General Amos A. Fries, claimed that gas was far more humane than explosives and that calls to ban chemical warfare were part of a communist plot to weaken national governments.[807] For many American military men like Fries, gas was undoubtedly the future of warfare.[808]

To many German military strategists, only the Russians appeared a greater chemical threat than the United States. While the Reichswehr was conducting cooperative weapons production and training with the Russians, this did not assuage fears over future Soviet aggression.[809] Soviet international policy seemed inherently hostile and their lack of involvement in any international treaties meant that they had never agreed to restrictions on the use of chemical weapons. Germans often invoked ethno-racial stereotypes in their fear of the Russians, claiming that their inherent Slavic barbarism allowed them to use chemical weapons freely.

[805] RH/12/9 Sig 66, 1927-1928 (BA-MA) Signatur 66, Standort 22, Magazin H3EG, Reihe 125, Regal 5, Gefach 3
[806] RH/12/9 Sig 69 1931-1932 (BA-MA) Signatur 69, Standort 22, Magazin H3Eg, Reihe 125, Regal 5, Gefach 3
[807] RH/12/9 USA 1926 (BA-MA) Signatur 64, Standort 22, Magazin H3EG, Reihe 125, Regal 5, Gefach 3. See also: Thomas Faith, "'As is Proper in Republican Form of Government': Selling Chemical Warfare to Americans in the 1920s", 31-32.
[808] RH/12/9 USA III 1927 (BA-MA) Signatur 65, Standort 22, Magazin H3G, Reihe 125, Regal 5, Gefach 3
[809] If anything, the joint German-Russian chemical weapons production program only proved to the German military that the Russians now had the capability to industrially produce modern chemical weapons.

Indeed, Bolsheviks were regularly depicted as violent apes and fears over Russians secretly crossing the eastern border of Germany proliferated throughout the 1920s.[810]

Such assertions ignored the fact that the Russians had been late in developing their chemical warfare program and that they lacked a strong chemical industry in the early 1920s. Nevertheless, German reports stressed that the Russians began to test aero-chemical bombs in 1927.[811] In that same year, Russia's Society for Chemical and Air Defense, the Ossoawiachim, made it mandatory for residents in large cities like Leningrad to buy a gas mask and attend gas training.[812] By 1931, the Ossoawiachim maintained a membership of twelve million Russians. The organization justified its mobilization of Russian society, claiming that "nobody today can say if the war will break out in one, three, or even six years, but it is clear that one day the bourgeoisie of the world will have to face the proletariat of the Soviet Union in a final battle."[813] German military theorists were certainly wary of this perceived bellicosity, stating in a 1926 report that "the fact that Soviet Russia has a long history of chemical warfare is reflected in the troops it has created for gas warfare, and the formation of this force has been accompanied by special gas protection formations."[814]

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[810] Paul Fox, *The Image of the Soldier in German Culture, 1871-1933*, 91. ; Annemarie H. Sammartino, *The Impossible Border: Germany and the East 1914-1922*, 148.

[811] Russland II, 1927 (BA-MA) RH/12/4 sig 47 ort22 mag H3EG Reihe 125 Regal 2 Gefach 3 ; Geyer- Denkschrift uber den Gaskampf 1919 (BA-MA) N/221/ sig 23, ort 22, mag H1EG, Reihe 15, Regal 4, Gefach 7. In fact, the Soviets had begun to test aero-chemical attacks in 1926 in far-flung regions of the Eurasian steppes. These tests came on the heels of the merger between the "Soviet of Friends of the Chemical Industry" [Dobrokhim] and the Society of Friends of the Air Fleet [ODVF]. The chemical society had previously worked to assist the Red Army in chemical warfare preparations, but now it increased its efforts to raise public awareness of possible aero-chemical attack. Scott Palmer, *Dictatorship of the Air*, 160.

[812] Russland III 1927-39. (BA-MA) RH/12/4 sig 48 Ort 22 Mag H3EG Reihe 125 Regal 2 Gefach 3

[813] Russland IV 1929-32 (BA-MA) RH/12/4 sig 49 ort22 mag H3EG Reihe 125 Regal 2 Gefach 3

[814] Russland I, 1926 (BA-MA) RH/12/4 sig 46 ort22 Mag H3EG Reihe 125 Regal 2 Gefach 3. See also: Luftschutz Rundschau Heft 1/2 (Sept/Okt 1932)

Figure 3: The German imagination of Soviet gas. The Ghost from Moscow says: "I will pretend to be upset about the production of poison gas." The political cartoon implies Russian connections to the 1928 gas accident in Hamburg.[815]

Fears over American and Russian chemical weapons development reinforced the belief that German civilians required gas protection in the late 1920s. Often overstating the reality of the foreign threat, militarists and proponents of chemical warfare could advocate for the continuation of a German chemical armaments program by stressing its essential role in national protection. When laying out the requirements for national gas protection, one Major Zanetti reminded Germans that it was:

> questionable whether one can expect countries to freely renounce a modern means of warfare. The strength of the home front, which was decisive in the First World War, will play a major role in the war of the future. The better a state's air supremacy, the greater chance it has to protect itself in peace by organizing the air defense and training the masses in gas protection.[816]

[815] Giftgas Unglück auf der Veddel 1928 (SH) 135-1 I-IV 4069
[816] Vortäge der Gasschuztlehrgänge Teil II, 1930 (BA-MA) RH/12/9 Sig 35, Standort 22, MAgazin H3EH, Reihe 125, Regal 5, Gefach 2 ; See also: Gasschutzlehrgange 1931 (BA-MA) RH/12/4 sig 64 ort 22 mag H3EG reihe 125 regal 2 Gefach 3

By claiming that air and gas protection was a matter of national life or death, advocates argued that this was not a political issue. Rather, every citizen had an irrefutable right to self-protection.[817] In 1931, the leader of the Technische Nothilfe, Erich Hampe, wrote:

> But it would also be just as wrong to see in the civilian air defense as a matter that could or should be measured on a political scale. The plight of man and his rescue from distress has never been a matter of politics. Luckily, all the slogans of party politics have been overturned, and civilian air defense is beginning to take effect because politicians have ceased to be effective. Civil air defense is not a military or political matter, but a self-evident act of affirming and protecting life. All people are threatened by the danger of aerial attack.[818]

These arguments for air and gas protection were not limited to military reports and specialized journals. Throughout the late 1920s, opinion pieces on the necessity of national protection flooded local and national newspapers including, but certainly not limited to, the *Deutsche Allgemeine Zeitung,* the *Deutsche Tagezeitung,* the *Berlin Lokal-Anzeiger,* the *Vossische Zeitung,* and the *Berliner Illustrierte Zeitung.*[819] Indeed, expressing the omnipresence of such op-eds, a Stoltzenberg chemical company pamphlet read, "Today, every newspaper writes almost daily of poison gas."[820] The publication of these various articles made air and gas protection a civic concern and forced the Weimar government to more actively address possible protective measures and limited rearmament.[821]

In 1926, Germany signed the Paris Air Agreement, which allowed the Germans to resume commercial air travel and to control their own air space. The Allies agreed to this

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[817] Dietmar Süss, *Death from the Skies: How the British and Germans Survived the Bombing in World War II*, 35.
[818] Luftschutz Nachrichtenblatt Heft 1 (Januar 1931), 15-16. The Luftschutz Nachrichtenblatt was the successor of Luftwacht.
[819] Ibid. See also: Peter Fritzsche, "The Economy of Experience in Weimar Germany", in *Weimar Publics/Weimar Subjects,* 375-376.
[820] Chemische Fabrik Stoltzenberg, "Instruktionskasten fur chemische Kampfstoffe und ihren Sanitatskoffer fur Kampfgaserkrankungen"
[821] In 1923, the Reich Ministry of Defense first set rough guidelines for German air defense. These were more formalized in 1925. However, there was little real action taken to ensure national protection. Erich Hampe, *Der Zivile Luftschutz im Zweiten Weltkrieg: Dokumentation und Erfahrungsberichte über Aufbau und Einsatz,* 10-12.

reduction of restrictions so that they could use German airports for fuel and maintenance, a privilege that the Germans had been strategically withholding throughout the early 1920s. This agreement further allowed the German Ministry of Defense to set up a military air defense service in 1927 under the direction of first lieutenant von Keller and reserve lieutenant Giesler.[822] For civilian measures, the Ministry of the Interior became the overarching organization for air protection, often supervising the private air protection association *Deutscher Luftschutz e.V.* (The Association for German Air Defense) in the implementation of nationwide plans. The *Deutscher Luftschutz e.V.*, under Dr. Rudolf Kröhne, began to conduct studies on the most effective forms of civilian protection and present its findings in a traveling air protection exhibition. Reflecting on these exhibitions, one military leader stated that, "It is urgently necessary to show the people that the Reich and the authorities are interested in this issue, which is vital to the German people."[823] During this same period, several other private air defense organizations were formed, including the German Air Defense League, the Flakverein, and the Ring of Fliers.[824] These groups tended toward sensational forms of propaganda in order to convey the importance of air and gas protection. They saw air raid exhibitions and public lectures as opportunities to imbue German civilians with the martial spirit necessary for resisting an insidious weapon like gas.

Due to a lack of funds in 1928, the Ministry of the Interior was unable to create a government service that solely dealt with air protection. Instead, national air protection

[822] Von Keller and Giesler were both members of the Flakverein, a private air defense organization. 1926 also saw the resignation of Hans von Seeckt from Chief of the German Army Command. With Seeckt's reforms in place, his successor, Wilhelm Heye increased the Reichswehr's focus on national defense or *Landesschutz*. See: Robert M. Citino, *The Path to Blitzkrieg: Doctrine and Training in the German Army, 1920-39*, 152-153. ; Matthias Strohn, *The German Army and the Defense of the Reich*, 170.

[823] Erich Hampe, *Der Zivile Luftschutz im Zweiten Weltkrieg: Dokumentation und Erfahrungsberichte über Aufbau und Einsatz*, 12-13.

[824] The Verein Deutscher Chemiker e.V. (the German Association of Chemists) also made suggestions for correct gas protection. In September 1932, they formed the Professional Group for Air Protection to continue their advisory role with the Weimar government. Vergiftungen durch Gase 1932 (BArch-B) R/86/ Sig 5600 Ort 51 Mag M 1 08 Reihe 52

guidelines put state-approved air defense in the hands of the preexisting police, firefighters, and ambulance services, with the Technische Nothilfe, German Red Cross, and the Arbeiter-Samariterbund serving as auxiliary first responders.[825] These various services set to work, creating air raid shelters in major German cities and industrial areas as well as educational materials for the press and schools. At the national level, the Ministry of Foreign Affairs observed developments in foreign air protection while the Ministry of Economic Affairs began building large collective air raid shelters. The Ministry of Labor was given the task of creating civil air protection jobs and the Reichswehr tested air raid protection devices like gas masks Finally, the Ministry of Transportation worked to protect train lines, water services, and energy delivery in the event of an attack.[826] While air protection gained a significant public presence in the late 1920s, the implementation of formalized aero-chemical guidelines remained fractured between various emergency services, private interest groups, and levels of government.[827]

Normalizing Contingency: The Rise of the Gas Specialist

Throughout the 1920s, the men who had studied or worked with chemical weapons in World War I created increasingly tighter-knit circles that could speak to issues of national gas protection. Many of them joined the private organizations that promoted air protection such as the *Deutscher Luftschutz* (the German Air Defense League) or the *Verein ehemalige Angehörer der Flugabwehr* (the Association of Former Members of the Air Defense).[828] Those who

[825] Gasschutzmassnahmen 1931-32 (LBWK) 233, 12570
[826] Literatur, Kriegsfuhrungen, Auslandsnachrichten, 1931-33. (BA-MA) RH/12/4 sig 40 ort 22 mag H3EG reihe 125 regal 2 gefach 2
[827] Erich Hampe, *Der Zivile Luftschutz im Zweiten Weltkrieg: Dokumentation und Erfahrungsberichte über Aufbau und Einsatz*, 14.
[828] The Association of the former members of the Air Defense was created in 1920 under the former artillery general Grimme. The Association held lectures and published essays on air protection, but their actions were limited in scope and distribution. Erich Hampe, *Der Zivile Luftschutz im Zweiten Weltkrieg: Dokumentation und Erfahrungsberichte über Aufbau und Einsatz*, 9.

remained in the field of applied chemistry primarily maintained relations through the *Verein Deutscher Chemiker* (the German Chemists Association or the VDCh).[829] Former gas pioneers, medical doctors specializing in gas poisoning, and chemists from Fritz Haber's Kaiser Wilhelm Institute began to write for the journals produced by both these private air defense leagues and the major gas mask manufacturers. This group included men such as Hugo Stoltzenberg, the chemists Hans Pick and Fritz Wirth, the gas-school instructor Julius Meyer, the toxicologist Ferdinand Flury, Wilhelm Haase-Lampe of the Drägerwerks, Karl Quasebart of the Auergesellschaft, the former policeman Heinrich Paetsch, General Hans-Georg von Tempelhoff, the politician Rudolf Kröhne, the chief of the Technische Nothilfe Erich Hampe, the former military doctors Otto Muntsch and Hermann Büscher, and the most publicly recognized gas-specialist Rudolf Hanslian.[830]

Rudolf Hanslian was born in 1883 to a brewer in Moravia. He received his doctorate in chemistry from the University of Leipzig and became an assistant at the University of Halle. At the outbreak of World War I, he served as both a troop pharmacist and a gas officer, eventually securing a post-war position as a military pharmacist in Berlin. From this position, Hanslian was selected as a clerk for the International Commission of Red Cross Experts on Civil Gas Protection. This allowed him to represent Germany at the meetings of the International Red Cross throughout the 1920s. By 1926, he was known as one of the "most prominent figures in public gas protection," playing a key role in bringing the various gas specialists together into a

[829] The VDCh was founded in 1887 and was mostly made up of chemists working in industry. The older *Deutsche Chemische Gesellschaft* (DChG), on the other hand, mostly represented academic/theoretical chemists. While distinctions between theoretical and applied chemistry are dubious in the German context, chemists certainly used the terms to demarcate their social world of research.
[830] For a list of even more chemists who entered into this world of gas protection, see: Helmut Maier, Chemiker im "Dritten Reich", 263.

formalized professional group.[831] Hanslian primarily created these scientific and technical conversations through the journal *Gasschutz und Luftschutz,* which he co-edited with Heinrich Paetsch.[832]

Figure 4: Rudolf Hanslian. Image from a Drägerwerks pamphlet[833]

In the mid-1920s, Hanslian and his fellows gas specialists independently advocated for increased public knowledge of poison gas protection. However, they also responded to the criticism of pacifists like Gertrud Woker, who claimed that they were simply driving German rearmament through indirect means. As part of their retort, the gas specialists used ad hominem

[831] Wilhelm Haase-Lampe, *Handbuch für das Grubenrettungsweser Sauerstoffretttungswesen und Gasschutz, Gerätebau und Organisation seit 1924*, 694. Hanslian received great acclaim after the 1925 publication of his first book *Der chemische Krieg*. In the Weimar and Nazi periods, the book was the foremost historical and scientific account of gas warfare in World War I. The book normalized many of Fritz Haber's rhetorical justifications for the German deployment of chemical weapons in World War I. For instance, Hanslian asserted in his text that the French were the first to break the provisions of the Hague Conventions and that chemical weapons had, in fact, been used since antiquity.

[832] Paetsch would later become a government liaison for the Auergesellschaft in the 1930s.

[833] Wilhelm Haase-Lampe, *Handbuch für das Grubenrettungsweser Sauerstoffretttungswesen und Gasschutz, Gerätebau und Organisation seit 1924.*

attacks, claiming that pacifists were truly communists and anarchists who desired to weaken Germany by fanning public fears of gas attacks.[834] According to men like Hanslian, pacifist visions of apocalyptic gas attacks were merely fiction.[835] Indeed, relying on their wartime experience, the gas specialists correctly pointed out that effective gas attacks required incredibly large amounts of gas shells to produce a sufficiently dense gas cloud over a small section of battlefield.[836] They further attempted to place poison gas within the larger context of industrialized violence, arguing that gas was no more morally repellant than other means of total war. For instance, the former artilleryman Wilhelm Hartnung wrote:

> Today, the pacifists use chemical weapons to arouse disgust for war. Such a point of view is incomprehensible to me as a former front-line soldier…is [gas] not a thousand times more humane than an enemy hunger blockade, starving a whole nation of women and children?[837]

Given that the gas specialists did not believe that international peace treaties would necessarily prevent a future gas war, they claimed that public knowledge was the best protection against poison gas.[838] Through explanations of the physical nature of various poison gases and presentations on the best technical solutions for gas protection, the gas specialists cast themselves as the true pacifists. With a realistic understanding of the capabilities of both poison gases and international treaties, they claimed that they could present the German public with their best options for salvation in a future war. One gas protection article read, "Like the pacifists, we hope that gas warfare will never come back, but we do not want to be defenseless if fate, which does not care about hopes or desires, should plague our people again. Preventative

[834] E. Haeuber and G. Gassert, *Der Kampf um den Luftschutz,* 9.
[835] Fessler, Gebele, Prandtl, *Gaskampstoffe und Gasvergiftungen: Wie schützen wir uns?,* 59.
[836] Wilhelm Hartung, *Großkampf Männer und Granaten!*, 448.
[837] Ibid.
[838] Margarete Stoltzenberg-Bergius, *Was jeder vom Gaskampf und den chemischen Kampfstoffen wissen sollte, 3. ; Fessler, Gebele, Prandtl, Gaskampstoffe und Gasvergiftungen: Wie schützen wir uns?,* 37.

protection is our elementary right."[839] By casting gas protection as a human right, the gas specialists followed the German military in insisting that their calls for protection were ethical rather than political in nature. In fact, in a press snippet, the Dräger company wrote:

> It is not the task of the gas protection technician to make major political considerations. He is a pacifist by nature; his work is directed against the horrors of war, against the annihilation of human and animal life by aero-chemical war. It is quite secondary to his work if gas protection equipment is also a weapon of aggression. One way or another, the purpose remains human protection. However, today's gas protection engineer is forced to comment on the question: "Will a future war also be a chemical war?" He cannot deny this question, and he is filled with skepticism about efforts to make war politically impossible...Only gas protection can resist the chemical war.[840]

Anti-gas pacifists and the gas specialists continued to vie for the German public's support throughout the 1920s. But in 1928, a gas leak at Hugo Stoltzenberg's chemical factory in Hamburg proved decisive for shifting public opinion and mobilizing political clout. On May 21 1928, three large tanks of phosgene leaked onto the industrial docks on the south side of Hamburg's harbor.[841] A fortunate breeze blew the eleven-cubic meter gas cloud westward, away from Hamburg's city center. Nevertheless, about 200 people went to local hospitals, some of them seriously poisoned. Authorities evacuated the west-lying town of Wilhelmsburg where the gas killed off the low-lying vegetation and animal life.[842] Ultimately, eleven civilians, mostly industrial workers and rescue team members, died. The *Hamburger Stimmen* reported that news of the gas leak created a "terrible panic," and more residents reported gas sickness over the following days.[843] *The London Times* reported that the gas leak has "given the appearance of a

[839] Die Gasmaske Heft 3 (Juli 1929), 59.
[840] Draeger Gasschutz im Luftschutz, 27.
[841] Konstruktion, Erfindungen, Erfahrungen uber Gasschutzgerat 1927-29 (BA-MA) RH/12/4 sig 80 ort22 mag H3EG Reihe 125 Regal 2 Gefach 4
[842] Klaus Meise, "Der Giftgas-Unfall am 20. Mai 1928 : Phosgen-Explosion in der Chemischen Fabrik Stoltzenburg am Hovenweg", 63.
[843] Vossische Zeitung 125 (May 30, 1928) ; Hammburger Stimmen 119 (May 13, 1928)

plague-stricken area, where men and women, haggard from sleeplessness, walk about haunted by the fear that they will yet be the victims of the invisible peril."[844]

In the wake of the gas leak, Hugo Stoltzenberg did not have the money to compensate the victims or pay for the environmental damage.[845] In fact, he had lost most of his holdings in the Bersol factory in Russia. Investigations and a trial followed, but Stoltzenberg emerged relatively unscathed. However, the accident did reveal to the public that chemical weapons stockpiles remained in Germany. The pacifist outrage over this scandal led to the German press's eventual discovery of Stoltzenberg's connections to the Rif War in Spain and chemical production in Russia.[846] Many on the political left blamed the eleven deaths on the societal failure to destroy German militarism.[847] The social-democratic newspaper, *Das Hamburger Echo*, wrote, "A disaster that is a bitter lesson to all those who spoke of poison gas as a 'humane' weapon. We have now been given a taste of the cruelty and ruthlessness of a coming war."[848]

Renewed fears over poison gas drove increased reporting on carbon dioxide and heating gas poisonings through 1929.[849] Newspaper articles blamed local authorities for their industrial inspection oversights and their slow reactions during emergencies.[850] This made many Germans

[844] The London Times (May 23, 1928) in Giftgas Unglück auf der Veddel 1928 (SH) 135-1 I-IV 4069
[845] Phosgen Ermittlung 1928 (SH) 311-2 IV Vuo II C 5 a II A 34
[846] Erich Mühsam, "Phosgen", 208-210. ; Rudibert Kunz and Rolf-Dieter Müller, *Giftgas Gegen Abd El Krim: Deutschland, Spanien und der Gaskrieg in Spanisch-marokko, 1922-1927*, 72.
[847] Hamburgische Volkszeitung 121 (May 25, 1928)
[848] Phosgen Giftgas Katastrophe auf der Weddel im Mai 1928 (SH) 352-3 II N 55
[849] Vergiftungen durch Gasse 1928 (Barch-B) R/86/ Sig 2350 Ort 51 Mag M 1 08 Reihe 49. Cooking and heating gas was a common German means of suicide throughout the 1920s and into the Great Depression. Christian Goeschel, *Suicide in Nazi Germany*, 25. The symbolic importance of suicide by gas was made explicit in Karl Aloys Schenzinger's 1932 novel Hitler Youth Quex, which was then made into a popular film in the summer of 1933. In what was described by the Nazi party as an "unforgettable scene," a mother attempts to kill both herself and her son to avoid further beatings from her communist husband. Jay W. Baird, To Die for Germany: Heroes in the Nazi Pantheon, 123.
[850] Such blame was also spread after a 1930 mining explosion in Silesia, in which gas broke through the walls of the mine and asphyxiated hundreds of miners. Otis C. Mitchell, Hitler's Stormtroopers and the Attack on the German Republic, 1919-1933, 105.

seriously question whether they were sufficiently protected from poison gas. Indeed, the *Hamburgischer Correspondent* subsequently wrote that:

> This incident gives cause to discuss the need of a civilian gas mask. As long as the country produces poison gas for military or industrial reasons at all, as the Hamburg catastrophe shows, the danger of poison gas still exists in the midst of peace for the civilian population. For such moments, the possibility of a defense must exist.[851]

The Hamburg gas accident moved the simmering poison gas debates into the national spotlight and encouraged the Weimar government to action.[852] As historian Michael Geyer has pointed out, fear-inducing events in the late 1920s like the Hamburg gas leak saw earlier right-wing calls for German rearmament become larger social issues in which a middle-class consensus began to push for national defense.[853] The gas specialists stepped into these debates as the highest authorities on the best practices for national gas protection. Public fears over poison gas trumped pacifist critiques of defensive rearmament and made international treaties a secondary concern.[854] This was best demonstrated by the 1932 Geneva Disarmament Conference, which initially intended to broker an inter-European disarmament treaty but ended as a vague proclamation of diplomatic peace.[855] In Germany, the gas specialists were no longer regularly lumped in with the militarists who argued for poison gas production. In a 1932 proclamation of their victory over the pacifists, Rudolf Hanslian wrote, "From here on out I note

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[851] *Hamburgischer Correspondent* 238 (May 23, 1928)
[852] In 1931 alone, lengthy opinion pieces on the necessity of increased gas protection appeared in the *Deutsche Allgemeine Zeitung* 571, *Berlin Lokal-Anzeiger* 584, *Deutsche Tagezeitung* 536, *Deutsche Zeitung* 296, *Der Tag* 296, *Der Reichsbote* 296, *Germania* 525, and *Vossische Zeitung* 583. For references see: Luftschutz Nachrichtenblatt Heft 1 (1931)
[853] Michael Geyer, "The Dynamic of Military Revisionism in the Interwar Years. Military Politics between Rearmament and Diplomacy," 115.
[854] A 1932 article from the air protection journal *Luftschutz Rundschau* read, "the blind and exclusive confidence in the achievement of any international solidarity against the dangers of war could be extremely dangerous. So far, such solidarity songs have never been able to prevent wars." Luftschutz-Rundschau Heft 1/2 (Sept/Okt 1932). The August 1931 edition of Gasschutz und Luftschutz provided a history of international peace treaties in order to reveal their inherent failures. Gasschutz und Luftschutz Augustheft (1931)
[855] Michael Geyer, "The Dynamic of Military Revisionism in the Interwar Years. Military Politics between Rearmament and Diplomacy," 114.

the following: the gas protection industry is first and foremost a peace industry."[856] Indeed, in 1928, many Germans began to willingly accept this claim, increasingly viewing the gas specialists as the only possible saviors of the nation. This ignored the fact that from 1925 onward, the Reichswehr had set up decentralized scientific networks that could pull on the expertise of gas specialists like Ferdinand Flury.[857] Respected scientists like Flury often maintained such direct or indirect connections to poison gas production and many believed in a Schmittian zero-sum geopolitics that merged national protection and aggressive militarism.

The political consolidation of the gas specialists began in Hamburg, where Dr. Heinrich Remy gathered 43 members of the local chapter of the *Verein Deutscher Chemiker* (VDCh) after the Stoltzenberg factory phosgene leak. Eight members of this local professional chemist's association were already sitting on the Air Protection Advisory Board of the city of Hamburg, but now Remy pushed for a permanent "specialist group for air protection" comprised of VDCh chemists. The city created this "specialist group" in 1932 without going through the normal channels of approval, citing the "urgency of the matter."[858] Writing in support of the decision, Remy claimed that

> While in the older form of warfare the chemist as such was only indirectly involved in the warfare, in a war waged using combat poisons—the so-called "gas wars"—the chemist will have to be directly involved in the warfare. His knowledge and experience are just as indispensable for the measures to prevent or protect against fighting poisons as for the correct assessment of the special attack and defense possibilities given by using fighting poisons.[859]

Chemistry advisory groups, like the one set up in Hamburg, were also assigned to various chapters of the German Air Defense League and the "Air Advisory Boards" of other major cities

[856] *Gasschutz und Luftschutz* Heft 4 (1932)
[857] Helmut Maier, Chemiker im "Dritten Reich", 265.
[858] Helmut Maier, Chemiker im "Dritten Reich", 268.
[859] Heinrich Remy, Denkschrift, Aufgaben des Chemikers im Luftschutz, 16.5.1933

like Berlin. Through national newspapers, traveling air and gas protection exhibits, and their own gas protection journals, the gas specialists now began to put political pressure on the Weimar government's air protection services.[860] They publicly claimed that the German authorities were not doing enough to protect their citizens from a future aero-chemical war. For instance, a member of the *Deutscher Luftchutz,* Rudolf Kröhne, wrote that "it has not yet been possibly to bring the negotiations between the government and the *Deutscher Luftschutz* to a satisfactory conclusion…they are burdening us and compelling us to make a clear statement, to clearly state 'air protection is necessary!'"[861]

Leaders in the VDCh gas protection movement like Heinrich Remy, Ferdinand Flury, Rudolf Hanslian, Albrecht Hase, Otto Muntsch, Karl Quasebart, and Fritz Wirth all agreed that German civilians needed a better understanding of poison gases and the possible forms of protection against them. Thus, they set out to produce a standardized educational literature and to open civilian gas protection schools. Funded by the private air protection organizations, they also sought to refit and test old military gas masks for civilian use.[862] Appreciating the value of the gas specialists' activities, the Reich's Ministry of the Interior attempted to fold the various air protection groups into the complicated and localized network for air protection that existed in the early 1930s.[863] However, the gas specialists felt that greater public funding, the inclusion of research chemists and engineers, and a more hierarchical organizational structure was needed. Many stressed the difference between individual and collective protection, arguing that while the government attempted to create collective solutions such as gas resistant shelters, it was also

[860] *Die Gasmaske* put on a major poison gas exhibition in Berlin in 1929. *Die Gasmaske*, Heft 1 (1929). *Gasschutz und Luftschutz* put on a major air protection exhibition in Cologne in 1932. Gasschutz und Luftschutz Heft 7 (1932)
[861] Rudolf Krohne, *Luftgefahr und Luftschutzmöglichkeiten in Deutschland*, 81.
[862] The chemist Fritz Wirth had been refitting 25,000 old gas masks since 1925. Bestimmungen Ausstatlung des Heeres mit Gasschutzgerat (BA-MA) RH/12/4 Sig 76/a ort22 reihe 125 regal 2 Gefach 4
[863] Gasschutz und Luftschutz Heft 3 (1932)

necessary for individuals to learn to protect themselves through chemical knowledge and gas discipline.[864] It was individual awareness and resistance, according to this argument, that could ultimately add up to large-scale national protection. As the *Deutscher Luftschutz* put it, "The possibility of aerial attack threatens each individual. Therefore, the entire German people must join together in an air raid community."[865]

In the early 1930s, the gas specialists most feared a civilian panic, which they believed would entirely incapacitate German urban spaces in the event of an aero-chemical attack. However, some believed that civilians could internalize the same form of gas discipline that gas officers demanded from World War I troops. In a world where the home front was now a potential battleground, certain gas specialists argued that civilians would have to be able to control themselves if they were to survive.[866] A representative article in the *Luftschutz-Rundschau* read:

> Because discipline is the first civil duty in an air raid, the population is educated to keep calm, to avoid panic and not to lose nerve. Nowhere is peace as necessary as in a gas attack. Although many people became sick in the phosgene poisoning in Hamburg a few years ago, only a few deaths occurred. And these deaths were people who wanted to quickly escape the gas cloud. Their lungs were exhausted and they inhaled large quantities of poison gas and died. Had these people kept calm, walked slowly, or lay down quietly, they would still be alive today![867]

While such claims were widely accepted by the gas specialists, it was the gas mask that served as the main source of internal strife. While most specialists believed that civilian gas discipline was possible, they did not agree on whether a gas mask was necessary for every

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[864] For collective measures see: Einzel und Sammelschutz 1931-32 (BA-MA) RH/12/4 sig 60 ort 22 mag H3EG Reihe 125 Regal 2 Gefach 3 ; Feuerwehr 1931-65 (SL) 325

[865] Vergiftungen durch Gase 1932 (BArch-B) R/86/ Sig 5600 Ort 51 Mag M 1 08 Reihe 52

[866] The work of chemist consultants for air protection organizations, outlined in the February 1933 "Preliminary Guidelines for the Activities of Chemists in Civil Air Defense, was continually presented by the VDCh as focused on civilian concerns. However, lectures at VDCh meetings often revealed a joint concern for civilian and military chemical weapons concerns. Helmut Maier, Chemiker im "Dritten Reich", 269.

[867] *Luftschutz Rundschau* Heft 4 (Dezember 1932) "Psychologische Wirkungen von Luftangriffen" von Max Peachmann

German citizen. Air protection journals had previously announced that various segments of the British, French, Russian, and Polish citizenry had received civilian gas masks between 1925 and 1927.[868] However, most gas specialists insisted that only members of the German air protection services should be outfitted with masks. The provision of gas masks to the entire populace, some gas specialists argued, could induce nation-wide panic. Furthermore, the cost of such a plan would be astronomical, thus counteracting the no-loss political solutions of gas protection training.

Even if only public officials were to be given masks, high prices and production capacity remained a challenge for the Ministry of the Interior.[869] The Weimar government had been attempting to solve this problem since 1925 when they paid the chemist Fritz Wirth 45,000 Reichmark to refit and test 25,000 World War I gas masks at the Technical University of Berlin.[870] In 1929, the government ordered over 30,000 new GM 24 masks from the Dräger company to try to meet increasing demand from both the military and the Ministry of the Interior.[871] While General von Seeckt was among those who wanted to provide each German civilian with a gas mask in the mid-1920s, this remained a sheer impossibly due to cost.[872] Guidelines for the aerial defense of Lübeck claimed that:

> Gas masks would be the best protection for individuals, of course, but the cost of supplying the population with gas masks was far too high, since the gas mask, even when mass produced, was still at least 10 Reichsmark per piece. The gas mask has to fit exactly and be maintained, otherwise it will leak and spoil the filters, which is why it is out of the question for the majority of the population.[873]

[868] *Die Luftwacht: Zeitschrift für das Weltflugwesen* Januar Heft (1927)
[869] Gasschutz-Volk 1932-33 (BA-MA) RH/12/4 sig 62 ort 22 Mag H3EG Reihe 125 Regal 2 Gefach 3
[870] Gasschutz fur die Zivilbewolkerung 1925-1933 (BArch-B) R/43/I Sig 726 Ort 51 Mag Haus 901/EG ; Bestimmungen Ausstatlung des Heeres mit Gasschutzgerat (BA-MA) RH/12/4 Sig 76/a ort22 reihe 125 regal 2 Gefach 4.
[871] Berichte Korrespondenz von Bauer an Letcher und Strauss (Röhm Bestand) 1928-33 (EA) RHT.2./6
[872] Gasschutz fur die Zivilbewolkerung 1925-1933 (BArch-B) R/43/I Sig 726 Ort 51 Mag Haus 901/EG
[873] Luft und Gasschutzeinrichtungen bei Fliegergefahr 1932 (SL) 18 4.6-6 Tiefbauamt 779

Even Professor Karl Quasebart of the Auergesellschaft admitted in a 1931 *Gasschutz und Luftschutz* article that civilian masks were "not worth the expense."[874]

Beyond financial concerns, many gas specialists thought that aerial gas attacks were not yet sophisticated enough to require individual respiratory protection. Gas-tight shelters in subway stations, sewers, and apartment building basements would provide sufficient collective protection while simultaneously making civilians responsible for the safety of their entire community.[875] Furthermore, the distinct duty of each individual would remind Germans of the dire nature of the chemical threat. The chemist K. Gemeinhardt wrote:

> The question may now be raised: Why not give a good gas mask to every inhabitant first and foremost? This question must be answered in the negative for various reasons. First, a high-quality civilian gas mask would require such sums of money that cannot be raised by any state, least of all our impoverished Germany. The second crucial point, however, is that the mask might give civilians a false sense of security that could cause them to lower their guard in the future![876]

Alongside these concerns over protection guidelines, not all of the gas specialists were convinced that the gas mask was a simple enough device for the average civilian to successfully operate. A 1932 article in *Gasschutz und Luftschutz* related the story of an eighteen-year-old boy who suffocated in a gasmask with a rusted filter.[877] Similar anecdotes prevented the gas specialists from demanding gas masks for every German man, woman, and child. Nevertheless, Karl Quasebart called for an increased familiarity with the mask, writing in a December 1932 *Gasschutz und Luftschutz* article that "Just as a child learns to clothe itself or the car owner learns to drive, every citizen should try on a gas mask in a gas shelter at least…once a year, in

[874] *Gasschutz und Luftschutz* Septemberheft (1931)
[875] Gasschutz fur die Zivilbewolkerung 1925-1933 (BArch-B) R/43/I Sig 726 Ort 51 Mag Haus 901/EG
[876] K. Gemeinhardt, "Gasschutz und Luftschutz der Zivilbevölkerung", 235.
[877] *Gasschutz und Luftschutz* Heft 10 (1932)

order to see how it works…to get rid of the unjustified aversion to this new piece of twentieth-century clothing."[878]

Fritz Haber, always lingering near the edges of the gas specialists' debates, also remained skeptical of civilian gas masks. Nevertheless, his scientific career throughout the 1920s further reveals the ways in which questions of national rearmament and gas protection entered national discourse late in the decade. By the mid-1920s, Haber had become an international delegate of German science, expressing the importance of cooperation through an International Union with the former Allied nations and Japan. Nevertheless, by the time the Great Depression had first been felt in Germany, Haber was calling for an authoritarian solution to Weimar democracy.[879] Even a man like Haber, who had lost so much through his ultra-nationalist endeavors, could not resist the cries for action that pervaded the struggling republic.

While questions regarding the nature of civilian air and gas protection remained open through the early 1930s, the gas specialists succeeded in garnering a significant influence with the German public that led to a certain level of leverage over the German government. Throughout the 1920s, poison gas scientists like Rudolf Hanslian had fought to build their reputations as scientific experts and to repel the personal attacks from pacifists like Gertrud Woker. By 1928, the gas specialists were able to capitalize on both the Hamburg phosgene accident and feelings of national vulnerability to make air and gas protection a pressing issue of national importance. Irmgard Keun's 1932 novel *Das Kuntseidene Mädchen* reflects on this period of national confusion. While the central female character insists on her apolitical existence, feelings of national contingency slip into her thoughts:

[878] *Gasschutz und Luftschutz* Heft 12 (1932)
[879] Fritz Stern, *Einstein's German World,* 147-150.

> Everything is being torn up and destroyed and if you want to be honest, you have to admit that you can't figure things out anymore...The whole world is uncertain and life and the future and what we used to believe in and we believe in now.[880]

In the general atmosphere of fear that Keun's novel reveals, the gas specialists offered their knowledge as a form of salvation, thus catapulting themselves into the national spotlight. Playing with the pervading sense of contingency and risk that visions of aero-chemical warfare infused into the Weimar era, the gas specialists proposed a mix of technology and trained vigilance for the survival of the German people. Based on the experiences of the Great War, they claimed, the German people could learn to discipline and prepare themselves for the future aero-chemical attack.[881] The gas mask became the central object around which these newly contested claims circled. The International Conferences of the Red Cross (ICRC) from the late 1920s perhaps best represented the political ascendancy of the gas specialists and their protective devices. While the ICRC had previously eschewed the cruelty of chemical warfare through pacifist rhetoric and denied the possibility of effective civilian protection, a 1928 committee of ICRC experts offered lucrative prizes for the best gas protection devices, including an award for the best civilian gas mask.[882]

[880] Irmgard Keun, *The Artificial Silk Girl*, 148.
[881] See: Peter Fritzsche, "Machine Dreams: Airmindedness and the Reinvention of Germany", 686-688.
[882] Leo van Bergen, "The Poison Gas Debate in the Interwar Years," 181.

CHAPTER 6: TECHNOLOGIES OF FATE: CULTURAL AND INTELLECTUAL PROPHESIES OF THE FUTURE WAR

In the quotation that served to open this study, the gas specialist Hermann Büscher wrote about a renewed political interest in poison gas in a 1930 scientific article. In Büscher's opinion, the gas debate was not merely a product of the 1928 Hamburg gas accident and the growth in power of private air protection groups. Additionally, he saw an increase in the discussion of poison gas among German intellectuals, artists, and the literati, which bled into so much post-1928 German cultural production that Germans could not help but haphazardly ruminate on the nature of poison gas, gas protection, and the future of warfare. Indeed, lamenting about the lack of specialized gas knowledge, Büscher wrote that, "the whole field of battle gases has become a playground for the literati."[883]

As Büscher claimed, poison gas did become a central theme in German cultural production and debate after 1928. Much of this was part of the larger boom in both the reading and writing of World War I literature that started around that year. Historian Modris Eksteins has expressed the difficulty in pinpointing the cause of this influx in war literature ten years after the conflict. The most common explanation states that post-war European societies were simply too exhausted or traumatized to discuss the war in its immediate aftermath.[884] As evidence, Eksteins provides the observations of journalist Ilya Ehrenburg, who visited Berlin in 1921 and stated that:

> catastrophe…presented a well-ordered existence. The artificial limbs of war cripples did not creak, empty sleeves were pinned up with safety pins. Men whose faces had been scorched by flame-throwers wore large black spectacles. The lost war took care to camouflage itself as it roamed the streets.[885]

[883] Vergiftungen durch Gasse 1928 (BArch-B) R/86/ Sig 2350 Ort 51 Mag M 1 08 Reihe 49
[884] Modris Eksteins, "All Quiet on the Western Front and the Fate of a War", 346.
[885] Ilya Ehrenburg, *Men, Years—Life, III,* 11-12.

As Ehrenburg later suggested, this war fatigue and war denial was most likely even more apparent in Germany, as the chief loser of the war.[886] Beyond the trauma of newly industrialized warfare, Germans also had to psychologically deal with the difficulties associated with post-war inflation and the instability of their newly democratic government. In this struggle for mere normalcy, many had little time or desire to reflect on the past. Eksteins adds that most early reflection led to confusion and many Germans, especially combat veterans, remained unsure of the true motivations for the war. Nationalist propaganda argued that Germany was responding to British and French aggression, fighting for German *Kultur* against the continued cultural and political pressure of soulless western materialism.[887] But in the post-war years, the envisaged spiritual destruction of Germany never obviously came, and many began to wonder how dire the threat actually was. If the reasons for war were complete fabrications, then millions of men had rushed to their deaths either for the benefit of European elites, or for no purpose at all. The existential difficulties that these questions posed provided, for some, yet another reason to avoid discussions of the war.

The material and psychological stresses of the post-war years may explain why it took about a decade before German intellectuals began to grapple with the war, but they do not reveal why 1928 was the specific year in which this began. Eksteins argues that the 1928 appearance of Erich Maria Remarque's *All Quiet on the Western Front* in serialized form set off a literary debate that inspired many former soldiers to write their own personal accounts. Certainly, *All Quiet* created a public stir that accelerated the proliferation of *Kriegserlebnis* (or war experience) novels, but Eksteins is forced to admit that "a number of [war-related] books appeared

[886] As Peter Jelavich has shown, German Expressionism and Dada represented this war weariness in the years immediately following the war. Peter Jelavich, "German Culture in the Great War" in *European Culture in the Great War: The arts, entertainment, and propaganda, 1914-1918,* 36-37.
[887] Modris Eksteins, "All Quiet on the Western Front and the Fate of a War", 347.

immediately before it."[888] It should also be noted that visual artists like Otto Dix had already produced war art well before 1928, although it certainty did not receive as much public attention as the later war novels. These earlier works force us to ask why several German soldiers chose to recount their wartime experiences before the publication of *All Quiet* and what inspired a larger reckoning with the war in 1928.

The previous chapter has pointed to 1928 as a turning point in discussions of German national security. The Hamburg gas accident brought these discussions to the forefront of national concern in May of that year, inspiring a reorganization of the national aero-chemical protection services. This afforded political power to private air defense organizations and men like the gas specialists, who then further encouraged public awareness of the possibility of a future aero-chemical war. These developments raised a slew of questions that probed the efficacy of international diplomacy, the inherent violence of humanity, and the role of technology in the modern condition. *Kriegserlebnis* novels were one method of reflecting on such questions, referring to the escalation of gas warfare in the final year of World War I in order to diagnose a future conflict. As Eksteins points out, even Remarque's *All Quiet* "is more a comment on the postwar mind, on the postwar view of war, than an attempt to reconstruct the reality of the trench experience."[889] However, *Kriegserlebnis* novels were not the only cultural genre that tackled these topics. Visual art, film, and science fiction/dystopian novels from the Weimar period provided further avenues for exploring the sense of risk and contingency of future aero-chemical warfare.

This chapter will explore these German cultural debates in order to examine the various depictions of both poison gas and the gas mask. Several of these artistic productions maintain

[888] Modris Eksteins, "All Quiet on the Western Front and the Fate of a War", 346.
[889] Ibid, 351.

passages or images that appear strikingly similar to the first-hand descriptions of World War I gas warfare. Given that many interwar artists and intellectuals were themselves war veterans, this is not very surprising. However, their numerous vivid recreations of gas warfare do not always align with the fact that poison gas was not a very effective weapon until 1918 and most soldiers never suffered severe gas poisoning. This points to the fact that artists and novelists were writing, painting, or sketching with distinctly interwar concerns in mind.[890] Reflecting on current anxieties over national vulnerability while also pulling on personal memories and shared war stories, many of these artists diachronically related the feeling of total victimization that gas produced among its prey in the trenches.

Questions surrounding warfare technologies entered into larger contestations over the memory of war. The ways in which interwar artists chose to represent chemical weapons often reflected both their personal reckoning and their political allegiances. While many former soldiers knew that humans had released the gas, they often posited gas as a mindless and indiscriminate killer. It was a rolling fog, an eerie haze, a monster, or a creature that snuck into every crevice and choked out all life. Indeed, gas weaponized the atmosphere and created a sense of imminent risk that no other weapon could equal.[891] As an extension of the gas, the gas mask could transform men into the masters or monsters of a chemically impregnated world. Once pulled over the face, a soldier lost at least part of his humanity and was transformed into a bug, ghost, or alien that would either live or die in this new environment. For this reason, the human face served as the central literal and symbolic point of contention for interwar depictions of gas. Interwar intellectuals debated whether a human mind and a human face lay behind both the gas

[890] Paul K. Saint-Armour, Tense Future: Modernism, Total War, Encyclopedic Form, 305.
[891] Doris Kaufmann, "'Gas, Gas, Gaas!' The Poison Gas War in the Literature and Visual Arts of Interwar Europe", in *One Hundred Years of Chemical Warfare: Research, Deployment, Consequences,* 185.

and the gas mask. They asked themselves and their fellow Germans whether these technologies were the products of men who could be understood and/or controlled in any future conflict, or if poison gas and the masked creatures who lived among it were harbingers of the apocalypse in which the release of a chthonic power outside of human control would lead to technological determinism.

Interwar literature primarily described this potentially mysterious power of poison gas through the sensation of its movement. It seeped, oozed, snuck, hissed, and wafted through the modern world. For those who found gas a faceless enemy, the weapon inherently defied visual "pictorialness."[892] Early World War I, the *London Times* described such warfare as "the butchery of the unknown by the unseen."[893] Thus, much like in soldier writings, authors, visual artists, and filmmakers relied on the gas mask to signal the deadly contingency of a gassed world. Not surprisingly, differences sometimes arose between interwar cultural depictions and first-hand accounts simply due to the author's temporal removal from the subject. Interwar artists imported new politics into the gas war by mediating their post-war lives with their wartime experience.

Within these works, the gas mask most frequently appeared as the key to survival in this future war. However, it could either be depicted as a device that could save humanity by augmenting and remolding it for the dangers of the future, or a stop-gap solution that only represented the inevitable loss of humanity through commodification, warfare, and death. Either way, the mask highlighted the possibility of an apocalyptic scenario and a post-human condition while also emphasizing the fetishized nature of technological objects in a modern consumer society.[894] As visual studies scholar Gennifer Weisenfeld points out in her study of interwar

[892] Doris Kaufmann, "'Gas, Gas, Gaas!' The Poison Gas War in the Literature and Visual Arts of Interwar Europe", in *One Hundred Years of Chemical Warfare: Research, Deployment, Consequences*, 171.
[893] *The London Times*, November 1914, in Kaufmann, "'Gas, Gas, Gaas!'", 171.
[894] Gennifer Weisenfeld, "Gas Mask Parade: Japan's Anxious Modernism," 180.

Japan, "the gas mask is not merely the transparent life-saving instrument that it might appear to be, but rather a multivalent symbol of national defense and eroticized monstrosity—a prophylaxis and a fetish."[895] This multivalent object particularly provoked the interwar intellectual imagination, serving as an easily-pictorialized material representation of modern German anxieties. Making this point explicit, the author Hans Rothe wrote in a 1931 article, "One can only be scared by the fact that the gas mask has become one of the most important commodities of our, as one can now aptly say, pre-war times."[896]

Theoretical debates over the nature of *all* modern technologies and their cultural representation subsequently arose around depictions of objects like gas and gas masks. These debates reflected and encouraged the political importance of Germany's search for effective national air and gas protection. The numerous and often intricate vectors of this debate most fully crystalized in the intellectual disputes between Walter Benjamin, Ernst Jünger, and Martin Heidegger in the late 1920s and early 1930s. Throughout this period, Jünger presented his vision of a technologically augmented "New Man" who could master the modern world of mass warfare and atmo-terrorism. For Jünger, humans maintained agency over poison gas, and masks did not entirely erase the human faces behind them.[897] Benjamin criticized what he saw as Jünger's fascist vision, reminding readers of the impossibility of total individual and collective protection and the territorializing nature of warfare technologies. Regardless of his inherent sympathy for Jünger's Nietzschean project, Heidegger remained unsure of the positive value of technology in Jünger's "re-enchantment of the modern world." In his pivotal reading and

[895] Gennifer Weisenfeld, "Gas Mask Parade: Japan's Anxious Modernism," 182.
[896] Hans Rothe, "Die Liebe mit der Gasmaske", 5.
[897] Historian Dagmar Barnouw has argued that utopian visions like Jünger's were central to the intellectual projects of the Weimar era. She finds projects like Jünger's overly idealistic and lacking in an engagement with the political realities of life, contributing to a dangerous conservativism and a withdrawal from formal politics. Dagmar Barnouw, *Weimar Intellectuals and the Threat of Modernity*, 42.

reception of Jünger's *Der Arbeiter*, Heidegger ultimately painted Jünger's work as a false promise, thus chastising those Germans who believed that they could technologically control the dangers of the modern world.

Of course, the temporal and artistic mediation of interwar cultural productions was not always clear to the average German. Indeed, revealing his attempt to conceal any political intent, the epigraph of Erich Maria Remarque's *All Quiet* read:

> This book is to be neither an accusation nor a confession, and least of all an adventure, for death is not an adventure to those who stand face to face with it. It will try simply to tell of a generation of men who, even though they may have escaped its shells, were destroyed by war.[898]

Even if a journalistic narrative was Remarque's real intention, his novel was nothing if not political in nature. Each German gleaned his or her own political message after reading Remarque's account of the pointlessness of the war.[899] While some saw the depictions of wasteful violence as a strong call for peace, others used it to justify a future revolution that could topple the structures that had created the war in the first place. Some Germans rejected the very idea that the violence was wasteful, arguing that it was a sacrifice in the ongoing creation of the German nation. Still more, like Jünger, saw the war as a valuable cleansing through fire and gas, a rebirth of the dissolute European as the heroic "New Man."

It is precisely Remarque's inability to escape Weimar-era political themes in both his writing and reception that encouraged Modris Eksteins to claim that *All Quiet* was more a reflection on the postwar condition than a loyal recounting of the First World War. Of course, this was not unique to Remarque's work, and much interwar cultural production could not escape the nagging questions that the war raised. Thus, poison gas and the gas mask served as

[898] Erich Maria Remarque, *All Quiet on the Western Front*, epigraph.
[899] Modris Eksteins, "All Quiet on the Western Front and the Fate of a War", 351.

particularly symbolic objects in interwar projects. In fact, no war novel was complete without a gas attack scene. The epitome of modern weaponry, poison gas could inspire sympathy for seemingly helpless soldiers or raise questions about humanity's future. Writers and intellectuals wondered how people could possibly survive in a world in which poison gas was an available option for supposedly absolute destruction. This concern legitimized the idea that a future war was practically inevitable, thus serving to morph "The Great War" into "The First World War," and rhetorically ensuring that a second act would follow.

Death or Rebirth: Poison Gas and Gas Masks in the *Kriegserlebnis* Novel

As Modris Eksteins had made clear, German war novels experienced a major publication boom between 1928 and 1930. Called *Kriegserlebnis Romane,* or war experience novels, these books "dominated the lists of publishers" in 1929.[900] When Erich Maria Remarque published *All Quiet on the Western Front* in book form in January 1929, it quickly became Germany's (and the world's) best-selling novel. By April 1930, the book had sold 2.5 million copies, sometimes selling over 20,000 editions in a single day.[901] The massive popularity of the novel prompted one reviewer to write, "Remarkable! And a war book to boot, especially a war book! Who would have read war books a year ago."[902] Similar pronouncements proved that 1929 was a cultural "crossroads in the interwar era."[903] According to Eksteins, the years 1925 to 1929 saw an increase in a form of optimistic humanism that stemmed from the successful creations of international peace treaties and a general sentiment of hope. However, the economic slump of

[900] Modris Eksteins, "All Quiet on the Western Front and the Fate of a War", 345. See also: Thomas F. Schneider, "Krieg ist Krieg schließlich". Erich Maria Remarque: *Im Westen nichts Neues* (1928)" in *Von Richthofen bis Remarque: Deutschsprachige Prosa zum I. Weltkrieg,* 231-232.
[901] Ibid, 353.
[902] Nouvelles Litteraires, 25 October 1930
[903] Modris Eksteins, "All Quiet on the Western Front and the Fate of a War", 357.

1929 and the ten-year anniversary of the Treaty of Versailles brought on a newly reflective mood that encouraged the writing and reading of war novels like *All Quiet.* Thus, for Eksteins, *All Quite* was a "symptom rather than an explanation, of the confusion and disorientation of the postwar world."[904]

There is no denying the importance of Remarque's text for the popularization of war novels in 1929. It is also fair to claim that external political, social, and economic problems inspired the general interest in Remarque's book. German readers were not just attracted to depictions of soldiers' lives in the trenches; they were looking for answers to contemporary issues in a historical event that felt incredibly influential in shaping the vicissitudes of the present. However, it is worth considering external events other than the Great Depression in this grand societal reflection on World War I. This is especially the case because the stock market did not collapse until October 24th, 1929, the full effects of which were not fully felt in Germany until the 1930s. Remarque's novel, on the other hand, first appeared in serial form in late 1928. Indeed, the story was already massively popular by January of that year.[905] Thus, while 1929 may have been a turning point for the sale of war novels, the inspiration for writing and publishing them came earlier. Remarque himself chose to write *All Quiet* in the summer of 1928, apparently stimulated by a feeling of exasperation over the war's continual lack of meaning in the Weimar era.[906] For this reason, the novel is a series of graphic yet emotionally detached depictions of senseless violence, attempting to convey the veteran's sense of existential emptiness in the wake of his wartime experience.

[904] Modris Eksteins, "All Quiet on the Western Front and the Fate of a War", 351.
[905] Ibid, 353.
[906] Ibid, 349-350.

Given the importance of poison gas to both the World War I soldier's experience of anonymous modern violence and the 1928 German debates over civilian protection from war gases, it is unsurprising that gas features prominently in Remarque's novel.[907] Remarque presented gas as one the modern technologies that made World War I truly horrifying for the average soldier. He wrote, "Bombardment, barrage, curtain-fire, mines, gas, tanks, machine-guns, hand-grenades—words, words, but they hold the horror of the world."[908] Among these many weapons, gas created particularly horrible moments of silent expectation followed by utter chaos. *All Quiet* maintains one such scene in which a gas attack leads to total confusion:

> Gaaas—Gaaas— I call, I lean toward him, I swipe at him with the satchel, he doesn't see—once again, he merely ducks—it's a recruit—I look at Kat desperately, he has his mask ready—I pull out mine too, my helmet falls to one side, it slips over my face, I reach the man, his satchel is on the side nearest me, I seize the mask, pull it over his head, he understands, I let go and with a jump drop back into the shell-hole…Someone plumps down behind me, another.[909]

In this scene, Remarque does not describe the gas itself. In fact, the reader does not truly know if gas was actually present. We are rather presented with the sheer fear of the soldiers and the din of human movement in expectation of gas. The young recruit who fails to ready himself is used to reveal the gas attack as a deadly initiation ritual that can form naïve boys into hardened veterans.[910] The readying of defensive equipment is portrayed as both a hindrance and a possible solution to surviving this violent baptism. Helmets slip and gas masks subsequently become wet, forcing the men to consider their tools' effectiveness. Remarque further writes:

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[907] Historian Eric J. Leed claims that this sense of technology as a propulsive force in history was felt by significant numbers of World War I soldiers. Leed writes, "In the war technology was recognized as an autonomous, legislative reality. It meant not just an array of weapons and tools, but the organization of material and men. This organization--freed from the nexus of use and wont that had made it ideologically comprehensible before 1914 as a means of progress and a system for the improvement of the human condition—took on the qualities of an abstraction, a unified system of force. After the war, men talked about technology in a way that was quite different than the discussions of mechanization before 1914." Eric J. Leed, *No Man's Land,* 31-32.
[908] Erich Maria Remarque, All Quiet on the Western Front, 83.
[909] Ibid, 44-45.
[910] Yuval Noah Harari, "Scholars, Eyewitnesses, and Flesh-Witnesses of War: A Tense Relationship," 220.

> I wipe the goggles of my mask clear of the moist breath…These first minutes with the mask decide between life and death: is it tightly woven? I remember the awful sights in the hospital: the gas patients who in day-long suffocation cough their burnt lungs up in clots. Cautiously, the mouth applied to the valve, I breathe.[911]

While Remarque presented the gas as a disembodied and powerful enemy in this passage, the gas mask truly expresses the powerlessness of the soldiers. They grab it and exhort it to protect them, much like a magical talisman, but they ultimately have no assurance that it will work.[912]

Remarque's depiction aligns with most first-hand descriptions of gas attacks from the war, while also expressing post-war concern over chemical attacks and protection. In an imagined world in which everyone was a potential gas victim at any given moment, Remarque makes it clear that technological defenses like the gas mask would not always work. Not only could the mask experience technological failures, but its effectiveness relied on quick-witted and collected operators. In both *All Quiet* and his second war novel *The Road Back,* Remarque's gas attack passages reveal the difficulties inherent to remaining calm and composed.[913] Nevertheless, Remarque's central characters employ the mask and survive the gas attacks; it is the background characters who remind the men that not everyone is so lucky. In this way, Remarque attempted to create a repelling depiction of warfare by presenting scenarios in which soldiers appear as mere victims in an increasingly dangerous world. Technology like the gas mask was not their salvation, but it was the best option in a world defined by terror.

Interwar receptions of Remarque's novels regularly described them as pacifistic due to the lack of heroic passages and an apparent presentation of the meaninglessness of war.[914]

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[911] Erich Maria Remarque, *All Quiet on the Western Front*, 220.
[912] The creation of totems, talismans, or amulets was apparently common in the trenches of World War I. In fact, the Italian chemist Giuseppe Bellucci reported amulets "formed of the copper rings from poison gas grenades." Paolo de Simonis and Fabio Dei, "Wartime Folklore: Italian Anthropology in the First World War," in Doing Anthropology in Wartime and War Zones, 92.
[913] Erich Maria Remarque, *The Road Back,* 140. *The Road Back* explicitly deals with the soldier's encounter with postwar political problems.
[914] Hans Wagener, Understanding Erich Maria Remarque, 33.

However, Remarque himself never claimed a commitment to pacifism and his writings never explicitly denounced violence.[915] In fact, the historian Omer Bartov has claimed that Remarque could not "avoid revealing [war's] fascination, its power to transport men to physical and mental states previously unknown to them. This was the intoxication of murder on a vast, unprecedented scale."[916] Regardless of Bartov's critique, Remarque certainly did not posit violence, gas-related or otherwise, as a wholly positive experience. Much like earlier pacifist writings from Ernst Friedrich and Waldus Nestler, Remarque's novels relied on the graphic results of violence to convey a sense of untimely tragedy. Similarly, his texts provided few answers for avoiding future violence other than vague appeals to international cooperation.[917]

A decade earlier, Fritz von Unruh's 1919 pacifist war novel *Opfergang* presented a similarly destructive image of poison gas. The novel depicts war gas as a metaphorical king that invites its subjects (the soldiers) to suffocate. While the men don gas masks to ward off the gas, the king "dances around the men like death."[918] In a separate scene, gas is described as a "white, ghostly wall" that crept toward the soldiers. The men yelled "Gas masks! And all covered their heads. [The men became] eyes and nothing but eyes."[919] Again, Unruh portrays poison gas as an unstoppable weapon, relying on supernatural metaphors to express its uniquely evil and destructive qualities. The gas mask is Unruh's last bulwark against such evil, allowing men to witness the end of the world through its celluloid eyepieces. Critical postwar authors like Remarque and von Unruh frequently associated poison gas with a *Götterdämmerung*, employing biblical language to equate gas' destructive power with the fires of hell or the vengeance of the

[915] Lawrence Rosenwald, "On Modern Western Antiwar Literature", 163.
[916] Omer Bartov, Murder in Our Midst: The Holocaust, Industrial Killing, and Representation, 44.
[917] Hans-Harald Müller, "Politics and the War Novel", in *German Writers and Politics 1918-39,* 113.
[918] Fritz von Unruh, *Opfergang,* 46.
[919] Ibid, 148.

four horsemen of the apocalypse. In his 1925 novel *Es lebe der Krieg!*, the avowedly pacifist writer Bruno Vogel also used such language to describe the World War I battlefield, writing, "The war, which, as a flood of steel and poisonous gases, will burn through the lands with fire, plague, and hunger, and drown them in blood and sullenness and misery, until all that man created is annihilated."[920]

Of the better known anti-war writers, Edlef Köppen and Ernst Johannsen provided the most interesting depictions of the gas mask, putting their hatred of the mask in tension with its potential to save life. Köppen pulled on his wartime experience as an artilleryman to write the 1930 novel *Heersbericht.*[921] The author suffered several wounds during the war, including mustard gas burns and gas inhalation. The central character in Köppen's novel is also gassed when a tree branch pulls his gas mask off in the middle of an attack.[922] This injury reveals the fallibility of the mask, which cannot account for the accidents of war. Köppen further criticized the construction of the mask, writing:

> God, this gasmask! It is soaking wet, the water on the right and left collects from my breathing, and now it sloshes against my chin while running and sometimes gets in my mouth, ugh. And then the eye glasses fog over as if the whole landscape is covered with mist.[923]

Köppen juxtaposed the failures of the mask against its absolute necessity, writing "but it's bad luck if you do not have the mask."[924] Referring to the concept of luck, Köppen again places technology beyond the total control of its user, giving the objects of gas warfare their own level of unpredictable agency.

[920] Bruno Vogel, *Es lebe der Krieg*!, 9.
[921] Brian Murdoch, German Literature and the First World War: the Anti-War Tradition, 246.
[922] Edlef Köppen, *Heeresbericht,* 337.
[923] Ibid, 338.
[924] Ibid.

Ernst Johannsen served at Verdun as a radio specialist. His 1929 novel *Vier von der Infanterie* (or *Four Infantrymen*) was only eclipsed in popularity by Remarque's *All Quiet.*[925] Much like Remarque, Johannsen described gas attacks as moments of chaos and confusion. He wrote:

> A French gas grenade rushes in. People jump in horror and attempt to run away. "Medic! — Medic! Lime! Where is lime?" There is it. They put down the lime and rub it around on the men. "Are they already dead, Corporal?" "Yes, my boy." Our own Blue Cross, Green Cross, Yellow Cross, strange explosive grenades and explosives in between: The hell is perfect.[926]

Johannsen also presented the mask as the only protection against the insidious gas, but his fictional soldiers remain even more skeptical of its abilities:

> Gas grenades explode nearby and gas moves through the ditch. "Gas! Gas!" Everyone reaches for the masks, the hated masks. One has already done his bit and is now sweating in the masks, gasping for breath, and trying to see through the misted lenses.[927]

Like the anti-gas pacifists, Johannsen and Köppen both posited the gas mask as part of the militarist's arsenal. The mask's offer of protection was never guaranteed for the common infantryman; rather, it provided just enough defense to encourage the expansion of chemical warfare at the strategic level.[928]

Within the larger war literature boom, a second group of writers published accounts of their own war experience as a direct response to anti-nationalist, pacifist, and/or nihilistic texts like *All Quiet* and *Vier von der Infanterie.*[929] While Remarque's novels stressed *Kameradschaft*

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[925] Johannsen's book sold 20,000 copies upon its publication and parts of the book were adapted for G.W. Pabst's film, *Westfront 1918.* Brian Murdoch, *German Literature and the First World War: the Anti-War Tradition,* 183-184.
[926] Ernst Johannsen, *Vier von der Infanterie*, 89.
[927] Ibid, 30.
[928] Arnold Zweig joined in the publication of pacifist war novels in the mid-1930s, writing both *Education Before Verdun* and *Einsetzung eines Königs.* Both books maintain discussions of poison gas in World War I, but *Education Before Verdun* follows a central character who serves as a gas pioneer. Arnold Zweig, *Education Before Verdun,* 395.
[929] Josef Magnus Wehner's 1930 novel *Sieben von Verdun* was written in direct response to Remarque's *All Quiet.* Wehner's novel is marked by his enthusiasm for the war and the glorification of German soldiers. The book

(or military comradery) as the only positive product of the war, nationalist and conservative writers insisted that this community of the trenches was part of a lager nationalist sentiment that could bind Germans together in the face of post-war political difficulties. Thus, while their *Kriegserlebnis* novels featured similar violence and suffering, this hardship was expressed as a sacrifice to the nation. Interestingly, many of the more commercially successful nationalist war novels were produced prior to the revisionary accounts of men like Remarque, again suggesting that 1928 represented a publically visible splintering of the war's collective remembrance. In fact, pro-nationalist writers like Walter Bloem, Ernst Jünger, and Franz Schauwecker found some level of popular acclaim immediately after the war. Much like the anti-war writers, nationalist authors presented industrialized methods of killing like poison gas as uniquely deadly and horrifying.[930] However, it was the enemies of Germany who were responsible for this suffering. No longer presented as entirely of its own mind, weapons like gas were controlled by the Allies and soldiers were afforded more agency in their narrative counterattacks.[931] Depictions of the gas mask also remained similar, reflecting the mask's unwieldiness and malfunctions. But these technical difficulties were merely another hardship that soldiers must endure in their

maintains several passages involving poison gas and gas masks, but Wehner's soldiers are never paralyzed by fear and confusion. In 1933, Wehner signed the "Vow of Most Faithful Allegiance" alongside 88 other German writers. This was a proclamation of loyalty to Adolf Hitler and the Nazis. The Nazis later appointed Wehner to the Prussian Academy of the Arts. See: Josef Magnus Wehner, *Sieben vor Verdun* (München: Albert Langen/ Georg Müller, 1930)

[930] In the late 1920s, even the Nazis put on a play entitled *Poison Gas* for the *Kampfbühne*, or the Nazi Theater of Struggle. The content of this play has been lost, but the overall intent of the Theater of Struggle was to indoctrinate audiences with militaristic and nationalistic themes through campy plays. Claudia Koonz, *The Nazi Conscience*, 79.

[931] Gottfried Benn's 1937 poem "Wolf's Tavern" posits poison gas as a product of the New World, associating all gas with the American development of Lewisite. Benn creates an allegory for a meeting of various nation states, each with its own original method of destruction: "The East the machine-gun, the West the tank, and the New World the dew of death, the gas that smells of geraniums." E.B. Ashton, ed., *Primal Vision: Selected Writings of Gottfried Benn*, 74.

national struggle.[932] Certainly, in these texts, the mask was not conspiring to kill German soldiers or prolong the war.

A former major in the German army, Walter Bloem, described the gas mask and gas warfare in his 1918 play *Dreiklang des Krieges.* Bloem portrayed a company commander in the trenches as:

> a tall clumsy lieutenant of the reserve in steel-helmet and gas-mask. Laced up from top to bottom, he stumbles down the stairs and stands at the entrance with his hands on his helmet. He takes off his helmet and gasmask to reveal an unshaven and feral face, emaciated by hardships.[933]

Bloem writes of the gas mask as the commander's second face, concealing the stresses and pains of modern warfare. Here the mask is a form of exterior armor, assisting the soldier in enduring what Bloem described as "the truly heavenly state" of war.[934] While many of Bloem's characters die in the play, they do so in the midst of battle, fighting heroically for their homeland. Bloem's war writings proved popular in the Weimar Republic and their sales made Bloem a millionaire. In 1931, he chaired a working group of nationalist writers that intended to restore the honor of Germany through reappraisals of World War I and the technological theme was crucial to this endeavor.[935]

Thor Goote joined Bloem in championing nationalist sentiment in scenes of industrialized combat. Goote was the pen name for Werner von Langsdorff, a former artilleryman and pilot during the war. After the armistice, Langsdorff earned his engineering

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[932] Gottfried Benn's poetry even replicated Fritz Haber's argument that poison gas was not a uniquely modern phenomenon. In his poem, "Primal Vision" Benn writes: "Today's technology, yesterday's mechanics. The first pirogue had greater sociological consequences than the submarine and the airplane; the first arrow was deadlier than poison gas. The people of antiquity knew W.C.'s as well as elevators, pulleys, clocks, flying machines, automatons..." E.B. Ashton, ed., *Primal Vision: Selected Writings of Gottfried Benn,* 36.
[933] Walter Bloem, *Dreiklang des Krieges*, 108.
[934] Ibid, 25.
[935] In October 1933, Bloem also signed the "Vow of Most Faithful Allegiance." Bloem joined the Nazi party in 1938, although he rejected the party's anti-Semitism.

degree and joined the Nazi party, claiming that the war taught him the value of national comradery.[936] His three war novels *Wir fahren den Tod* (1930), *Wir tragen das Leben* (1932), and *Die Fahne hoch!* (1933) all point to the importance of *Kameradschaft* in convincing former soldiers to join the Nazi party. Langsdorff's *Wir fahren den Tod* is somewhat unique in its willingness to present German soldiers as aggressors. Indeed, the book describes the German use of poison gas:

> Dark brown clouds are rolling over hostile position. It is like a tremendous natural catastrophe. We are spellbound and shaken. We have contributed to this extermination but can hardly believe that this devastating black-gray billowing wave should be human work. My eyes start to burn, and I wipe them with my hands.[937]

While Langsdorff's characters reflect on the German use of poison gas, the gas remains a human creation rather than an uncontrollable monster. The use of this gas is subsequently justified by the nationalist spirit that animates the German war effort. Much like Bloem, Langsdorff presents the fallible gas mask as part and parcel of this struggle.[938] While the soldiers resent the problems that the mask creates, they always carry it out of habit.[939]

Langsdorff's depictions of gas mask use are similar to those of Hans Zöberlein, another nationalist author whose 1931 book *Der Glaube an Deutschland* achieved significant commercial success.[940] Describing a fictional gas attack, Zöberlein wrote:

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[936] Langsdorff later served in the National Socialist Air Corps as a Luftwaffe fighter pilot. He died in 1940 when his plane crashed in Scotland.
[937] Thor Goote, *Wir fahren den Tod*, 159.
[938] Ibid.
[939] Ibid, 127.
[940] *Der Glaube an Deutschland* sold 800,000 copies. Zöberlein served as a sergeant in the Bavarian infantry during World War I. After the war, he joined the Freikorps and the Nazi party SA. Climbing through the ranks of the SA, Zöberlein became the head of the Cultural Office in 1934, responsible for the Nazi review of the cultural arts. See: Walter Delabor, "Aufhören, aufhören, he, aufhören—hört doch einmal auf! Hans Zöberlein: Der Glaube an Deutschland (1931)" in *Von Richthofen bis Remarque: Deutschsprachige Prosa zum I. Weltkrieg*, 399-403.

> Gas! Gas! I cried, pulling the mask over my face—the gas was already coming in the trench. Canisters clattered and helmets fell into the puddles of water. Then we stood with red cheeks and goggled eyes, fading in and out of the gray-white haze of the gas.[941]

Indeed, Zöberlein's book is full of such gas attack scenes, leading to multiple detailed descriptions of both the gas and the mask. For instance, in one passage, an English officer praises the lethality of German mustard gas, claiming that the Allies have no protection against it.[942] In another scene, the masked German soldiers are described as ghosts waiting in the trenches.[943] Again, Zöberlein's descriptions of gas warfare resonate with those of Remarque and Johannsen. However, Zöberlein's text is insistent that gas was merely one more necessary struggle in a war for national existence. While the gas mask was not a perfect form of protection, Zöberlein's German soldiers are never killed by poison gas. Only the Allies are unable to resist the weapon, ultimately succumbing to its deadly capabilities.[944]

The importance of *Kameradschaft* for post-war nationalist writers is most evident in Heinz Grothe's *Der Fronterlebnis*, a 1932 scholarly treatment of war literature. Born in 1912, Grothe was far too young to serve in World War I. But his nationalist and National Socialist sympathies in the early 1930s encouraged him to reflect on the right-wing accounts of the war that had begun appearing in large numbers in the late 1920s.[945] Considering the descriptions of the World War I trenches, Grothe wrote:

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[941] Hans Zöberlein, Der Glaube an Deutschland, 199. In 1934, Zöberlein turned *Der Glaube an Deutschland* into a feature length film entitled *Strosstrupp 1917.* The film also maintained a poison gas attack scene at the 22-minute mark in which the soldiers successfully don gas masks and survive. The film was ultimately meant as a reply to the cinematic version of *All Quiet on the Western Front.* Jason Crouthamel, "Nervous Nazis: War Neurosis, National Socialism and the Memory of the First World War," 62.
[942] Ibid, 287.
[943] Ibid, 214.
[944] Werner Beumelberg's 1934 nationalist war novel, *Die Gruppe Bosemüller* also depicts the gas mask as a tenuous ally. However, his characters survive gas attacks and use their own gas to "smother" their enemies. Werner Beumelberg, *Die Gruppe Bosemüller*, 277, 303. Beumelberg also signed the "Vow of Most Faithful Allegiance" and joined the Prussian Academy of the Arts under the Nazis.
[945] Grothe later joined the National Socialist Bamberg poetry circle and served in the Wehrmacht as a war correspondent.

> The front is monstrous. Young people dragged out of life, now in fire, gas, and annihilation. The front is an eerie vortex. You can feel its suction power when you are still far away from its center. It attracts men without much resistance.[946]

Grothe acknowledged the danger of modern weapons like poison gas, but he also attributed a certain appeal to their lethality. Without the trials of gas, Grothe argued, there would be no front-line community, no brotherhood forged in the shared experiences of war. It was precisely this brotherhood that formed the foundation of a renewed German nationalism. Grothe wrote:

> There has never been a war fought solely with gas and other treacherous forms of warfare that drowned both the individual and the collective. The real happenings did not destroy the communal form. It rather welded the people together. People joined together against the daily invisible enemy: death.[947]

Grothe's conception of a front-line soldier community and its ritual baptism in the industrialized weapons of war reflected the ideas of the two most important post-war authors for both the nationalist and National Socialist movements, Franz Schauwecker and Ernst Jünger.

The war writings of both Schauwecker and Jünger replicated much of the nationalist sentiment that appeared in their contemporaries' novels. However, they re-conceptualized the pain and suffering of the war as not only necessary, but also uniquely positive on an individual level. According to these two writers, it was only through ordeals such as gas attacks, that a stronger man could historically emerge. This "New Man" would bring Germany into the modern world, refashioning the nation in the industrial forges of war.[948] This revaluation of human violence encouraged Schauwecker and Jünger to present their readers with particularly graphic depictions of aggression and suffering. These fictionalized scenes of violence were no longer

[946] Heinz Grothe, *Das Fronterlebnis*, 54.
[947] Ibid, 29.
[948] The former artillery officer Karl Haushofer seemed to agree with this sentiment, writing that the men who survived the "shower of gas, fire, and steel were best qualified to lead the German nation in the interwar period. This glorification of the war fed into Haushofer's interwar zero-sum geopolitics. Holger H. Herwig, The Demon of Geopolitics. How Karl Haushofer "Educated" Hitler and Hess, 71.

moments of final defeat, but rather the beginning of a new German triumph. Indeed, the Great War was merely the prologue to the larger struggle of the twentieth century. Inevitably, some would perish in this new knight's quest for the modern world.

After fighting as an enlisted man in the First World War, Franz Schauwecker made his breakthrough as a novelist with his 1919 war novel *Im Todesrachen.* This first-person depiction of trench warfare featured an evocative depiction of a gas attack:

> In 1918, the opponent had phosgene and something similar to our new, deadly yellow cross. Invisible and nearly odorless, it sinks heavily into the fields, penetrates into the uniforms like cigar smoke, eats away at things in its liquid form, even sits for days in holes, forests, and valleys, descending, stifling, and poisoning. There is only one salvation: strip out of your uniform and run. Every hesitation is suicide. Like most weapons against which men are powerless, gas is a cruel and deceitful way of fighting that is best characterized by the term 'poisoning.' Gas! This word creates fear and tightens muscles and tendons, ready to jump.[949]

In this passage, Schauwecker labels gas as an unfair and brutal weapon, and his portrayal of the gas attack is certainly not a straight-forward glorification of war. However, he does later argue that soldiers could survive the suffering that poison gas elicited. This survival required a mix of individual stamina and technological know-how. In the same gas attack scene, Schauwecker wrote, "'Gas!' Here and there heads and bodies rise, some begin vomiting. In no time, the gas masks are pulled out and placed over heads. Then you feel calmer, safer."[950] Similarly, in a passage from his later novel, *Endkampf 1918,* Schauwecker described sleep deprived and flea bitten soldiers who "snapped their noses in gas masks in the middle of the night and waded in clay to their knees."[951] While Schauwecker portrays the soldier's pain and fear during these gas attacks, he does not claim that this agony is without meaning. In fact, the calming reassurance of the gas mask offered possible salvation in and of itself.

[949] Franz Schauwecker, *Im Todesrachen,* 293.
[950] Ibid, 293.
[951] Franz Schauwecker, *Endkampf 1918,* 55.

After working with Ernst Jünger on a publication that formulated their mutual conception of "New Nationalism" in the mid-1920s, Schauwecker wrote his most widely read novel *Aufbruch der Nation* (or *Dawn of the Nation*).[952] Published at the height of the war novel boom, *Aufbruch der Nation* maintained particularly graphic depictions of maimed soldiers in a military hospital.[953] Schauwecker writes, "They were wounded. They screamed in pain and moaned in the hospitals. Knives milled in their bodies for the splinters and projectiles. They died in explosions, smoke, gas, mud and rain. They died in the trenches, buried and suffocated. They died, eaten alive by gas."[954] Alongside the painting of such explicit scenes, Schauwacker's novel follows a middle-class soldier named Albrecht Urach who loses faith in the war after suffering several injuries of the kind listed above. However, Urach's exposure to both violence and Bolshevism over the course of the war forces him to recognize the need for a strong German nation that can resist both the lure of communism and the effeminate weakness of the bourgeoisie. While the war destroyed the Second Reich, Schauwecker advanced this destruction as a new beginning for the German people, a bursting forth into a modern world pregnant with possibilities.[955] Thus, the explicit pain of the men in the hospital is posited as a necessary trial in the birth of the German nation.

Ernst Jünger's war novels play with similar themes of both individual and collective rebirth.[956] While Jünger's fictional works, like his world-famous *Storm of Steel*, were not as

[952] Martin Travers, *Critics of Modernity: The Literature of the Conservative Revolution in Germany, 1890-1933*, 98. See also, "Ulrich Fröschle, "Radikal im Denken, aber schlapp im Handeln? Franz Schauwecker: Aufbruch der Nation (1929)" in *Von Richthofen bis Remarque: Deutschsprachige Prosa zum I. Weltkrieg*, 270.
[953] The novel also features a gas attack scene that is similar to the attack in *Im Todesrachen.* Franz Schauwecker, *Aufbruch der Nation*, 196.
[954] Franz Schauwecker, *Aufbruch der Nation*, 373.
[955] The Nazis praised Schauwecker's books in the late 1920s and early 1930s. In 1931, Schauwecker joined the Society for the Study of Fascism, an organization that aimed to foster a positive perception of fascism in Weimar Germany. In 1933, under the new Nazi regime, Schauwecker signed the "Vow of Most Faithful Allegiance" and his novels reached their peak sales. Interestingly, Schauwecker never officially joined the Nazi party.
[956] See: Antoine Bousquet, "Ernst Jünger and the problem of nihilism in the age of total war", 17.

discernibly nationalistic as Schauwecker's, they featured comparable scenes of both individual and collective strength through suffering.[957] Jünger depicted gas attacks and gas defense far more than most *Kriegserlebnis* authors. Pulling on his experience as a gas officer during the war, Jünger filled his loosely autobiographical novels with chemical weapons, often describing attacks with the flat affect of the consummate technician.[958] For instance, in *Storm of Steel* he wrote:

> I leaped over the ramparts of the reserve line, raced forward, and soon found myself enveloped in the gas cloud. A penetrating smell of chlorine confirmed for me that this was indeed fighting gas, and not, as I had briefly thought, artificial fog. I therefore donned my mask, only to tear it off again right away because I'd been running so fast that the mask didn't give me enough air to breathe; also the goggles misted over in no time, and completely whited out my vision. All of this of course was hardly the stuff of 'What To Do in a Gas Attack,' which I'd taught so often myself. Since I felt pain in my chest, I tried at least to put the cloud behind me as fast as I could.[959]

In a seemingly odd amalgamation with this scientific and technical language, Jünger uses the metaphors of magical realism to enchant modern technology, creating a romantic world that lies within mankind's technical relationship to the world. Jünger's fictional soldiers, previously victimized by the technology of modern war, now ride into battle on mechanized mythical steeds in order to renew their age-old struggle.[960] As part of this use of magical realism, he often

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[957] Storm of Steel sold 244,000 copies in 26 editions in the 1920s. Karl Pruemm, Die Literatur des Soldatischen Nationalismus der 20er Jahre, 101.

[958] Jünger was reportedly gassed on August 8, 1918. This is one of the fourteen wounds he reportedly suffered during the war. Elliot Y. Neaman, *A Dubious Past: Ernst Jünger and the Politics of Literature after Nazism*, 26.

[959] Ernst Jünger, *Storm of Steel,* 79.

[960] In his 1925 novel *Copse 125*, Jünger displayed the height of his magical realist style. For instance, he wrote: "Never did man go to battle as you do, on strange machines like birds of steel, behind walls of fire and clouds of deadly gas. The earth has borne Saurians and frightful monsters. Yet no being was ever more dangerously, more terribly armed than you. No troop of horse and no Vikings' ship was ever on so bold a journey. The earth yawns before your assault. Fire, poison, and iron monsters go in front of you. Forward, forward, pitiless and fearless! The possession of the world is on the throw!" Ernst Jünger, *Copse 125: A Chronicle from the Trench Warfare of 1918,* 8. Modris Eksteins has argued that poison gas and gas masks created particularly fantastical images on the battlefield. He claims that soldiers "became figures of fantasy, closer in their angular features to the creations of Picasso and Braque than to soldiers of tradition." Modris Eksteins, *Rites of Spring*, 163.

described poison gas as a creeping cloud and men in gas masks as demons, ghosts, and animals.[961] In one such passage, Jünger writes,

> As I heard the next morning, in that hour in the woods a lot of our men died of poisoning from the clouds of heavy phosgene nestling in the undergrowth. With weeping eyes, I stumbled back to the Vaux woods, plunging from one crater to the next, as I was unable to see anything through the misted visor of my gas mask. With the extent and inhospitableness of its spaces, it was a night of eerie solitude. Each time I blundered into sentries or troops who had lost their way, I had the icy sensation of conversing not with people, but with demons. We were all roving around in an enormous dump somewhere off the edge of the charted world.[962]

By imbuing poison gas and the gas mask with supernatural powers, Jünger's war writings often resemble passages from Remarque and other anti-war writers. Pushing the straight-forward historical narratives of his nationalist peers far further, Jünger expressed the sense of unworldly fear that poison gas elicited. However, Jünger's demonic gases could be controlled and conquered by the equally powerful gas mask. In this way, Jünger enchanted the entire technological world while placing humanity at its controls. Poison gas was no longer faceless and undetectable, but rather a formidable weapon that could be employed by the soldiers of the modern battlefield.

Jünger's fictional world is both deeply uncaring and disturbingly violent. While his texts have little stated aim in their depictions of gas warfare, they are part of the author's larger attempt to position World War I as a European rebirth. It was precisely the technological assault on humanity that created a new physical environment in which Europeans would have to refashion themselves.[963] In the late 1920s and early 1930s, Jünger made this idea explicit in his non-fiction essays such as *Der Kampf als inneres Erlebnis* (The Battle of Inner Experience,

[961] Ernst Jünger, *Storm of Steel*, 49, 79-80, 114.
[962] Ibid, 114. Jünger writes similar descriptions of gas attacks in his second war novel *Feuer und Blut* (published in 1925). Ernst Jünger, *Feuer und Blut*, 99, 102.
[963] Robert Heynen, Degeneration and Revolution: Radical Cultural Politics and the Body in West Germany, 265.

1922), *Sturm* (Storm, 1923), *Die Unvergessenen* (The Un-forgotten, 1928), and *Über den Schmerz* (On Pain, 1934). According to Jünger, the war reminded Europeans that they were inherently violent animals; nineteenth-century civilization was merely a façade for the dark simian conflict that propelled human history. Resembling Carl Schmitt's geopolitical theories on an individual, almost biological, level, Jünger wrote:

> man drives the will to kill through the storms of explosives, iron and steel, and when two people clash in the tumult of battle, so meet two beings, of which only one can exist. These two beings have set themselves in a primal relationship to each other, in the struggle for existence in its most naked form.[964]

Jünger celebrated this supposedly primitive realization, asserting its importance in the creation of a "New Man." In sexual terms, the literary theorist Klaus Theweleit famously described this envisioned process as a:

> procreation [that] occurs when the hard core of men (the nation) blasts away 'Mother Earth,' tearing her apart and penetrating her in warrior fashion, 'fertilizing' her interior with streams of blood…War is a process that regenerates both the nation and soldier male himself.[965]

For Jünger, unbridled violence coupled with the incredible power of modern warfare technology forged a new hardened man, a being who could utilize said technology to break the illusions of civilization and reenchant modernity with the more primal gods of aggression, violence, and warfare.[966] Jünger wrote of his envisioned "New Man":

> The spirit of the war of material and of trench warfare, which was fought more recklessly, wilder, and more brutally than any other war that man has produced, created a novel form of man. It was a whole new breed, embodying energy and loaded with the utmost force. Smooth, lean, sinewy bodies, striking faces, eyes petrified in a thousand horrors under the helmet. They were overcomers, steel men, set in battle in its most ghastly form.[967]

[964] Ernst Jünger, Der Kampf als inneres Erlebenis, 8-9.
[965] Klaus Theweleit, Male Fantasies Vol. 2, 88.
[966] Klemens von Klemperer, German Incertitudes, 1914-1945: The Stones and the Cathedral, 53.
[967] Ibid, 32-33.

Of course, many soldiers would not survive the modern warfare of the trenches. Jünger saw this culling process as essential to the social-Darwinian evolution of the "New Man." The pain elicited by methods of technological warfare like poison gas was recast as a baptism in "fire and blood."[968] Those men who did not endure this ritual were nevertheless essential to the process of fashioning Jünger's vision for the modern man, the modern community, and the modern German nation.[969] Thus, it was precisely the poison gas attacks and other technologically induced moments of wartime suffering that gave the war its meaning. For Jünger, to question the importance of this process was a betrayal of the experience itself, a denial of the significance of risk and contingency in the valuation of heroic virtue.[970] Reflecting on the implications of modern warfare technologies like gas, Jünger wrote that:

> one could see the enhancement of human ability through technology: Compared to the roar of the attack, the clash of weapons and hooves of an earlier time, these [modern weapons] were thousands of times stronger. For that reason, the courage required here greatly exceeded that required of the Homeric heroes.[971]

By granting courage such importance on the modern battlefield, Jünger was attempting to revalue chivalric bravery in a form of warfare that often felt anonymous and capricious. This re-humanizing of total war placed a human control behind all of the explosives, tanks, airplanes, and gasses that defined the western front of World War I. For Jünger, gas might have been ghostly and supernatural but it was ultimately the face of the "New Man," encased in rubber and celluloid, who directed and controlled this quasi-mystical power.

The Excesses of the Mask: Depictions of Gas Warfare in Visual Art and Film

[968] Ernst Jünger, *On Pain*, 1.
[969] See: Ernst Jünger, *Die Unvergessenen* (Berlin: Wilhelm Andermann Verlag, 1928)
[970] Thomas Nevis, Ernst Jünger and Germany: Into the Abyss, 1914-1945, 85.
[971] Ernst Jünger, *Sturm*, 33.

In her study of poison gas in interwar visual art, historian Doris Kaufmann presents several French and British landscape paintings that attempt to depict poison gas floating over the World War I battlefield.[972] However, as Kaufmann points out, these landscapes struggle to express the "quantum of suffering" that gas inflicted on soldiers. Due to its inherent "lack of pictorialness," poison gas was a particularly difficult weapon to depict in visual form. For this very reason, the weapon lent itself to modernist artistic styles like cubism and futurism, which were able to bend the realities of gas into a subjective experience of horror and pain.[973] In the German context, this is best expressed in Otto Dix's 1917 expressionist painting, *Lichtsignale,* which depicts colored flares that light up trenches filled with entangled bodies and barbed wire. The flares are intended to warn of a gas attack and the bodies below wear primal masks.[974] While Dix's painting is a jumble of colors and objects that creates a sense of wartime confusion, its use of the gas mask as a distinct material representation of gas attacks anticipates later developments in German war art.

Dix, a former machine gunner in the German army, turned towards a more realistic style in the 1920s as part of the larger New Objectivity movement in the visual arts. In 1923, he produced "The Trench," a depiction of the World War I battlefield that would be incorporated into a larger War Triptych between 1929 and 1932. Like *Lichtsignale,* "The Trench" relied on a scarred physical landscape, darkened skies, and mutilated bodies to express the destruction of World War I. However, one of the central objects in the painting is a lone soldier in a steel helmet and gas mask. Through the mask, Dix insinuates the presence of poison gas and expresses

[972] Doris Kaufmann, "'Gas, Gas, Gaas!' The Poison Gas War in the Literature and Visual Arts of Interwar Europe", in *One Hundred Years of Chemical Warfare: Research, Deployment, Consequences,* 171-172.
[973] Ibid, 173-174.
[974] For Dix's *Lichtsignale* see: Doris Kaufmann, "'Gas, Gas, Gaas!' The Poison Gas War in the Literature and Visual Arts of Interwar Europe", in *One Hundred Years of Chemical Warfare: Research, Deployment, Consequences,* 173.

the toxicity of the entire environment. In this way, the presence of the gas mask is far from coincidental. Much like all masks, the gas mask conceals the human face, making it an object that always maintains excess meaning. Whether worn or not, the mask constantly suggests the suppression of the real. At the same time, this allows the mask to serve as a locus for expanded symbolic significance. For this very reason, interwar artists frequently used the gas mask to represent the possibility, imminence, or aftermath of gas attacks. The ambiguity of temporality in depictions of the gas mask further allowed artists to express distinct wartime experiences while pointing to the dangers of a future war.

As a symbolic object, the mask can also be seen as a representation of broader conceptions of modernity. In his posthumously published 1901 work, *The Will to Power*, Friedrich Nietzsche described the masked quality of the triumphant modern man, writing: "He knows that he cannot reveal himself to anybody: he thinks it bad taste to become familiar; and as a rule he is not familiar when people think he is. When he is not talking to his soul, he wears a mask."[975] Likely reflecting Nietzsche's claims, the interwar philosopher Helmuth Plessner argued in his 1924 work of philosophical anthropology, *Grenzen der Gemeinschaft,* that masks constantly mediated social life, thereby armoring the individual against social exposure and offering a certain internal freedom in the impersonal.[976] Indeed, Plessner even described such masks as a form of technology, relying on the more expansive conception of *techne* to include the artifices of human expression. *Grenzen der Gemeinschaft* was in favor of this protective masking, arguing that it allowed humans to socially exist in a pluralistic society like the Weimar Republic. Indeed, Weimar Berlin, the city that most fully articulated the promises and pitfalls of

[975] Friedrich Nietzsche, *The Will to Power*, 367.
[976] Helmuth Plessner, The Limits of Community, 80. ; Helmut Lethen, *Cool Conduct: The Culture of Distance in Weimar Germany*, 62-63.

modernity to contemporaries, was (and still is) described as a social arena in which people could now choose their own masks.[977] Of course, this claim refers to both the figurative and literal representation of each city dweller.

The artists of the Dada movement were perhaps the first to pick up on this idea and to use the gas mask as one of its many representations of uncertainty. For instance, in her 1919 *Dada-Rundschau,* Hannah Höch placed an ambiguous soldier figure on top of a cloud of poison gas that threatens to envelope the German Minster of Defense, Gustav Noske. The soldier, whose sex appears undefined, is entirely covered by a long trench coat, a helmet, and a gas mask. The combination of images appears to suggest that the new technologically armored human, as a product of the First World War, now threatens the older political order. Similarly playing with ambiguous identities and threats to the established social world, Rudolf Schlichter's 1920 painting *Dada Dachatelier* features a number of cyborgs, cobbled together with various common items. At least two of the humanoids have gas masks as faces, representing the ways in which the German military had both figuratively and literally reassembled humans over the course of the First World War and into the interwar period.[978]

Returning the gas mask to the battlefield, Otto Dix's work from the mid-1920s focused on the fear producing quality of its inherent anonymity. In Dix's 1924 portfolio, entitled *Der Krieg,* the artist relies on two different temporalities of a gas attack, showing both the immediate reality of the violence and the human cost in its aftermath. In *Sturmtruppen,* the gas mask turns attacking soldiers into violent ghouls, assaulting the viewer through the haze of gas. Like in Schlichter's work, the gas mask appears as the permanent faces of the soldiers, revealing what Dix saw as the mechanical violence and horror of the war.

[977] Tyler Carrington, *Love at Last Sight,* 169.
[978] Carol Poore, Disability in Twentieth-Century German Culture, 34.

Figure 5: Otto Dix's *Sturmtruppen* from his 1924 portfolio, *Der Krieg*.[979]

In this same portfolio of war drawings, Dix also included two depictions of gassed soldiers, *Gas-Opfer (Templeux-La-Fosse, August 1916)* and *Die Schlafenden von Fort Vaux (Gas-Tote).*[980] In both of these works, Dix presents a row of corpses with darkened skin to express the brutal end effects of asphyxiation under gas. In many ways tied to an image like the advancing *Strumtruppen,* Dix's *Gas Victims* reveals the gas mask's fallibility, toggling between two competing images of chemical warfare. Dix forces his viewer to contemplate the easy slippage between violent aggressor and lifeless victim, thus raising questions that would dominate the intellectual debates over chemical weapons that appeared in the late 1920s.

While Dix's depictions of the gas mask remained in the trenches of World War I, plenty of other visual artists used their work to bring such military technologies into the social and

[979] Otto Dix, Shock Troops Advance under Gas, 1924. For a 1937 drawing that appears similar in its attempt to convey the dehumanizing anonymity of the gas mask, see: Heinrich Stegemann, *Warnung vor dem nächsten Krieg*, 1937.
[980] Otto Dix, Gas Victims (Templeux-La-Fosse, August 1916), 1924. ; Otto Dix, Die Schlafenden von Fort Vaux (Gas-Tote),

political context of the interwar period. Reflecting on the ways in which military rearmament threatened Europe in the mid to late 1920s, the gas mask now became a symbol of a broad technological militarism. For instance, in 1924, George Grosz unveiled "Shut Up and Do Your Duty" as part of a larger set of prints entitled *Hintergrund.* The piece featured a recreation of Christ's crucifixion in which Jesus is wearing both army boots and a gas mask. Adapting one of the weightiest symbolic images in European history, Grosz aggressively politicized his Christ figure for the contemporary moment in an attempt to reflect on the German soldiers of World War I who were killed by the very weapons that the German army had first employed. Thus, the piece served as a rejection of Germany's stated war aims and the subsequent heroic memorialization of the war. However, the image can also be read to represent German civilians (or humanity at large) in a world where large-scale aero-chemical attacks now seemed imminent. Ultimately, Grosz' provocation achieved its desired effect and the German state brought criminal charges against both the artist and his publisher for the release of "Shut Up and Do Your Duty." Fighting against accusations of "blasphemy and defamation of the German state," Grosz was now caught up in the longest trial in the history of the Weimar Republic.[981] While Grosz was ultimately acquitted in 1931, his trial most fully revealed the symbolic power of the gas mask and the political importance of national gas protection in the minds of interwar Germans.

After fleeing the rise of the Nazis in 1933 and settling in the United States, Grosz would return to this visual theme in his 1936 lithograph "Soldier on Horse with Gas Mask." Grosz's horseman is foregrounded against the bombing and gassing of a major city. The soldier is given a spectral quality while the skeleton of the zombie horse is visible through its skin. Through these supernatural features, the image reminds the viewer of the pale horseman of the apocalypse (or

[981] Herbert Knust, "George Grosz: Literature and Caricature", 235.

the horseman of death), as he rains poison gas down on humanity.[982] Serving as the counterpart to Christ in a gasmask, Grosz's masked soldier anticipates the future violence of technologically advanced weaponry. However, the horseman blends both modern and pre-modern elements, wearing a gas mask along with a saber and cloak. For this reason, Grosz's piece resembles the World War I photograph of the German cavalryman with a gas mask and spear. Eliciting uncanny dread through this amalgamation, the unrestrained and barbaric violence of an imagined past is brought forward into a more technologically precarious modernity.[983]

For the Dada artists, Otto Dix, and George Grosz, the gas mask undoubtedly served to depersonalized and obscure the human face. For Dix and Grosz, this symbolically meant that violence too had become depersonalized and widespread in the modern world. However, not all interwar visual artists created such a stark morality tale, instead exploring the complicated politics of violence, complicity, and victimhood that the gas mask seemed to produce. At first glance, Barthel Gilles 1930 work "Self Portrait with Gas Mask" attempted a straightforward critique of the modern man who must always discipline himself for an imminent gas attack. A product of the "New Objectivity" movement, the painting features the artist standing in front of the nocturnal silhouette of a burning Cologne, presumably just bombed and gassed. Gilles raises a gas mask to his face in a cramped composition, tightening his body in preparation for gas. He gazes intently out at the observer, as if to ask how the world had come to this moment. In donning the gas mask, Gilles appears aware of the fact that the mask is territorializing his life, forcing him to react to gas attacks in the most intimate and physical way. At the same time, the

[982] It is again important to point out that the pale horseman of the apocalypse is often translated from the Greek as the yellowish-green horseman. The Greek word khloros can mean either pale or greenish-yellow, and is also the root of the word chlorine.

[983] A similar dynamic can be found in the works of Max Busyn, a German-Jewish artist who created a number of gas related drawings in the 1930s. See, for instance: Max Busyn, "Bombings accompanied by Death," (1939)

artist realizes his own complicity with the mask's demand for individual and collective discipline.[984] Nevertheless, the scene is frozen at the moment of choice and the viewer is led to believe that Gilles will most likely put the mask over his face; the desire to simply survive overcomes more systemic concerns with this newly violent world.

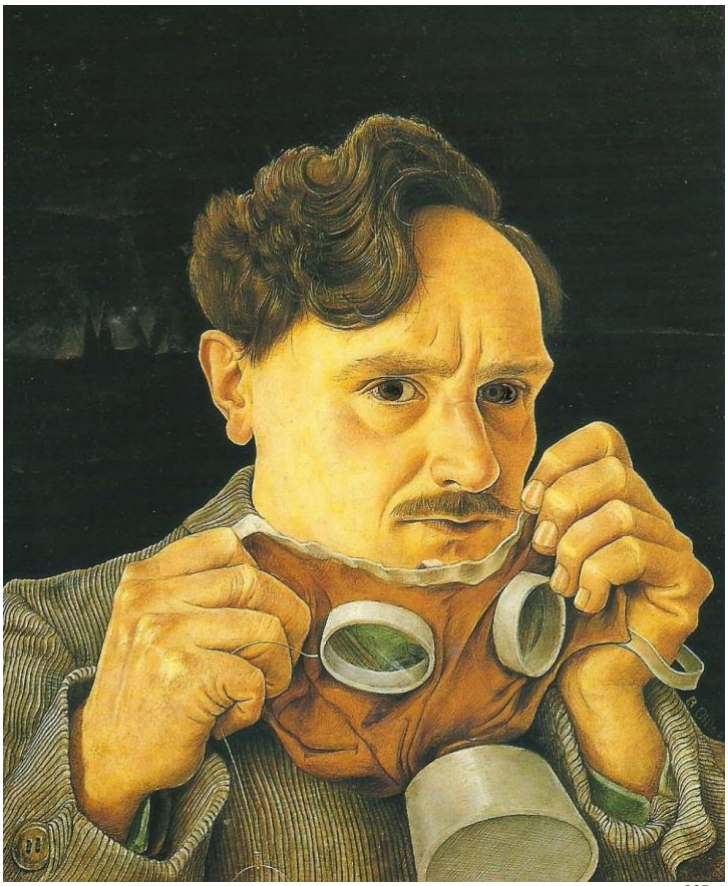

Figure 6: Barthel Gilles, "Self Portrait with Gas Mask" (1930)[985]

In the late 1920s and into the 1930s, the symbolic connection between the gas mask and future warfare became even more explicit in German visual art. For instance, the communist artist Gerd Arntz used both the gas mask and gas clouds to express the ways in which

[984] See: Peter Fritzsche, "Airmindedness and the Reinvention of Germany," 708-709.
[985] Barthel Gilles, "Self Portait with Gas Mask," 1930.

nationalism and patriotism were used to enrich capitalists in the armament industry. In his 1936 work *Fürs Vaterland,* faceless workers walk away from a factory, transforming into masked soldiers before meeting their death on the battlefields.[986] Similarly, Lea Grundig made an explicit connection between gas masks and wartime death in her 1936 etching *Gasmasken von Krieg droht!,* or *Gasmasks Warn of War*. Grundig's work depicted a masked soldier aggressively gazing on a group of terrorized people, thus anticipating the violent gassing of defenseless civilians. Permanently linking the mask to the poison that it was meant to resist, Grundig's title replicated the pacifist critiques of Gertrud Woker by arguing that the provision of the gas mask was only a furthering of militarism; in fact, the mask encouraged militaries to employ gas in a future war and to find ways to tip the scales in a chemically saturated war.[987] For Grundig, chemical warfare was a search for pure, raw power, an attempt to violently separate the protected from the exposed.

Clearly, German visual art from the 1920s and 30s brought concerns over national defense and poison gas to the attention of those who patronized the often-insular art world. While some Germans may have seen these artworks through reproductions in pacifist literature, the majority of people never had the chance to study their political images. On the other hand, film provided a medium that could reach far more German eyes.[988] In his study, *Shell Shock Cinema,* film scholar Anton Kaes has argued that, at least through metaphorical means, some of the best-known Weimar era films tackled the destruction and trauma of World War I. Kaes sees Robert Wiene's 1920 classic, *The Cabinet of Dr. Caligari*, as an attempt to confront the psychic

[986] Gerd Arntz's *Fürs Vaterland* (1936).
[987] Lea Grundig, Gasmasken von Krieg droht!, 1936.
[988] The interwar period saw the breakthrough of film as a mass medium in Germany. In 1910, there were 1,000 cinemas in German with 200,000 seats. By 1928, there were 5,267 cinemas with 1,876,600 seats. By 1930, Germans went to the cinema an estimated six million times per week. However, it is worth noting that almost all movie-goers were city dwellers. Corey Ross, "Mass Culture and Divided Audiences: Cinema and Social Change in Inter-War Germany", 160-161.

trauma that many German veterans experienced after the war.[989] Similarly, F.W. Murnau's 1922 film *Nosferatu* recreated the narrative of the war by sending young men off to fight a deadly horror, represented by the film's eponymous vampire.[990] Still further, Kaes sets up Fritz Lang's 1924 *Die Nibelungen* as a tale of German national consciousness and its break from an idealistic past after the war.[991] And finally, he argues that Lang's 1927 film *Metropolis* is a reckoning with the scientific, industrial, and military ties that propelled Germany's failed war effort.[992]

Metropolis tells the story of Freder Frederson, a young man who lives in a utopian society predicated on the power of advanced machinery. After following a mysterious young woman into the sewers, Freder learns that his utopian city sits above slums filled with oppressed workers. Freder attempts to unite the upper and lower societies, fighting against an engineer and his perfidious robot in the pursuit of social harmony. Certainly, *Metropolis* can be read in terms of class struggle and Marxian history with technology playing a central role in the film as the mediator of class. Lang raises questions about the ways in which technology can deceive and destroy humans and the ways in which humans propagate technologies through an insistence on scientific rationality. Utilizing modernist set design, the city of Metropolis appears distinctly dystopian due to his hard, cold, technological spaces. Interestingly, Anton Kaes claims that the film was loosely based on Georg Kaiser's *Gas* trilogy, a series of post-war plays that questioned the destructive nature of wartime technologies, specifically poison gas.[993]

While Expressionist films like *Metropolis* had already exposed discerning audiences to questions regarding the destructive powers of technology, Mikhail Dubson's 1929 film *Giftgas*

[989] Anton Kaes, *Shell Shock Cinema: Weimar Culture and the Wounds of War*, 48.
[990] Ibid, 101. Murnau's 1926 film version of *Faust* also depicted a plague blanketing a city. Kai Evers, *Violent Modernists: The Aesthetics of Destruction in Twentieth-Century German Literature*, 160.
[991] Ibid, 147.
[992] Ibid, 187.
[993] Anton Kaes, *Shell Shock Cinema: Weimar Culture and the Wounds of War*, 187.

(or poison gas) expressly brought out many of the themes surrounding the concurrent poison gas debates. Dubson and his writers based the film on a poorly received 1929 play by Peter Martin Lampel entitled *Giftgas über Berlin.*[994] Pulling on the events of the 1928 Hamburg gas accident, Lampel's play involved a gas leak at a secret military installation in Berlin. The gas poisons much of the city, creating a desire for national gas protection and leading to the election of General Hans von Seeckt as an emergency military dictator.[995] Only appearing on stage a few times, Weimar authorities banned Lampel's play for its supposedly dangerous political message.[996] Nevertheless, Dubson adapted the play for the big screen, telling the story of a young scientist who succeeds in synthesizing a fertilizer. Clearly referring to the wartime actions of Fritz Haber, the film's fertilizer synthesis process also produces poison gas as a byproduct. When the scientist attempts to stop fertilizer production due to his concerns over the production of poison gas, his employer shoots and kills him. However, the pistol fire accidentally unleashes the stores of poison gas, eventually killing the entire city. The film's final scene features the ghosts of World War I soldiers, who rise from the dead to decry the use of poison gas. Dubson uses gas masks throughout the film to express the problems of gas protection and as the gas wafts over the city, civilians fight for scarce masks and leave each other to asphyxiate.[997] Certainly, such brutal cinematic scenes forced German movie-goers to consider the possibility of such violence taking place in every German city and every German home in a future war.

[994] Werner Hirsch, *Die rote Fahne: Kritik, Theorie, Feuilleton 1918-1933*, 379.
[995] Richard Elsner, *Das deutsche Drama: ein Jahrbuch*, 233.
[996] Julius Bab, "Giftgas und Zensur", 170.
[997] Mikhail Dubson, *Giftgas*, 1:10:40.

The Apocalyptic Novel: Dystopian Science Fiction and Visions of Gas Destruction

While *Kriegserlebnis* novels and films treating technological destruction clearly maintained strong political messages, their historical setting often served to depoliticize any claims. Undoubtedly, right- and left-wing Germans fought over the memorialization of the war through these narratives, but ancillary questions often went unnoticed by those engrossed in the inherent romanticism of the soldier's tale.[998] However, a second body of literature emerged in the Weimar era that presented these post-war questions in a much more explicit and future-oriented manner. Apocalyptic and/or dystopian novels and plays began to hypothesize the role of aerial bombing and gassing in a future war. Reflecting on both the experience of modern industrialized killing in World War I and the national aerial defense debates of the 1920s, these proto-science fiction works unambiguously narrated dark visions of the German future. Indeed, literary scholar Paul Saint-Amour has described this larger moment in modernist writing as a "perpetual interwar," in which writers were constantly "remembering a past war while awaiting and theorizing a future one."[999]

One of the predecessors of this "perpetual interwar" first appeared in 1917. Georg Kaiser's *Die Koralle* was the first installment in a trilogy that examined the links between industry and warfare that developed over the course of World War I.[1000] Kaiser made this theme more explicit in his second installment, *Gas I.* Published in 1918, *Gas I* centers on the son of an industrialist billionaire who inherits his father's gas factories. Following his progressive impulses, the son distributes the factory profits among the workers and gives them fiduciary interest in the business. When one of the factories explodes, the son wishes to shut down the

[998] See: Joyce Wexler, "The New Heroism", 11.
[999] Paul K. Saint-Armour, *Tense Future: Modernism, Total War, Encyclopedic Form*, 305.
[1000] *Die Koralle* examined the ways in which a wealthy industrialist exploits his workers.

entire business, now fully realizing the danger of his products. However, the workers, led by "the Engineer," refuse to abandon the lucrative factories. After a government call for national gas production, the son and the Engineer hold a public debate on the future of the gas factories. The Engineer effectively wins, the factories are kept open, and the play ends with the workers chanting for more "Gas!"[1001]

The sequel to *Gas I, Gas II* was published in 1920. Set twenty-five years after *Gas I,* the factory workers are now trapped in an endless cycle, producing natural gas for their nation's war effort. When the chief engineer synthesizes a new poison gas, he wishes to employ it on the battlefield. The current factory owner (and son of the owner in *Gas I*) rejects the chief engineer's suggestion, instead pleading for universal peace. The factory workers ignore this call for peace due to their strident nationalism and the factory owner smashes a vial of poison gas in extreme anger. Weeks later, when the opposing army approaches the now abandoned gas factory, the soldiers find the skeletons of the entire workforce. Horrified by the effects of the poison gas, the enemy soldiers commit mass suicide. In *Gas II,* Kaiser again employed a climactic scene in which the engineer and workers chant for gas, reciting: "Poison gas! Be our avenger! Poison Gas! Be our champion!"[1002]

It is fairly obvious that Kaiser's plays fictionalize Fritz Haber's use of poison gas in World War I. Reflecting his growing technological pessimism between 1918 and 1923, Kaiser decried what he saw as a military-industrial complex that had developed during the war.[1003] His plays further pulled on Marxist insights to narrate the ways in which capitalist profit-seeking

[1001] Georg Kaiser, *Gas I,* 75.
[1002] Georg Kaiser, *Gas II,* 162.
[1003] Axel Goodbody, *Nature, Technology and Cultural Change in Twentieth-Century German Literature*, 94-95. Walter Mehring's cabaret poem "Simultaneous Berlin" also served as an early warning about the military production of poison gas. The poem read: "An Ufa film Hails Kaiser Wil'm. Cathedrals wag reaction's flag, with swastikas and poison gas, monocles won't let hooked noses pass. On to the pogrom in the hippodrome!" See: Peter Jelavich, Berlin Cabaret, 149.

inspired technological advances. While the tragic characters hold up these advances as a path to utopia, they ultimately lead to human exploitation and greater social risk. This, Kaiser warned, could lead to the apocalyptic scenario that his plays imagined.[1004]

As debates over national aerial and gas protection intensified in the late 1920s, Kaiser's plays served as a template for the proliferation of other apocalyptic novels and plays.[1005] These fictional accounts took on specific political contexts that expressed distinct German concerns over the role of France, Britain, the United States, the Soviet Union, and even Japan in a future aero-chemical war. For instance, Peter Martin Lampel's 1929 play *Giftgas über Berlin* posited a future German war with France that included English and Russian interference.[1006] Similarly, in his 1929 novel *Giftküche,* Karl August von Laffert imagined a gas war between England and Russia in which Germany suffered in the crossfire. Expressing serious doubts about international diplomacy's ability to avert a future war, Laffert's book left readers with few answers other than personal protective devices like gas masks.[1007] Likewise, Hans Chlumberg's *Wunder um Verdun* presented a diplomatic discussion between the French and Germans in which both nations could not agree to mutual disarmament while the other maintained poison gas.[1008] Between 1931 and

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[1004] Axel Goodbody, *Nature, Technology and Cultural Change in Twentieth-Century German Literature*, 108. In his 1918 play, *The Last Days of Mankind,* the Austrian writer Karl Kraus expressed a similar possibility for the fate of the world. Kraus' plays included a scene in which future men and women in gas masks express physical attraction. In a world in which people must always wear masks, human features become comical. Full of dark humor, the masked male proclaims: "If only your face got accustomed to mine, we then might embrace, for your mask is so fine. But no features are shown when such horrors appall. We must stay unknown and obey duty's call. While we shoulder our rifle, we dread a reprisal from fumes that could stifle our will for survival. But while flames fill the air we still feel hale and hearty, so let's form a pair and be off to the party." Karl Kraus, *The Last Days of Mankind,* 554-555. Walter Benjamin later wrote that the satirist Kraus "never had firmer ground under his feet than amid a generation about to mount tanks and put on gas masks, a mankind that has run out of tears but not out of laughter. In him civilization prepares to survive." Walter Benjamin, "Karl Kraus," in *Selected Writings: 1931-1934,* 448.
[1005] Johannes Becher took up Kaiser's themes in his 1925 modernist novel, *(CHCl=CH)3As (Levisite)*. Ernst Toller's plays *Hoppla, We're Alive!* (1927) and *Transfiguration* (1919) both include scenes in which poison gas is satirically justified.
[1006] Richard Elsner, *Das deutsche Drama: ein Jahrbuch*, 233.
[1007] Karl August Laffert, *Giftküche,* 236. For similar doubt about the effectiveness of international diplomacy see Kurt Tucholsky's essay entitled "A Vision." Kurt Tucholsky, *What if--? Satirical Writings of Kurt Tucholsky*, 43-44.
[1008] Hans Chlumberg, *Wunder um Verdun,* 109-110.

1933, German authors like Hans Gobsch, Johann von Leers, and Axel Alexander created similar depictions of aerial war between various European states.[1009]

Imaginary apocalyptic scenarios easily lent themselves to distinctly science fiction narratives. For example, the science fiction author Hans Dominik first wrote on the dangers of poison gas in his story *Der Gas-Tod der Großstadt* (The Gas-death of the City). In this unpublished work, a group of enemy soldiers sit in an underground bunker and direct aerial attacks on a fictional capital city. The planes drop gas bombs and phosgene penetrates every building. Dominik writes:

> The next day, when the sun rose in the east, the last life had died out in the capital of Austrasia. A single gas attack by the superior enemy had turned the thriving city of millions into a cemetery… The age of the chemical war had dawned. When there were no more fronts, no cannons, no difference between combatants and non-combatants, the whole country of the weaker adversary became a battleground, each one of its inhabitants exposed to the deadly effect of hostile chemical agents.[1010]

Clearly influenced by the military writings of Giulio Douhet, Dominik presented exaggerated dangers of chemical warfare. However, his story also provided a means to combat this apocalyptical vision. Mass chemical death is staved off after civilians are provided with gas masks. Similarly, in Dominik's later novel *Atomgewicht 500,* scientific and technological solutions ward off a major chemical disaster.[1011] In this way, Dominik replicated the arguments of the gas specialists in the late 1920s, arguing that humans could survive in a poisoned

[1009] Hans Gobsch, *Wahn-Europa 1934* (Hamburg: Fackelreiter-Verlag, 1934) ; Johann von Leers, *Bomben auf Hamburg* (Leipzig: R. Voigtländers Verlag, 1932) ; Axel Alexander, *Die Schlacht über Berlin* (Berlin: Verlag "Offene Worte", 1933) ; Arnold Mehl's 1935 novel *Schatten der aufgehenden Sonne* narrated an attempt by Japan to steal chemical from Europe in order to attack the continent with poison gas. Arnold Mehl, *Schatten der aufgehenden Sonne* (Leipzig, Wilhelm Goldmann Verlag, 1935). Walter Dach's 1935 novel *Volksgenosse Müller II* told the story of a German chemist who refused to assist the French in producing chemical weapons due to his staunch German nationalism and pro-Nazi politics. Reavling in the "perpetual interwar" mode of the novel, Dach wrote, "The gas, I can tell you, is a positively horrible thing. It eats its way through tanks and concrete cellars. The next war will be damned funny for Germany." Walter Dach, *Volksgenosse Müller II,* 21-31.
[1010] Hans Dominik, *Der Gas-Tod der Großstadt,* 102.
[1011] Hans Dominik, *Atomgewicht 500,* 19.

atmosphere as long as they received the correct training and equipment. For Dominik, it was only a continued commitment to science and engineering that could save humanity.[1012]

Most German authors were not nearly so optimistic as Dominik, providing no real means of salvation in their fictional writings. Pulling on the theoretical insights of the sociologist Ulrich Beck, literary scholar Kai Evers has identified the growth in apocalyptic writing in the late 1920s and early 1930s as a collective "literature of risk."[1013] This focus on human contingency was not only found in war novels and science fiction from the 1920s and 30s, but also in the works of Weimar literary luminaries such as Robert Müsil, Alfred Döblin, Elias Canneti, and Hans Henny Jahnn.[1014] As Evers puts it, "Their works recognized society's unpreparedness to imagine the potentially disastrous capacity of otherwise immensely productive and beneficial modern technology."[1015] Thus, even *Berlin Alexanderplatz,* Döblin's famous 1929 modernist depiction of Weimar Berlin, ends with a short reflection on aero-chemical bombing.[1016] Döblin writes:

> Keep awake, keep awake, for there is something happening in the world. The world is not made of sugar. If they drop gas-bombs, I'll have to choke to death; nobody knows why they are dropped, but that's neither here nor there, we had the time to prepare for it.[1017]

In this passage, Döblin presents aero-chemical warfare as an inevitable condition of modernity. His characters are aware of this condition, but they do nothing to prevent it, reflecting the lack of

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[1012] While writing his science fiction, Dominik was also working as an electrical engineer and a technical writer. William B. Fischer, *The Empire Strikes Out: Kurd Lasswitz, Hans Dominik, and the Development of German Science Fiction,* 181.
[1013] Kai Evers, "Risking Gas Warfare: Imperceptible Death and the Future of War in Weimar Culture and Literature", 271.
[1014] This sense of contingency was even present in concurrent newspaper images that attempted to imagine the future aero-chemical war. The *Berliner Illustrierte Zeitung* printed the image of a lone woman dead in the streets of Berlin in their October 30, 1927 edition. See: Kai Evers, "Gassing Europe's Capitals: Planning, Envisioning, and Rethinking Modern Warfare in European Discourses of the 1920s and 1930s," in *Visions of Europe: Interdisciplinary Contributions to Contemporary Cultural Debates*, 76.
[1015] Kai Evers, "Risking Gas Warfare: Imperceptible Death and the Future of War in Weimar Culture and Literature," 272.
[1016] Literary scholar Paul K. Saint-Armour argues that Döblin's literary recreation of the Berlin city-scape is an attempt at memorialization in the event of future citywide bombing. Paul K. Saint-Amour, "Air War Prophecy and Interwar Modernism", 149.
[1017] Alfred Döblin, *Berlin Alexanderplatz,* 634.

perceived human agency in the increasingly technologically-bound world. Just two years after the publication of *Berlin Alexanderplatz,* another soon-to-be widely respected modernist writer, Hermann Broch, also used poison gas as a symbol of modernity's tightening noose. In his 1931 study of German society entitled *The Sleepwalkers*, Broch wrote:

> And this age seems to have a capacity for surpassing even the acme of illogicality, of anti-logicality: it is as if the monstrous reality of the war had blotted out the reality of the world. Fantasy has become logical reality, but reality evolves the most a-logical phantasmagoria. An age that is softer and more cowardly than a preceding age suffocates in waves of blood and poison-gas.[1018]

Here, Broch posits the illogical panic of the interwar period as its source of downfall. It is the constant concern for future aero-chemical warfare, or the mode of "perpetual interwar" discourse, that will inevitably bring the phantasmagoric gas war. And according to Broch, unlike the soldiers in the trenches of World War I, interwar Europeans are even less prepared to face this deadly new reality.

Technology for the Modern Age: Weimar Philosophers Enter the Gas Debate

Nearly immediately after his front-line service in World War I ended, Ernst Jünger began to publish his reflections on the massive technological changes taking place in modern warfare. By 1921, he had written the article "Die Technik in Zukunftsschlacht" (Technology in the Future War) in which he began to construct his vision of an ever-more technological form of warfare. In Jünger's opinion, humans still maintained a role in this clash of animated material, for they needed to maintain both the knowledge to direct the violence of their technologies and the discipline to withstand that of their enemy.[1019] In his larger 1922 reflection on the war, entitled

[1018] Hermann Broch, *The Sleepwalkers*, 373.
[1019] Ernst Jünger, "Die Technik in der Zukunftsschlacht"

Der Kampf als inneres Erlebenis (*The War as an internal Experience*), Jünger continued to consider man's new role on the battlefield, writing:

> The battle of material and trench warfare was fought more recklessly, wilder and more brutally than any other form that man produced. The new soldier was a whole new breed, embodying energy and loaded with the utmost force. Smooth, lean, sinewy bodies, striking faces, eyes petrified in a thousand horrors under the helmet…Jugglers of Death, masters of explosives and flame, magnificent predators, rushed through the trenches. At the moment of the encounter, they were the epitome of the most combative force in the world, the keenest gathering of the body, the intelligence, the will, and the senses.[1020]

In his wartime reflections from 1925, Jünger continued write about this technological molding soldiers, often concentrating on the material changes brought on by the use of poison gas. He was insistent that gas could never be used on a grand scale precisely due to its unpredictability.[1021] Nevertheless, gas had noticeable strategic benefits on the battlefield like creating impassable terrain or harassing entrenched positions. While it changed tactics and re-conceptualized battlefield space, chemical warfare also produced physical changes on the common soldier. Jünger claimed that, "Since the introduction of gasmasks the long beards that many of [the soldiers] wore, apparently in pious memory of their grandfathers of 1871, have disappeared; and certainly the clean-shaven features under the helmet-rim express the strenuous spirit of the man of today a great deal better."[1022] Indeed, poison gas altered both the subjective experience and the physical appearance of men on the battlefield.

Intimately aware of the debates surrounding German rearmament and national aero-chemical defense, Jünger rearticulated his ideas on technology in two intertwined areas of intellectual inquiry in the late 1920s and early 1930s. First, Jünger edited and wrote introductory

[1020] Ernst Jünger, *Der Kampf als inneres Erlebenis*, 32-33.
[1021] Ernst Jünger, *Copse 125*, 133.
[1022] Ernst Jünger, *Copse*, 40.

essays for seven photo albums, released between 1928 and 1933.[1023] Most these albums were dedicated to wartime photos, interwar political confrontations, or images of aerial technologies. His final two photo books, *Die gefährliche Augenblick* and *Die Veränderte Welt,* visualized moments of catastrophe and the global changes of modernization. As part of this project, Jünger carefully considered the role of photography, a medium that he had previously dismissed as superficial. Jünger now theorized photography as a technological weapon that could create carefully constructed narratives of domination.[1024] The camera was the tool through which modern man could create an aesthetics of power by curating a seemingly all-encompassing photo narrative.[1025] For Jünger, there was no truth outside of the frame of the photograph; the man behind the camera stood in absolute control of reality, in an omniscient position of "stereoscopic vision."[1026] This idealized cameraman would be able to shape the course of modernity and enact his own politics at will.

Granting himself authorial control, Jünger wished to express the revealing qualities of all technology, but specifically photography. Through his photo albums, Jünger attempted to reveal the contingency and risk of the newly modern world by creating montages of technology-induced death, destruction, and catastrophe. According to Jünger, the industrialized technologies of the twentieth century did not protect humans from the dangers of the premodern world; rather, they masked unavoidable threats such as disease and natural disasters. In moments of technological failure, these dangers reemerged and revealed the precariousness of modern human existence. In fact, modern technology could serve to intensify this moment of destruction.

[1023] Thomas F. Schneider, "Narrating the War in Pictures: German Photo Books on World War I and the Construction of Pictorial War Narratives", 31.
[1024] Ernst Jünger, "War and Photography," 25.
[1025] Isabella Gil, "The Visuality of Catastrophe in Ernst Jünger's Der gefährliche Augenblick and Die verärderte Welt", 67.
[1026] Carsten Strathausen, "The Return of the Gaze: Stereoscopic Vision in Jünger and Benjamin", 131.

Indeed, Jünger's *Der gefährliche Augenblick* included images of crashed planes, overturning cars, and mine disasters where human death was predicated on modern technologies.[1027] In *Die Veränderte Welt*, Jünger pointed to poison gas as another one of these technologies that could immediately and unexpectedly reveal the proximity of danger and death. He wrote in the album:

> The increased range and total character of the means of destruction include the possibility of catastrophes, which make planned protection of the population seem ever more necessary. In particular, one also seeks to familiarize the non-combatants with the dangers of gas and air raids.[1028]

Die Veränderte Welt also included several images of gas attacks and gas preparation. The photos express the surprising speed and ethereal character of gas, often featuring people with gas masks as the potential masters of this new danger. Jünger certainly would not have viewed the technology of the mask as infallible, but an embrace of this imperfect technological mediation allowed for action and survival.

While contributing to these photo albums, Jünger simultaneously developed similar ideas in his nonfiction writing from the same period. In his 1931 essay "Über die Gefahr" ("On Danger"), Jünger made clear his assertion that increasing levels of danger always lurked behind the façade of modern bourgeois society.[1029] Reflecting on technology's role in maintaining this façade, he wrote, "The history of inventions also raises ever more clearly the question of whether a space of absolute comfort or a space of absolute danger is the final aim concealed in technology."[1030] Pointing out that automobiles now killed far more people globally than war, Jünger insisted that technology's concealed aim was death and destruction. While Jünger was clearly attracted to the new and omnipresent dangers of modernity, he remained ambivalent

[1027] Ferdinand Bucholtz, ed,. *Der gefährliche Augenblick*, 72, 128
[1028] Edmund Schultz, ed., *Die Veränderte Welt,* 190.
[1029] Ernst Jünger, "On Danger," 27.
[1030] Ibid, 30. Jünger subsequently pointed to the fact that Europeans used nearly all technologies for purposes of war.

about this concealing nature of technology and its implications for human freedom.[1031] In his 1930 essay "Die totale Mobilmachung," Jünger made it clear that such technology had robbed the professional soldier of his previous glory. By shrinking the space of the battlefield and destroying the possibility of hand-to-hand combat, technologies like the tank, airplane, and poison gas had all made military honor, intimate struggle, and genuine heroism obsolete.[1032] As a proponent of a romantic conception of chivalric militarism, Jünger personally felt this loss while fighting in the trenches. Nevertheless, he saw the introduction of modern technology to the battlefield as inevitable and diagnosed it as an inherent part of modernity.[1033] Thus, his intellectual project attempted to identify the nature of technological warfare in order to carve out a space for the modern warrior.

Jünger expressed modern man's role in this technological world most clearly in his 1932 book *Der Arbeiter* (*The Worker*). In this text, Jünger triumphantly proclaimed that a Gestalt of the modern worker was increasingly intruding upon bourgeois European society.[1034] A metaphysical concept, the Worker Gestalt represented an elementary power that transformed the modern world through revolutionary acts.[1035] Jünger enumerated the moments in which the Worker Gestalt had revealed itself. Many of these moments of revealing arose through

[1031] Neil Turnbull, "Heidegger and Jünger on the 'significance of the century': technology as a theme in conservative thought," 12.
[1032] Ernst Jünger, *Die totale Mobilmachung*, 121.
[1033] Jünger's brother Friedrich Georg Jünger also makes this loss of wartime agency clear in his essay "Krieg und Krieger", writing: "The plains flooded with gas and explosives are the spaces in which the abundance of its resources is transformed by war. The machine world sneaks into battle, constructed, built, operated and directed by an army of technically trained men, who quietly and reliably settle for years in the zones of destruction." Friedrich Georg Jünger, "Krieg und Krieger," 56.
[1034] Unlike in Marxist thought,"the Worker" was not a socio-economic category for Jünger. He rather imagined "the Worker" as a World War I veteran who had come to similar realizations about technology and danger through the war. Jünger uses the term "Gestalt" to mean a phenomenon that consists of discrete parts or moments but is conceived as a whole. Wolf Kittler, "From Gestalt to Ge-Stell: Martin Heidegger Reads Ernst Jünger," 82
[1035] Ernst Jünger, *The Worker,* 10. See also: Holger Zaborowski, Technology, Truth, and Thinking: Martin Heidegger's Reading of Ernst Jünger's The Worker," in *Heidegger's Question of Being: Dasein, Truth, and History,* 167.

technology, and Jünger claimed modern, industrialized technology as the medium through which the Worker "mobilized the world."[1036] Indeed, each individual's embrace and effective use of technology decided his/her relationship to the Worker Gestalt. The heroic human of the future would thus integrate entirely with his or her technology, riding into both real and metaphorical battle on steeds of steel and hurling projectiles of fire and gas.

For Jünger, modern weapons of war like poison gas were predominantly tools for the revolutionary acts of the Worker.[1037] They could destroy the decadence of the old world and usher in a new one defined by human discipline and hardness. Unlike the European of yesteryear, the Worker could survive in a world inundated with poison gas. By fully integrating into modern technology, he/she would effectively utilize devices like the gas mask to survive in this chemically uncertain reality.[1038] In fact, Jünger postulated that the modern Worker, like the soldier in the trenches of World War I, even began to physically resemble his or her own technologies. He wrote:

> First of all, what stands out purely physiognomically is the masklike rigidity of the face which is both acquired and also accentuated and increased by external means such as beardlessness, haircut, and tight headgear. Nor is the role accidental, incidentally, which the mask has begun to play recently in daily life. This becomes apparent in many ways in places where the special work character breaks through--in gasmasks, with which one seeks to arm entire populations[1039]

[1036] Ernst Jünger, *The Worker,* 184.
[1037] Julia Encke makes clear the importance of poison gas for Jünger's ideas on technology. The speed and surprise of gas demanded a serious philosophical reflection on personal technological armoring. See: Julia Encke, *Augenblicke der Gefahr: Der Krieg und die Sinne. 1914-1934,* 194-218.
[1038] Humanity's relationship to technology in Jünger's work is very close to the concept of "techne" developed in Oswald Spengler's 1931 work *Man and Technology.* Spengler's "technics" or "techne" is closer to an intellectual position of scientific rationality than pieces of material technology. Thus, techne is humanity's ability to think in terms of technological solutions and to implement said solutions. In his work, Spengler even posited a "chemical and gas-warfare" form of technics. Oswald Spengler, *Man and Technology,* 9. See: Ian James Kidd, "Oswald Spengler, Technology, and Human Nature," 19-18.
[1039] Ernst Jünger, *The Worker,* 142.

In Jünger's hands, poison gas lost its previously assumed immoral characterization. Warfare technologies like gas and the gas mask were merely material facts of the modern world. Those who could embrace this reality would be rewarded, but this would certainly not be an easy task. In Jünger's formulation, the modern man must face his own mortality, passing through the pain of baptismal rituals like gas attacks to emerge as a technologically augmented master of the future.[1040] A mass gassing of German civilians, which Jünger had already hypothesized in his war writings, would only bring humanity closer to new truths of the twentieth century. In essence, Jünger re-mythologized the modern world, replacing God with industrialized technology in the role of absolute arbiter.[1041] In doing so, Jünger also provided humanity with the possibility for substantial control over the dangers of chemical warfare. While control over poison gas could always slip, devices like the gas mask placed a new human face behind the chemical attack. All of the metaphorical language with which soldier's described gas in *Kriegserlebnis* novels was now part of the very human world.

Intellectual works that essentially countered Jünger's developing theories appeared immediately after the First World War. In 1918, Karl Kraus published his essay "Das technoromantische Abenteuer" (The Techno-romantic Adventure) in his literary journal *Die Fackel.* In the essay, Kraus anticipates Jünger's philosophical project, caustically writing, "It must be said, first of all, that especially the German God comes not only in a gas cloud, but also

[1040] Ernst Jünger, *On Pain*, 1. This baptismal armoring is the creation of what literary scholar Susan Buck-Morss has called the "anesthetic subject." Susan Buck-Morss, "Aesthetics and Anaesthetics: Walter Benjamin's Artwork Essay Reconsidered," 32-36. Andres Huyssen calls this process "fortifying" or "armoring." Andres Huyssen, "Fortifying the Heart—Totally: Ernst Jünger's Armored Texts," 15. Wrapping the armoring of the individual together with Jünger's conception of photography as an objective weapon of exposure, Helmut Lethen describes Jünger's aesthetic position as one of "coolness," or "dispassionate objectivity" that creates codes of conduct devoid of human feeling or morality. Helmut Lethen, *Cool Conduct: The Culture of Distance in Weimar Germany*, 152.

[1041] Neil Turnbull, "Heidegger and Jünger on the 'significance of the century': technology as a theme in conservative thought," 16. See also: Klemens von Klemperer, *German Incertitudes 1914-1945: The Stones and the Cathedral*, 51-52.

out of the machine; that bravery and honest combat have no part in the chance of a hit of mines, an aerial bomb, or a torpedo."[1042] Referring to Germany's war on the Western Front as a "chlorious" affair, Kraus granted technology its god-like status in the modern world, but he disavowed man's ability to control its carnage.[1043] Rather, he claimed that human violence and patriotic nationalism set warfare technology in motion, but once it had been enacted, human agency and heroism was nullified. Thus, modern man lost control of his own technology, becoming a slave to its violence. Kraus wrote:

> Humanity, which has spent its imagination on inventions, can no longer imagine its effectiveness—otherwise it would commit suicide because of regret! But since she has also spent her human dignity on inventions, she lives and dies for all the power that uses such progress against her. The inconceivable nature of everyday things, the incompatibility of power and the means to enforce it, that is the condition, and the techno-romantic adventure into which we have engaged will, whatever happens, put an end to the condition.[1044]

Not only was Kraus claiming that technology had transcended its former human handlers, but he was also insistent on the fact that visions like Jünger's reeked of ethno-nationalist chauvinism. Indeed, while Jünger's work implied that the Germans were poised to effectively control these violent technologies, Oswald Spengler's 1931 work *Man and Technics* picked up similar themes in order to place them in a predicted world-historical struggle between ethno-racially constructed civilizations. Spengler wrote that:

> For these "colored" peoples…the Faustian technics are in no way an inward necessity. It is only Faustian man that thinks, feels, and lives in this form. To him it is a spiritual need, not on account of its economic consequences, but on account of its victories.[1045]

For Spengler, this so-called "Faustian man" who bested controlled the powers of technology was a hazy amalgamation of northern European ethnic groups, but for thinkers like Karl Kraus such

[1042] Karl Kraus, "Das technoromantische Abenteuer"
[1043] Mark Cornwall, The Undermining of Austria-Hungary: The Battle for Hearts and Minds, 273.
[1044] Ibid.
[1045] Oswald Spengler, *Man and Technics*, 51.

constructions were clearly justifications for aggressive ethno-racially inflected German nationalism.

Picking up on many of Kraus' themes, Walter Benjamin argued that Germans were unwilling or unable to face the deadly possibilities of the weapons that they had created. In his 1925 essay "Die Waffen von Morgen" (The Weapons of Tomorrow), Benjamin pulled on Giulio Douhet's military theories in an attempt to imagine the real consequences of aero-chemical war through "literary montage."[1046] This method of splicing "dialectical images," attempted to jolt the reader out of their complacency through evocative images.[1047] For example, Benjamin wrote, "The coming war will have a ghostly front. A front that advances over metropolises, into their streets and before every one of their front doors. This war, the gas war from the air…will be truly 'breathtaking.'"[1048] As evidence for this assertion, Benjamin presented the massive interwar chemical arsenals of France and England, claiming that the next war would feature the continual escalation of civilian gassing. He further contemplated the poisoning effects of mustard gas, writing, "By a few 'raids,' the population of the hostile centers is to be filled with unconscious horror in such a way that every appeal for the organization of the defense fails. This terror should approach psychosis."[1049] In considering urban "centers" and "metropolises", Benjamin brought landscape and the environment into the equation. Weapons like poison gas were not aimed at individuals on the battlefield, but rather methods of polluting land and air that could terrorize large numbers of people. Benjamin ended his essay by chastising right-wing Germans who

[1046] Kai Evers, "Risking Gas Warfare: Imperceptible Death and the Future of War in Weimar Culture and Literature," 271.
[1047] Carsten Strathausen, "The Return of the Gaze: Stereoscopic Vision in Jünger and Benjamin," 144. Kurt Tucholsky attempts a similar aesthetic technique in his 1931 satirical short story "Die brennende Lampe." Tucholsky presents a dying young man who was unable to resist the attractions of nationalism, patriotism, and idealized militarism. Thus, the young man is complicit in the war that has just killed him. Kurt Tucholsky, "Die brennende Lampe"
[1048] Walter Benjamin, "Die Waffen von morgen," 1.
[1049] Ibid.

denounced the Treaty of Versailles. He reminded his reader that there were far more pressing political problems in a world constantly threatened by poison gas.

After reading Jünger's early conceptualization of warfare technologies like gas, Benjamin responded directly to what he proclaimed Jünger's fascist worldview. In his 1930 article, "Theories of German Fascism," Benjamin chided Jünger's attempt to mythologize technology, claiming that warfare technology would inevitably escape humanity's grasp in any future war.[1050] Not surprisingly, Benjamin particularly focused on gas warfare, writing:

> And we know that there is no adequate defense against gas attacks from the air. Even individual protective devices, gas masks, are of no use against mustard gas and lewisite. Now and then one hears of something 'reassuring' such as the invention of a sensitive listening device that registers the whir of propellers at great distances. And a few month later a soundless airplane is invented. Gas warfare will rest upon annihilation records, and will involve an absurd degree of risk.[1051]

Alongside these somewhat overstated but meaningful claims, Benjamin went on to argue that Jünger's turn to technology was nothing more than a mystical attempt to recreate an idealistic and imagined past in which soldiers could again claim themselves the personification of masculinity and honor.[1052] According to Benjamin, Jünger's desire to enforce this prescriptive relationship between man, nature, and technology on all other humans was, in fact, the face of fascism.[1053] Benjamin claimed that Jünger's personal philosophy was a serious threat to humanity because it only took a single pilot to drop gas bombs on millions of people. If lone reactionaries attempted to fulfill Jünger's vision, Benjamin warned that, "…millions of human bodies will indeed inevitably be chopped to pieces and chewed up by iron and gas."[1054]

[1050] Walter Benjamin, "Theories of German Fascism: On the Collection of Essays War and Warrior, Edited by Ernst Jünger," 120.
[1051] Ibid, 121.
[1052] Walter Benjamin, "Theories of German Fascism: On the Collection of Essays War and Warrior, Edited by Ernst Jünger," 126.
[1053] For a fascinating recent study that examines fascist attempts to organize both nature and technology see: Tiago Saraiva, Fascist Pigs: Technoscientific Organisms and the History of Fascism, (Cambridge MA: MIT Press, 2016).
[1054] Ibid, 128.

In his famous 1935 essay, "The Work of Art in the Age of its Technological Reproducibility," Benjamin reiterated his critique of so-called "New Nationalists" like Jünger. He claimed that the glorification of war and the technologization of the human body were attempts to aestheticize politics. For Benjamin, this was a fascist endeavor aimed at giving the masses a cultural voice while denying them tangible rights.[1055] Only war could mobilize people and diffuse their productive energies enough to pacify them under a fascist state.[1056] Benjamin wrote, "And in gas warfare, [war] has found a new means of abolishing [the peaceful and collective forces of society]."[1057] Benjamin's essay was not only a condemnation of Jünger's politics, but also his aesthetic means of expression. For Benjamin, Jünger's photo albums were an attempt to render the human body mechanically armored and numbed.[1058] Interestingly, Benjamin did not differ from Jünger in his attempt to create stereoscopic montages through his writings. However, as literary scholar Carsten Strathausen points out, Benjamin's modernist project attempted to present the reader with an intimate sense of loss by juxtaposing the reality of modernity against the promises of the past.[1059] In contrast, Benjamin claimed that Jünger pulled his viewer outside of history; the viewer now felt overwhelmed and passive in the face of Jünger's graphic images, granting the author dictatorial power over historical narrative.[1060] However, Jünger's theory of photography grasped not only the viewer, but also the photographer, in its optic regime.[1061] According to Benjamin, Jünger and his Worker Gestalt

[1055] Siegfried Kracauer was one of the first to diagnose Jünger's attempt subsume politics into the aesthetic. Carsten Strathausen, "The Return of the Gaze: Stereoscopic Vision in Jünger and Benjamin," 148.
[1056] Walter Benjamin, The Work of Art in the Age of its Technological Reproducibility and other Writings on Media, 42.
[1057] Ibid.
[1058] Susan Buck-Morss, "Aesthetics and Anaesthetics: Walter Benjamin's Artwork Essay Reconsidered," 38.
[1059] Carsten Strathausen, "The Return of the Gaze: Stereoscopic Vision in Jünger and Benjamin", 144.
[1060] Ibid, 145.
[1061] Isabella Gil, "The Visuality of Catastrophe in Ernst Jünger's Der gefährliche Augenblick and Die verärderte Welt", 69.

were trapped in their own authoritarian aesthetics, unable to theorize beyond the borders of their visual narratives and unable to see the lack of human control over poison gas. They were encircled by what the communist theorist Otto Biha contemporaneously described as the "dangerous poisonous gas deployed on the cultural front."[1062]

Jünger's interwar aesthetics could also be seen in his aerial photo books, which repeatedly featured images taken from airplanes. Focusing on the ground below, these photographs enacted what recent scholars of visual media and drone warfare have called "vertical mediation" or "vertical vision." Vertical mediation, according to media scholar Lisa Parks, denotes a totalizing method or regime of sight that is abstracted from the normal human horizon, pulled upward above the ground level, and privileged with a more expansive field.[1063] In abstracting vision in this way, human agency is regularly flattened, made miniscule from such a seemingly omniscient perch. In the context of warfare, the contingency of aerial attack is visually transformed into a self-fulfilling immanence.[1064] In many ways, we can see Benjamin's critique of Jünger as an early problematization of such "vertical mediation."

Of course, positions on national air and gas protection were as diverse among intellectuals as they were among all other Germans.[1065] Debates often cut across broadly defined political divides, making left/right distinctions misleading and sometimes useless. Regularly associated with the Weimar Republic's right-wing intellectuals, the philosopher Martin Heidegger shared a foundational concern for Friedrich Nietzsche's critique of "European

[1062] Otto Biha, "Der proletarische Massenroman. Eine neue Eine-Mark-Serie des 'Internationalen Arbeiterverlages."
[1063] Lisa Parks, Rethinking Media Coverage: Vertical Mediation and the War on Terror, 25-31.
[1064] For more on vertical mediation and aerial warfare see: Lisa Parks and Caren Kaplan, eds., Life in the Age of Drone Warfare (Durham: Duke University Press, 2017) ; James Der Derian, Virtuous War: Mapping the Military-Industrial Media-Entertainment Network (London: Routledge, 2009) ; Caren Kaplan, Aerial Aftermaths: Wartime from Above (Durham: Duke University Press, 2018) ; Antoine Bousquet, The Eye of War: Military Perception from the Telescope to the Drone (Minneapolis: University of Minnesota Press, 2018) ; Roger Stahl, Through the Crosshairs: War, Visual Culture and the Weaponized Gaze (New Brunswick NJ: Rutgers University Press, 2018).
[1065] Wolfgang G. Natter, *Literature at War, 1914-1940: Representing the "Time of Greatness" in Germany*, 2.

Nihilism" with thinkers like Ernst Jünger.[1066] In his work from the 1920s, Heidegger sensed that European society had "fallen" into a state of decadent inauthenticity. Yet, while Jünger explicitly claimed that the cataclysmic events of World War I would serve as a turn away from such bourgeois inauthenticity, Heidegger only appeared sympathetic to the idea and never made the distinct assertion.[1067] Nevertheless, scholars have labeled Heidegger's 1927 masterwork *Sein und Zeit* as a personal interaction with the legacy of World War I. Historian Richard Wolin claims that Heidegger took the soldier's life as a normative model for his conception of authenticity, while philosopher William H.F. Altman has classified *Sein und Zeit* as a "funeral oration" for German World War I soldiers, going so far as to claim that Heidegger idolized the soldier's bravery that he himself could never muster.[1068]

Putting aside the contents of *Sein und Zeit,* World War I certainly did influence Martin Heidegger's life and thought. At the outbreak of the war, Heidegger was forced to put aside his philosophical work for two months after being conscripted into the army. He was then released from duty due to a supposed heart condition.[1069] After returning to the University of Freiburg to work under Edmund Husserl for two more years, Heidegger was then again called up for military service in 1918. Serving for the last ten months of the war, Heidegger spent three months in a meteorological unit on the western front. Little is known of the precise details of Heidegger's time in the army outside that which he described in his letters to his new wife Elfride. The letters suggest that Heidegger first viewed his service as a grand adventure, only to later find the close

[1066] Martin Heidegger, *Martin Heidegger zu Ernst Jünger, Gesamtausgabe*, 27.
[1067] Elliot Y. Neaman, *A Dubious Past: Ernst Jünger and the Politics of Literature after Nazism*, 180.
[1068] Richard Wolin, "Heidegger und Jünger: 'Der gefährliche Augenblick,'" 81. ; William H.F. Altman, *Martin Heidegger and the First World War: Being and Time as Funeral Oration*, 7-9.
[1069] William H.F. Altman, *Martin Heidegger and the First World War: Being and Time as Funeral Oration*, 84-87. Altman has pointed to Heidegger's insistence that he volunteered for service, when he was most likely drafted, as proof that he felt ashamed of skirting military duty. Further, Altman has questioned the seriousness of Heidegger's heart condition.

quarters and lack of privacy oppressive.[1070] In July of 1918, Heidegger was sent to Berlin to begin taking courses in meteorology and gas discipline.[1071] He apparently enjoyed these scientific lectures, writing to his wife that he "learned a lot of new things and [had] more fun every day."[1072] In late August, Heidegger then headed to the French front in order to observe temperature, barometric pressure, and wind speed for the German artillery and military pilots. Heidegger's unit largely reported these measurements for the German deployment of and protection against poison gas attacks. He described the next few months as a time of movement and excitement, constantly relaying his atmospheric observations to artillerymen and gas officers.[1073]

At the end of the war, Heidegger returned to Freiburg where he began to develop his philosophical concept of time while living under the constant perceived threat of French aerial bombardment.[1074] Literary scholar John Durham Peters does not find it coincidental that Heidegger's *Sein und Zeit* utilizes atmospheric and meteorological language such as *Wachsein* (vigil) or *hüten* (vigilance) to describe *Dasein's* relationship to its own temporal existence.[1075] In this way, the scientific and the technological (especially that related to atmospheric conditions), entered into Heidegger's earliest major writings.[1076] However, the relatively young philosopher

[1070] Martin Heidegger, *Mein liebes Seelchen!: Briefe Martin Heideggers an seine Frau Elfride 1915-1970*, 61. ; Alfred Denker, ed, *Martin Heidegger Heinrich Rickert Briefe 1912 bis 1933*, letter from January 27, 1920.
[1071] Gertrud Heidegger, ed., *Martin Heidegger: Letters to His Wife, 1915-1970*, 42.
[1072] Ibid, 71.
[1073] Martin Heidegger, *Mein liebes Seelchen!: Briefe Martin Heideggers an seine Frau Elfride 1915-1970*, 80.
[1074] Gertrud Heidegger, ed., *Martin Heidegger: Letters to His Wife, 1915-1970*, 52.
[1075] John Durham Peters, *The Marvelous Cloud: Toward a Philosophy of Elemental Media*, 242-243.
[1076] World War I also had a profound impact on the fellow phenomenologist Hans Lipps, who served as an army physician between 1914 and 1918. He too began to write on the impact of war technology on modern life in the 1930s. See: Hans Lipps, *Der Soldat des letzten Krieges*, 8.

did not fully engage with questions of technology until he read Ernst Jünger's work in the late 1920s and early 1930s.[1077]

Initially, Heidegger maintained a favorable impression of Jünger's obviously political writings, claiming them as the most accurate diagnosis of Nietzsche's "will to power" in the modern world. Nevertheless, Heidegger labeled these works as a form of "cultural criticism" rather than formal philosophy.[1078] In particular, Heidegger saw Jünger's *Der Arbeiter* as a potential culmination of Nietzsche's attempt to destroy western metaphysics.[1079] The technologically-enacted "will to power" would replace the metaphysical thinking that was now made obsolete in the nihilistic modernity of Jünger's Worker. However, the marginalia in Heidegger's copy of *Der Arbeiter* reveal that Heidegger rejected this very possibility. Nietzsche and Junger's "will to power" was not a way out of metaphysics for Heidegger, but rather a circular bridge that continued the metaphysical tradition in a different linguistic guise.[1080] Heidegger subsequently chastised Jünger's romantic re-enchantment of the modern age through technology. In another marginal note, Heidegger wrote that Jünger's patriotic depiction of World War I soldiers was merely a "cosmic antagonism which is repeated each and every time when the world order is perturbed and which is expressed here by the symbols of a technological age."[1081]

For Heidegger, Jünger's desire for the "new gods" of technology best represented his perpetuation of metaphysical thinking.[1082] In proposing such metaphysics, Heidegger argued,

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[1077] The philosopher Vincent Blok has recently insisted on the importance of Ernst Jünger's work for the development of a more mature Heideggerian philosophy that gestated in the mid-1930s. Vincent Blok, Ernst Jünger's Philosophy of Technology: Heidegger and the Poetics of the Anthropocene, 65.
[1078] Holger Zaborowski, "Technology, Truth, and Thinking: Martin Heidegger's Reading of Ernst Jünger's The Worker," 170.
[1079] Martin Heidegger, *Gesamtaufgabe 16,* 375.
[1080] Elliot Y. Neaman, *A Dubious Past: Ernst Jünger and the Politics of Literature after Nazism*, 180-181.
[1081] Wolf Kittler, "From Gestalt to Ge-Stell: Martin Heidegger Reads Ernst Jünger," 86.
[1082] See Heidegger's personal letter to Jünger from December 18, 1950 in Martin Heidegger and Ernst Jünger, *Correspondence 1949-1975: Martin Heidegger, Ernst Jünger*, 9-12.

Jünger further misunderstood the nature of technology. His desire for control created a purely subjective relationship to the technological that fit within the Cartesian need for certain knowledge and the historic rise of scientific rationality.[1083] Thus, Heidegger later claimed that Jünger's work fit within the long and tenuous search for universal human dominion that would ultimately encompass the events surrounding both World Wars. In Heidegger's opinion, which began to gestate in the mid-1930s, technology had to be viewed as a form of revealing rather than an object of control. It was both a "historical and poetic mediation between 'man' and 'Being.'"[1084] Thus, neither humanity nor technology itself could control the violence and death of something like a chemical war. In such an instance, the assured suffering and death revealed the powerlessness of humanity to control its world and the facelessness of the entire debate over aero-chemical protection.

Heidegger's reading of Jünger was the beginning of his turn away from a philosophy of willful intent to a passive waiting for his so-called "forest clearing." His later works, most notably *The Question Concerning Technology*, were defined by this critique of the anthropological and instrumental view of modern technology.[1085] It is unclear exactly when this turn took place in Heidegger's thought, but he certainly voiced strong critiques of Jünger's *Der Arbeiter* in a 1938 seminar and in his post-World War II writings.[1086] This suggests that his 1934 rectorship resignation and his ideological split with the Nazis played a significant role in the turn to his own form of quietism and ecocriticism. However, Heidegger conducted an earlier seminar

[1083] Vincent Blok, "An Indication of Being- Reflections on Heidegger's Engagement with Ernst Jünger," 200.
[1084] Neil Turnbull, "Heidegger and Jünger on the 'significance of the century': technology as a theme in conservative thought," 24.
[1085] Martin Heidegger, "The Question Concerning Technology," in *The Question Concerning Technology and Other Essays*, 33.
[1086] Daniel Morat and Vincent Blok have also argued or insinuated that Heidegger's philosophical turn (or "die Kehre") did not come in 1945, but had rather been formulated over the course of the 1930s after his failure as the rector at the University of Freiburg. See: Daniel Morat, Von der Tat zur Gelassenheit: Konservatives Denken bei Martin Heidegger, Ernst Jünger und Friedrich Georg Jünger (Göttigen: Wallstein, 2007)

on *Der Arbeiter* immediately after its publication in 1932.[1087] The marginalia from his personal copy of the book suggests that the seed of his later thought had already been planted in the early 1930s.

Much like Benjamin's critique of Jünger, Heidegger's later philosophy called for a historically open reading of the technological.[1088] Viewing Jünger as part of a nearly irresistible and global human attraction to modern technology, Heidegger warned of the potential dangers of instrumental thinking in the search for domination.[1089] In Jünger's world, humans became raw material for the maintenance of machines, and natural disasters or weapons of mass destruction could wipe them away at a moment's notice.[1090] Ever the anti-humanist, Heidegger never explicitly decried this outcome, which he saw taking place both before and after World War II. However, he was certainly concerned by intentional thinking's ability to conceal the true nature of both humanity and technology. For Heidegger, technology could never solve the kind of political problems that it created, like the future aero-chemical war, nor could it provide meaning in an increasingly fallen modernity.[1091]

[1087] Martin Heidegger, "The Rectorate 1933/34: Facts and Thoughts," in *Martin Heidegger and National Socialism,* 2-3. ; Laurence Paul Hemming, "Work as Total Reason for Being: Heidegger and Jünger's Der Arbeiter," 234.
[1088] Wolf Kittler, "From Gestalt to Ge-Stell: Martin Heidegger Reads Ernst Jünger," 86.
[1089] Martin Heidegger, "The Question of Being (Letter to Ernst Jünger "Concerning 'The Line',"" in *Martin Heidegger: Philosophical and Political Writings,* 148. These insights would profoundly shape the work of Heidegger's student Günther Anders.
[1090] Interestingly, Arnold Zweig's 1936 war novel *Education Before Verdun,* resonates with Heidegger's later critique. Zweig wrote: "Human material…the irrefragable proof that man is destined to transform the surface of the earth—subject, indeed, to a compelling force…It often seems as though the planet were self-inspired with energy, and lives to lavish its raw materials and its vital forces, so as to provide its reasoning denizens with richer life…Flying, chemistry, the art of healing, and the science of war…Science is much more intelligible; for it helps humanity to kill. Arnold Zweig, *Education Before Verdun,* 167.
[1091] After World War II, Ernst Jünger's writings also moved away from the embrace of the technological and towards a more naturally-inclined language. Many scholars see Friedrich Georg Jünger's (Ernst Jünger's brother) 1956 text *The Failure of Technology* as a revision of *Der Arbeiter.* Writing about chemical weapons, Friedrich Georg recognized that it was "the masses especially who are threatened by destruction" and that "At all times the power proffered by technology has exacted and forever will exact, a high price; the price of the blood and sinew of human hecatombs who in one way or another get caught in the cogs and wheels of that vast engine." Friedrich Georg Jünger, The Failure of Technology: Perfection Without Purpose, 119, 163.

In its most academic form, the intellectual disputes between Jünger, Benjamin, and Heidegger represented the larger air and gas debates that wracked the Weimar Republic. Escalating in the late 1920s and early 1930s, the concern over aero-chemical attack permeated everything from the most theoretical discussions to the literary and cinematic consumption of the average German. This, in turn, only increased the sense of risk and contingency that defined much of the Weimar era and forced the German government to enter into discussions of national security with greater urgency. In his personal letters, the novelist Stefan Zweig attempted to express the dizzying nature of the newly dangerous modern world through a reflection on the French philosopher Michel de Montaigne. Zweig wrote that de Montaigne maintained an admirably level head, for "in an equally dirty time like ours [he] tried to stay independent and to think clearly even under the gas mask."[1092] The gas mask's ability to distort and fog the vision of its wearer served as an apt metaphor for interwar Germans' inability to diagnose and describe the problem of aero-chemical defense. Contemporaries remained at odd over who or what controlled poison gas and whether Germany could successfully harness its powers for either national survival or national rebirth.

[1092] Stefan Zweig, Stefan Zweig Briefe 1932-1942, 334.

CHAPTER 7: SYNTHESIZING THE NEW CHEMICAL SUBJECT: GAS MASKS, PERSONAL ARMORING, AND VESTIARY COMPLICITY IN THE THIRD REICH

The early 1930s saw the continued growth of a widespread German concern for national security. Over the course of the 1920s, the Franco-Belgian occupation of the Ruhr and the porous border with Poland exposed the weaknesses of a German nation that could not maintain significant armed forces under the stipulations of the Treaty of Versailles.[1093] The visions of future aero-chemical warfare that permeated military theory, intellectual debate, and popular culture increased the sense of national vulnerability and risk that plagued many Germans. While the 1926 Paris Aviation Agreement allowed Germany to put passive air defense measures in place, the perceived threat of the Soviet chemical arsenal and the 1928 poison gas accident in Hamburg suggested that these defensive measures might not be enough. Private air protection organizations like the German Air Defense League and the German Air Defense Association, alongside the consulting scientists and engineers who referred to themselves as poison gas specialists, put significant pressure on the Weimar government to provide greater protections against aero-chemical attack. While the Weimar government attempted to use the private air protection organizations and other municipal authorities in the creation of a state air protection service, many air protection advocates claimed that the state remained unprepared, and that this lack of preparation was a moral failure of the democratic establishment.[1094]

This chapter returns to these debates, examining the zenith of the gas specialists' political power and the intensified spotlight on national defense measures. The increased importance of a national gas protection discourse created a unique opportunity for political groups that sought to win German hearts and minds through assurances of national protection. Thus, the chapter will

[1093] Benjamin Carter Hett, *The Death of Democracy*, 112.
[1094] Dietmar Süß, Death from the Skies: How the British and Germans Survived the Bombing in World War II, 33.

focus on the ways in which the National Socialists proved especially adept in this opportunistic political campaign, relying on the convergence of their own insistence on military rearmament with calls for aero-chemical defense in order to create complicit German subjects. The Nazis' authoritarian structure and martial appearance conveyed a sense of renewed national strength and order that could pacify fearful German minds.[1095] Thus, through careful propaganda that reminded citizens of the dire nature of the external gas threat while simultaneously offering salvation through order and discipline, the Nazi regime co-opted the calls for aerial gas protection that the gas specialists had crafted throughout the 1920s.

In the spring of 1932, the Weimar government created six air raid education units for providing air defense demonstrations and training sessions across Germany.[1096] Nine more units were added that summer when gas raid exercises confirmed the air protection activists' worst fears. Reports from the drills claimed that civilians were unable to follow simple orders; they panicked in attack simulations and exercises devolved into chaos. In particular, the reports claimed that women and children became too excited, while members of the working-class actively disobeyed orders.[1097] For many air protection specialists who reflected on these results, the atomized individual proved the greatest danger in the event of an aero-chemical raid. Civilians, they argued, would have to work selflessly and cooperatively in order to ensure the safety of their entire community.[1098] Successful air protection was not just a matter of technical knowledge, but also one of mass-psychological composure.[1099] As such, air protection specialists

[1095] Even many World War I veterans and pensioners gave their support to the Nazis after the SPD began to cut pensions in the late 1920s. Many accepted the claim that the German nation's real trauma was living through the abortive revolution of 1918-1919 and the creation of the Weimar democracy. Under the Nazis, it was possible for veterans to win pensions if they could prove that they had fought against Marxism during the 1920s. Jason Crouthamel, "Nervous Nazis: War Neurosis, National Socialism and the Memory of the First World War," 63.
[1096] Luftschutz ist Selbstbehauptungswille : Aufgaben und Erfahrungen über die Ausbildung im zivilen Luftschutz
[1097] Peter Fritzsche, "Machine Dreams: Airmindedness and the Reinvention of Germany," 698.
[1098] Ritter von Mittelberger, in *Gasschutz und Luftschutz*, 2 (August 1932): 170.
[1099] Peter Fritzsche, "Machine Dreams: Airmindedness and the Reinvention of Germany," 697.

began to wonder if the problems that they encountered in these exercises were related to the dissolution of broad German social ties. They asked themselves if perhaps the inability to work collectively was a problem inherent to democratic equality. Foreshadowing future developments, one observer of a practice air raid in East Prussia claimed that the unruly civilians urgently needed a strong-willed leader.[1100]

In the early 1930s, demands for better air and gas protection fed into the larger concerns for national security that helped to define the unstable German political landscape. Gas experts and air protection advocates helped to fan the flames of this debate. As historian Andreas Linhardt has pointed out, the desire for national gas and air protection was often just a political cloak for general German rearmament or the implementation of more authoritarian state structures.[1101] A 1932 letter petitioning the state authorities of Baden-Württemburg to create better air and gas defense measures reveals this form of political pressure. In the letter, an unnamed German engineer wrote that "[aero-chemical war] is the most important issue of all, as aircraft pose a real mortal danger to all those people who are quietly asleep, trusting in the effectiveness of international treaties, which *will* fail to protect them."[1102] The engineer went on to boldly (and falsely) assert that French aerial attacks could kill 600,000 Germans in a single day. The German authorities knew this, he claimed, but chose to do nothing.[1103]

While many economic, social, and political events contributed to the rise of the Nazis in the early 1930s, anxieties over national security certainly assisted the party in soliciting German

[1100] "Die zivile Luftschutzübung in Ostpreussen vom 23-25 Juni 1932: Kritische Betrachtung und Auswertung ihre Ergebnisse," *Gasschutz und Luftschutz* 2 (August 1932): 179-80.
[1101] Andreas Linhardt, "Die Fachzeitschrift "Gasschutz und Luftschutz" unter dem Einfluss des Nationalsozialismus," 3.
[1102] Gesuch des Oberingenieurs Karl Leuprecht in Karlsruhe Luft und Gasschutz betreffend, 1932 (LBWK) 231, 6516
[1103] The engineer argued that the 8 million then unemployed Germans should be set to work creating gas masks for air defense.

votes in both the 1930 and 1932 federal elections. With the perceived threat of aero-chemical attack looming (most likely from a chemically armed Soviet Russia) and political street violence increasing, the democratic governing parties lost significant credibility in their attempts to quell violence and secure German borders.[1104] The Nazis, on the other hand, conveyed a sense of ruthless order and national steadfastness in the face of crisis.[1105] In a country with vastly reduced armed forces, the SA brownshirts appeared as a potential auxiliary military force, while Hitler's calls for a strong and proud Germany resonated with those concerned with geopolitical vulnerability.[1106] Historian Michael Wildt has argued that many accepted the authoritarian Nazi vision in 1933 because "Germans hoped for the end of party squabbles and political bickering...[they] wanted peace and order, [to] re-establish the state's authority and alleviate Germany's economic problems."[1107]

Just four days after Hitler had risen to the position of chancellor on January 30th, 1933, he organized a private meeting with his senior military commanders and outlined his plan to rearm Germany and invade Eastern Europe. Publicly, the issue of national security took center stage during the Reichstag fire on February 27th. Once the communist arson suspect was rounded up, Hitler was able to pass the "Decree for the Protection of the German People," which allowed the Nazis to suspend civil liberties in the name of "public safety and security."[1108] The subsequent

[1104] Michael Wildt, Hitler's Volksgemeinschaft and the Dynamics of Racial Exclusion: Violence Against Jews in Provincial Germany, 1919-1939, 268.
[1105] Richard J. Evans, The Coming of the Third Reich, 293.
[1106] Jerome G. Kerwin, "The German Reichstag Elections of July 31, 1932," 932. See also: Ian Kershaw, *The 'Hitler Myth',* 265.
[1107] Michael Wildt, "Self-Reassurance in Troubled Times: German Diaries during the Upheavals of 1933," in *Everyday Life in Mass Dictatorship: Collusion and Evasion,* 56.
[1108] Benjamin Carter Hett, *Burning the Reichstag,* 71.

suppression of communists cleared the way for yet another set of elections and the passing of the Enabling Act, which granted Hitler dictatorial powers on March 23, 1933.[1109]

Once in power, the Nazis fully realized the prevalence of air and gas protection in the minds of many Germans. Political solutions could not only allay anxieties over aero-chemical attacks, but also forge the kind of social ties that the Nazis envisioned for the German nation. Air and gas experts had already expressed the significance of creating a seamless air and gas protection community predicated on collective cooperation and submission to authority. During the 1932 air raid exercises, an early incarnation of this functional air raid community could best be found in the small towns where political divisions were not particularly pronounced and local club culture created intimate ties between neighbors.[1110] The task for the Nazis, then, was to replicate this homogenized and seamless society on the national level.

The first step was the centralization of air and gas protection services within the state. Rather than rely on private organizations, the Nazis charged Josef Seydel, Bruno Loerzer, and Erich Hampe with quickly setting up the *Reichsluftschutzbund* (Reich Civil Defense League or RLB) for national air and gas protection.[1111] On April 29, 1933, the *Reichsluftschutzbund* became operational with the Flak artillery officer Hugo Grimme serving as president, but ultimate control lying in the hands of the Minister of Aviation, Hermann Göring.[1112] As early as the summer of

[1109] Not entirely coincidentally, a traveling air defense exhibition opened in Munich only days before this announcement. Dietmar Süß, Death from the Skies: How the British and Germans Survived the Bombing in World War II, 35.
[1110] Kurt Kottenberg, "Zum Luftschutzproblem in Mittel- und Kleinstädten," *Gasschutz und Luftschutz* 2 (June 1932): 127-29.
[1111] Seydel was an elected member of the Reichstag with a background in civilian air defense work. Loerzer was the Chairman of the Association for German Air Defense. Hampe was the head of the emergency services called the *Technische Nothilfe.* Nicole Kramer, Volksgenossinnen an der Heimatfront. Mobilisierung, Verhalten, Erinnerung, 107.
[1112] Göring's control of the *Reichsluftschutzbund* revealed the Nazi blending of military and civilian concerns. In the world of aerial defense, this blending was already apparent in the Weimar-era membership of the private air defense organizations and the military research conducted by consulting chemists.

that year, the league launched a massive campaign to teach air readiness to all German citizens. This campaign was inaugurated with the dropping of leaflets over Berlin on June 24th. In an attempt to express the seriousness of air protection, these leaflets stressed that only paper was currently falling on the capital city, but soon it would be real bombs.[1113] By the end of 1933, the voluntary *Reichsluftschutzbund* enjoyed a membership of one million Germans. By the following summer, 2.5 million more had joined the ranks.[1114] The public presence of the *Reichsluftschutzbund* and its summer campaign of 1933 made it abundantly clear that the Nazis would afford greater importance to air and gas protection than the Weimar government could ever muster.

Alongside the creation of a formal institutional structure for air and gas protection, the Nazis also looked for new ways to instill the work ethic and selflessness that was deemed necessary for wartime survival. Months before Hitler's seizure of power, the leader of the *Technische Nothilfe* (Technical Emergency Corps), Erich Hampe, began to question the prevailing orthodoxy of Weimar-era civilian air and gas protection. Since World War I, experts had assumed that women, children, the elderly, and all other supposedly weaker members of society would never be able to conduct air raid exercises. These drills required strenuous manual labor, an overriding concern for others, and most importantly, a cool and calm demeanor amid danger. However, reflecting on the failures of previous air raid drills, Hampe argued that *all* civilians should be given air and gas protection duties, regardless of their age or gender. According to Hampe, a sense of responsibility and collectivity could fortify all Germans and enter them into a social fabric that could best withstand aero-chemical attacks.[1115] This argument

[1113] Peter Fritzsche, *A Nation of Fliers,* 208.
[1114] Peter Fritzsche, *A Nation of Fliers,* 211.
[1115] Erich Hampe, "Technische Nothilfe und Luftschutz," *Gasschutz und Luftschutz,* 1 (September 1931): 43.

aligned with the Nazis' creation of the centralized but voluntary *Reichsluftschutzbund* and the more general Nazi desire to create a self-sufficient and socially integrated German subject.

Distinguishing Nazi air and gas protection protocol from those of other European countries, now no German citizen would receive special treatment in the event of an aero-chemical attack. Much like the soldiers of 1918, German civilians would be forced to face the perilous realities of a chemically perilous world. Following the logic of former soldiers like Ernst Jünger, the Nazis saw this deadly adversity as a way to forge a national community of crisis in this presumed era of "total mobilization." According to this ideological worldview, the categories of civilian and soldier had collapsed in the modern world, forcing all people to confront deadly technologies as an inherent part of national struggle. The gas specialist Fritz Wirth elaborated on the individual responsibility required by total mobilization:

> when, in the spring of 1933, we began to build up the self-defense of the German people against enemy air raids, there was hardly any noteworthy experience available. The first defensive measure, therefore, was based on the simplest, *self-imposed* requirements.[1116]

While self-protection within a collective air raid community became the de-rigueur air and gas defense structure under the Nazis, specific technical questions remained open-ended. The gas specialists, many of whom easily translated their work into the authoritarian terms of National Socialism, were still unsure whether gas masks were necessary for each German civilian. Aside from the financial concerns related to providing millions of people with gas masks, the gas specialists were doubtful about whether civilians could learn to correctly use gas masks or if gas masks would be of any use in the event of a traditional aerial bombing. Nevertheless, regardless of its real effectiveness, the RLB used the gas mask as a material tool in the attempted creation of an idealized German chemical subject. They ordered millions of the

[1116] Dr. Wirth, "Die Neuordnung des Selbstschutzes," *Gasschutz und Luftschutz* 8 (August 1938)

newly designed *Volksgasmaske* to be sold at a discounted rate to German civilians across the Reich. With masks donned, German civilians now appeared as technologically augmented soldiers in the struggle for national survival. In the eyes of the *Reichsluftschutzbund*, the mask created a physically homogenized society that could now survive, if not thrive, in a modernity defined by its toxicity. By affixing their masks, German civilians could take on the new face of the pitiless master of the modern atmosphere, thereby regularly becoming complicit in Nazi civic mobilization and giving implicit assent to a chemically armed world.[1117]

The Big Business of Chemical Defense under the Nazis

Alongside the creation of the *Reichsluftschutzbund,* the Nazi seizure of power brought a renewed focus on chemical production and its subsidiary industries.[1118] Counter to the party's foundational rhetoric, the Nazis quickly expressed their willingness to allow large corporations like I.G. Farben to pursue profit through competitive capitalist enterprise. As historian Peter Hayes has shown, the giant chemical concern achieved significant profits through the Nazis' state sponsored economic programs while simultaneously respecting Nazi policies that discouraged the growth of foreign markets and/or instituted ethno-racial discrimination. Summing up this relationship, Hayes writes, "Nazi economic policy rested on the recognition that so long as a state displays its determination but permits businessmen to make money, they will let themselves be manipulated as to how."[1119]

[1117] Peter Fritzsche, "Machine Dreams: Airmindedness and the Reinvention of Germany," 698.
[1118] Historian Florian Schmaltz has argued that chemical weapons production "became a high priority in the context of the armament policy of the new regime." Florian Schmaltz, "Chemical Weapons Research on Soldiers and Concentration Camp Inmates in Nazi Germany," in *One Hundred Years of Chemical Warfare: Research, Deployment, Consequences,* 230.
[1119] Peter Hayes, Industry and Ideology: IG Farben in the Nazi Era, 379.

Prior to 1933, Carl Bosch, the de-facto leader of the IG concern, criticized the Nazis' pursuit of autarky and the ways in which their racial ideology would impinge on the autonomy of international science.[1120] However, the Nazis' ability to put down labor disputes and their lucrative contracts for IG fuel, synthetic rubber, and chemical research eventually quieted Bosch's initial criticisms. In fact, for some industrialists, the Nazi regime represented potential economic stability for the large German firms that had weathered the Great Depression.[1121] Over the course of 1933, the IG Farben group gave over 4.5 million Reichsmark to the Nazi Party and gradually moved toward domestic accommodation of the new regime.[1122]

While early Nazi economic programs did little to help the IG's bottom line, the pursuit of German autarky renewed hopes that chemical armaments might again be produced and sold.[1123] Thus, the IG group cozied to the Nazi regime with the hope of future military contracts and political sway. The open announcement of German rearmament on March 16, 1935 and the introduction of the Nazi Four Year Plan on September 9, 1936 began to make this relationship pay off. While IG's net profits had stagnated between 1933 and 1935, they doubled in 1936 to 140 million Reichsmark.[1124] These financial successes were most fully felt in the 1940s, when Nazi military conquest finally produced significant growth in IG's sales, raising yearly profits to 300 million Reichsmark.[1125]

As part of the IG's ongoing research into chemical pesticides, the chemical plant at Leverkusen assigned the chemist Gerhard Schrader to study organic fluoro-phosphorine

[1120] Peter Hayes, "Carl Bosch and Carl Krauch: Chemistry and the Political Economy of Germany, 1925-1945," 357.
[1121] Werner Plumpe, German Economic and Business History in the 19th and 20th Centuries, 225-226.
[1122] However, many of IG Farben's Jewish researchers were not removed from their positions until 1938. While this may appear as if the company was protecting its employees, it was more likely an exploitation of their work. Keeping them in Germany until 1938 often put these Jewish researchers in impossibly deadly situations. Stephan H. Lindner, *Inside IG Farben*, 154-159.
[1123] Peter Hayes, Industry and Ideology: IG Farben in the Nazi Era, 114.
[1124] Ian Kershaw, The Nazi Dictatorship: Problems and Perspectives of Interpretation, 59.
[1125] Peter Hayes, Industry and Ideology: IG Farben in the Nazi Era, 325.

compounds. On December 23, 1936, Schrader synthesized a nerve agent that was later named Tabun. After accidentally poisoning himself with the gas, Schrader realized Tabun's ability to induce asthma and painfully constrict the pupils of the eye.[1126] The IG Concern reported the discovery of Tabun to the Army Ordinance Office, which expressed great interest its potential military applications.[1127] Alongside the production of Tabun at Bayer, as part of the Nazis' Four Year Plan, the BASF chemical plant began to again manufacture chemical weapons like phosgene and mustard gas under the direction of Dr. Otto Ambros.[1128] In 1938, Schrader then isolated the more toxic nerve gas Sarin, which alongside Tabun, could penetrate all known gas masks.[1129] In September of the following year, the German military contracted IG Farben to construct a Tabun factory at Dyhernfurth. At its peak, the factory produced 1000 tons of Tabun per month.[1130] A second IG plant at Falkenhagen raised this production capacity in 1943. Estimates suggests that the Germans produced up to 30,000 tons of Tabun before the end of the Second World War.[1131]

Private chemical research institutes faced similar changes under the Nazi regime. The 1934 Civil Service Law forced many Jewish chemical researchers to abandon their positions.

[1126] Florian Schmaltz, "Neurosciences and Research on Chemical Weapons of Mass Destruction in Nazi Germany," 188-189.

[1127] In fact, much of the chemical weapons production under the Nazis was largely due to the political pressures of the IG group. Rolf-Dieter Müller, "World Power Status through the Use of Poison Gas? German Preparations for Chemical Warfare, 1919-1945, " 184-185.

[1128] IG AG Kampfstoffe P 70/I Diverse Ausarbeitungen zu Kampfstoffen im Allgemeinen Dyhernfurth Gendorf finden sich in IG A 866/1 (BASF) IG A 866/1 ; Monatsmeldungen an das Oberkommando des Heeres uber die Produktion von Sprengstoffen und Vorprodukten sowie den Rohstoffverbrauch Dez 1939-1941 (BASF) Pertinenzbestand P.7./6

[1129] See Albert Speer's description of Tabun in: Albert Speer, *Inside the Third Reich*, 413. ; Monatsmeldungen an das Oberkommando des Heeres uber die Produktion von Sprengstoffen und Vorprodukten sowie den Rohstoffverbrauch Dez 1939-1941 (BASF) Pertinenzbestand P.7./6

[1130] Albert Speer, *Inside the Third Reich*, 413.

[1131] For the production numbers of all nerve agents in the Third Reich see: Rolf-Dieter Müller, "Die deutschen Gaskriegsvorbereitungen 1919-45: Mit Giftgas zur Weltmacht?," 46. The Nazis also considered the production and use of bacterial weapons. See: RH/12/9 Sig 27 (BA-MA) Signatur 27, Standort 22, Magazin H3EG, Reihe 125, Regal 5, Gefach 2

This included Fritz Haber who resigned as the director of the Kaiser Wilhelm Institute for Physical and Electrochemistry on October 1, 1933 after facing anti-Semitic attacks in the *Journal for Natural History*.[1132] To the end, Haber held on to his German nationalist sentiments, writing in his resignation letter: "You will not expect from a man in his sixty-fifth year a change of mental outlook, which in the preceding thirty-nine years directed his academic life, and you will understand that the pride with which he has served his German homeland for his entire life prescribes this request for retirement."[1133] However, in one of his final acts as a leading figure at the KWI, Haber refused the German military's request to transition his laboratories back to chemical warfare research. Rather, he began to organize the emigration of his fellow Jewish-German scientists and secured a spot for himself at a Cambridge laboratory.[1134]

Suffering from insomnia and anxiety, Haber did not find Cambridge to be a particularly comfortable academic home. In a scene laden with symbolism, fellow physicist Ernst Rutherford reportedly refused to shake Haber's hand due to his role in unleashing chemical warfare. Thus, the conflict between the international ideals of science and national pride hounded Haber to the end of his life. Choosing to leave his position in England, Haber subsequently accepted a position at the Sieff Research Institute in Palestine. While traveling through Switzerland, Haber succumbed to his continuing illnesses and died of heart failure on January 29, 1934. Ever the German patriot, Haber regrettably died in exile from his beloved country.[1135] When remembering

[1132] Dietrich Stoltzenberg, Fritz Haber: Chemist, Nobel laureate, German, Jew, 285-286.
[1133] Fritz Stern, Einstein's German World, 155.
[1134] Haber notably helped Chaim Weizmann emigrate from Germany. He found his own laboratory position at Cambridge through Sir William Pope, a chemist who developed mustard gas for the British. Fritz Stern, *Einstein's German World,* 158, 161.
[1135] The physicist Max von Laue pushed for a commemoration service for Fritz Haber despite assured Nazi disapproval. At the service, Max Planck and Otto Hahn spoke to a large crowd of industry scientists, military men, and diplomats. Many academic professors were represented by their wives due to state surveillance. This funeral is often cited as one of the German physics community's important acts of ideological resistance to the Nazi regime. Ruth Lewin Sime, *Lise Meitner: A Life in Physics,* 156.

Haber's condition during the 1930s, the physicist Max von Laue said, "The spiritual suffering that this great man endured is unforgettable."[1136]

The removal of most Jews from the ranks of the Kaiser Wilhelm Society initially strained all thirty of the state sponsored research institutes like Haber's. Only through connections to corporate interests and a fairly insular bureaucratic structure, now led by the physicist Max Planck, was the Kaiser Wilhelm Society able to remain focused on its research agenda without much state interference in the early years of the Third Reich.[1137] However, with the announcement of the Four Year Plan, the Society increasingly fell under the control of the Reich Research Council and the Military Weapons Office. Over the first six years of the Nazi regime, the Kaiser Wilhelm Society's budget doubled, continuing to climb well into the Second World War.[1138] By 1942, Society research, now monitored by Albert Speer, was again almost completely beholden to military interests.[1139] Of the over forty Kaiser Wilhelm Institutes active in the Third Reich, seven worked on projects related to offensive or defensive chemical warfare.[1140] Six of these predominantly researched gas mask materials and technologies or some other form of gas protection. The biochemist Richard Kuhn conducted the most important of these studies at the Institute for Medical Research at Heidelberg.[1141] Studying the effects of

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[1136] Ibid, 142.

[1137] The Kaiser Wilhelm Society managed to protect the positions of several Jewish researchers in the early 1930s. Max Planck met with Hitler on May 16, 1933 to intercede on the behalf of Fritz Haber. Allegedly, Hitler claimed that he had nothing against the Jews, but that he must rid Germany of these communists. After Hitler reportedly built himself into a rage, Planck left and Haber's position at the KWI remained in jeopardy. David Cassidy, *Uncertainty: the Life and Science of Werner Heisenberg*, 307.

[1138] Kristie Macrakis, Surviving the Swastika: Scientific Research in Nazi Germany, 5.

[1139] Ibid, 95.

[1140] This included the Kaiser Wilhelm Institute for Work Physiology in Dortmund, which studied the effects of the gas mask on physical labor. Geratetechnisches, Konstruktion, Erfindungen, Versuche, Formveranderungen usw. 1933-36 (BA-MA) RH/12/4 sig 84 ort 22 mag H3EG reihe 125 Regal 2 Gefach4 See also: Florian Schmaltz, "Chemical Weapons Research in National Socialism: The Collaborations of the Kaiser Wilhelm Institutes with the Military and Industry," in *The Kaiser Wilhelm Society under National Socialism*, 313-315.

[1141] Richard Kuhn was also the president of the *Deutsche Chemische Gesellschaft* (DChG) and a departmental head for the Reich Research Council. Like the *Verein Deutscher Chemiker*, the DChG also involved itself in chemical

Vitamin B1 on the central nervous system in 1944, Kuhn and his laboratory synthesized the exceedingly lethal nerve agent Soman. Like Tabun and Sarin, a single drop of Soman induced vomiting, extreme muscle pain, and eventual nervous system failure. IG Farben produced 70 kg of Soman before the end of the war.[1142]

University and smaller private chemical research laboratories often maintained even less independence from Nazi directives. Indeed, laboratories like Ferdinand Flury's at the University of Würzburg had already been secretly contracted by the Reichswehr to study chemical weapons in the Weimar Republic.[1143] The small size and decentralization of these laboratories kept their research low-profile in a supposedly disarmed Germany. In the Third Reich, this decentralization allowed for a variety of different chemical warfare research agendas, encouraging specialization and problem-driven approaches.[1144] This included the continued testing of many of the gases developed during World War I in laboratories at the universities in Marburg, Munster, Giessen, Würzburg, Greifswald, and the Academy of Medicine at Danzig.[1145] The extent to which this testing led to the creation of new poison gases is unclear due to the wartime destruction of pertinent documents.

As part of this decentralized chemical weapons research, the German military set up and maintained three separate production and testing facilities that employed upwards of 1,000 scientists and support staff. The largest site was the Army Proving Grounds north of Münster where scientists started to produce Tabun in 1937. The second was the Army Gas Protection

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weapons research under the Nazis. The DChG, composed primarily of academic chemists, mostly worked on offensive weapons production in military funded labs. Helmut Maier, Chemiker im "Dritten Reich", 265.

[1142] Florian Schmaltz, "Neurosciences and Research on Chemical Weapons of Mass Destruction in Nazi Germany," 198-199.

[1143] Florian Schmaltz, "Neurosciences and Research on Chemical Weapons of Mass Destruction in Nazi Germany," 186-187.

[1144] Ibid, 187. ; Helmut Maier, Chemiker im "Dritten Reich", 265.

[1145] Florian Schmaltz, "Chemical Weapons Research on Soldiers and Concentration Camp Inmates in Nazi Germany," in *One Hundred Years of Chemical Warfare: Research, Deployment, Consequences,* 232.

Laboratory at the Spandau Citadel, which began testing the effects of Tabun on animals. And the final site was the Gas Protection Office of the Army Ordnance Office in Berlin. Besides these three large chemical testing sites, the Military Medical Academy in Berlin produced valuable supplemental research. Set up in 1934, the Academy was largely intended to train sanitary officers in the Wehrmacht. However, through the Academy's Department of Pharmacology and Military Toxicology, directed by Wolfgang Wirth and Otto Muntsch, scientists began testing Tabun on both themselves and other volunteer officers.[1146] By 1939, the testing at these state-directed sites, as well as at IG factories, KWI institutes, and university laboratories provided the Nazis with a massive national advantage in state-of-the-art chemical weapons knowledge. After Germany invaded Poland in 1939 and Hitler declared Germany's official "Preparations for the Gas War," IG Farben and the Wehrmacht were well positioned to begin large-scale production.[1147]

While a complete picture of poison gas research in the Third Reich still remains difficult to piece together, evidence of gas protection research is abundant. Private research groups, the military, and manufacturers conducted studies on everything from new gas mask satchels to hand-held gas alarms.[1148] Unsurprisingly, the gas mask received the most attention. Through studies on cardiac and respiratory activity under the gas mask, scientists and engineers hoped to create masks and filters that could last longer, provide a more comfortable fit, and be worn easily

[1146] The Military Medical Academy's Department of Pharmacology and Military Toxicology also served to direct many of the separate university laboratories that worked on chemical weapons research. Florian Schmaltz, "Neurosciences and Research on Chemical Weapons of Mass Destruction in Nazi Germany," 189-190.
[1147] Besprechung bei Herrn Generalmajor Thomas am Sept 5, 1939 (BA-MA) RH 12-9/25. The SS also began chemical weapons testing in 1942 through the SS-Ahnenerbe's Applied Military Research Institute. The anatomist August Hirt directed most of this testing at the University of Strasbourg. Florian Schmaltz, "Chemical Weapons Research on Soldiers and Concentration Camp Inmates in Nazi Germany," in *One Hundred Years of Chemical Warfare: Research, Deployment, Consequences,* 232.
[1148] Sondergerat fur Gasschutz, 1931-36 (BA-MA) RH/12/4 sig 91 ort 22 Mag H3EG reihe 125 regal 2 gefach 4 ; Beschaffung der Tragetaschen zür Gasmaske 24, 1932 (BArch-B) Signatur: 5595 Standort: 51 Magazin: M 2 03 Reihe: 38

during daily life.[1149] This research appeared particularly imperative because the most recent Auergesellschaft gas mask (the Gas Mask 30) often had problems with its gas tight fit.[1150] At the same time, most German soldiers were still training with defective or broken gas masks from World War I.[1151] Responding to complaints about old equipment in 1932, the Dräger company wrote, "In our opinion, such masks are completely unsuitable for any kind of exercise and should only be used for educational purposes. The mask wearer would learn the operation of the primitive mask, which is exactly opposite that of the modern mask."[1152] When testing an older Gas Mask 24, a military officer also claimed that the mask did not fit people with large noses or big foreheads. Further still, the mask could make the neck sore when worn for extended periods of time and the exhalation valve frequently leaked.[1153]

To address these concerns, both the Auergesellschaft and the Drägerwerks began working on both a new military gas mask as well as a mask that would be affordable enough for every German citizen. After barely surviving the Hyperinflation Crisis and the Great Depression, the Dräger company was reluctant to recommit themselves to this kind of military-specific manufacturing. Under Heinrich Dräger, the company attempted to continue to manufacture about 50% of its products for international markets, focusing primarily on medical and mining equipment.[1154] Nevertheless, the Nazi state demands for the production of more civilian gas

[1149] Karl Graus aus Schmechten, Elektrokardiographie Untersuchungen bei Belastun älterer Personen unter der Gasmaske, 5. ; Deutschen Roten Kreuz, Sammlung von Vorträgen über Gasschutz und Gassanitätsdienst, 202-203.
[1150] Neue Gasmaske, 1933 (BA-MA) RH/12/4 sig 88 ort 22 MAg H3EG Reihe 125 Regal 2 Gefach 4
[1151] Verwaltung, Lagerung, Nachschub, Unterbringung, Besichtigung des Gasschutzgerats bei der Truppe 1933-36 (BA-MA) RH/12/4 sig 78 ort 22 Mag H3EG Rehe 125 Regal2 Gefach 4. Due to production shortages, military training with World War I masks lasted well into the 1940s. Austeilung und Prüfung von Gasmasken 1938-1940 (LBWH) M 400/1 Bü 460
[1152] Stahlhelmzeitung "Luftschutz tut not" Briefe 1932 (BArch-B) Signatur: 375 Standort: 51 Magazin: M 1 08 Reihe: 76
[1153] Truppenversuche, Erfahrungsberichte 1933 (BA-MA) RH/12/4 sig 69 ort 22 mag H3EG Reihe 125 Regal 2 Gefach 3
[1154] The Drägerwerks maintained an often-contentious relationship with the Nazis. Heinrich Dräger protected several of his Jewish employees and the philosopher Hans Blumenberg from Nazi persecution. However, the company also utilized 1,200 forced laborers from Eastern Europe and 50 prisoners of war for production in the 1940s. After

masks (the Gas Mask 40 or *Volksgasmaske)* required the acquisition of new factories and raw materials suppliers.[1155] Due to the Nazis' apparent concern for air and gas defense, military contracts shot up to about 65% of all Dräger production in 1935. Between 1933 and 1939, Dräger's final profits increased by more than forty times, sitting at 6 million Reichsmark by the end of the decade. In 1939 alone, the Dräger company received contracts for civilian gas masks worth over 6 million Reichsmark.[1156] This windfall slowed between 1940 and 1943 and Dräger cut back its civilian gas mask production by 50% due to wartime rubber shortages.[1157]

The Auergesellschaft also experienced financial difficulties after 1933. The Jewish partners Leopold Koppel and his son Albert Leopold Koppel removed at chairmen, forcing the remaining board to convert Auer into a public limited company.[1158] In 1934, the Degussa company bought significant shares of the Auergesellschaft, allowing Auer to continue its production of incandescent lamps and gas masks.[1159] Much like for Dräger, contracts for civilian gas masks skyrocketed, eventually making up 90% of all Auer profits (64 million Reichsmark in 1939). This lack of market diversity practically forced Auer to seek even more military contracts

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initially turning down the offer to use concentration camp labor, Dräger was pressured by the Nazis to use 500 concentration camp prisoners at the Hamburg-Wansbeck factory. In June 1944, the Nazis established the first women's subcamp at the Neugamme concentration camp for the production of Dräger gas masks. A survivor of the camp, Stephanie Kuder, noted that plant management demanded the production of 12,000 masks per shift. With two shifts per day and 26 or 27 work days a month, this would produce 624,000 to 648,000 masks each month. Historian Mark Buggeln figures that the prisoners were actually able to meet this production demand in August 1944. These masks would then be double checked for production errors by German civilians in another location. Buggeln, Slave Labor in Nazi Concentration Camps, 132-133.

[1155] Michael Knoll, *Die Drägerwerke im Dritten Reich*, 10-12. ; Geratetechnisches, Konstruktion, Erfindungen, Versuche, Formveranderungen usw. 1933-36 (BA-MA) RH/12/4 sig 84 ort22 mag H3EG reihe 125 Regal 2 Gefach4

[1156] For more on Dräger military contracts see: Bernhard Lorentz, Industrieeltie und Wirtschaftspolitik 1928-1950: Heinrich Drüager und das Drägerwerk, 173.

[1157] Michael Knoll, Die Drägerwerke im Dritten Reich, 11-12. In fact, it was the production of aircraft tires and rubber components for gas masks that encouraged the Armaments Ministry to give high priority to Continental AG through most of the Second World War. Mark Buggeln, Slave Labor in Nazi Concentration Camps, 108-109.

[1158] After the removal of the Koppels, Dr. Karl Quasebarth took more of a leadership role in the Auergesellschaft. In 1937, he was made chairman of the board and head liaison to the German military. Auergesellschaft 1939 (BArch-B) NS/19/ Sig 3446 Ort 51 Haus 901/EG. Waldemaar Neitzel, later the head of the SS Department of Gas Protection, assisted in purging the Auer company of Jews in 1935. Paul Lawrence Rose, *Heisenberg and the Nazi Atomic Bomb Project. A Study in German Culture*, 193.

[1159] Peter Hayes, From Cooperation to Complicity: Degussa in the Third Reich, 128.

that could be quickly fulfilled in Auer's Oranienburg factory, conveniently location just outside Berlin. Competition with Dräger further spurred costly expansion, drawing concern from Auer's parent company Degussa. However, there was little that Degussa could do to reign in Auer's dependence on government contracts due to the company's increasingly intimate relationship with the now powerful *Reichsluftschutzbund* and the Wehrmacht.[1160] In 1933, Auer received 10 million Reichsmark to produce about 500,000 gas masks for the military.[1161] This was three times the total number of masks that they had sold in 1932. During the same year, Auer reopened its gas training school at its Oranienburg factory.[1162] After the implementation of the Four Year Plan, the company made about 2.8 million more civilian gas masks per year.[1163] Reflecting on this increased demand in its 1936 product catalog, the Auer company claimed that, "The implementation of the Four Year Plan requires the application of all the scientific, technical, and economic energies of our people."[1164] However, due to increasing investment in assets and slow payment from government contracts, Auer lost 2.5 million Reichsmark in the 1937 financial year. By 1938, Auer owed its creditors about 7 million Reichsmark. Degussa reeled in Auer's proposed expansions, now only allowing the company to acquire stock in a radium and uranium firm in the Sudentenland.[1165]

[1160] Auer's desire to continually expand and increase production partly inspired their decision to utilize 2,000 female Sachsenhausen concentration camp prisoners for gas mask production at Oranienburg after 1944. Vorermittlungsverfahren Tatbestand: NS-Verbrechen in Nebenlagern des Konzentrationslagers Sachsenhausen Tatort: Nebenlager Auerwerk-Oranienburg 1944-1945 (LBWL) EL 48/2 I. In 1936, Auer installed a monument in the center courtyard of the Oranienburg factory that was dedicated to the fallen soldiers of World War I. The monument was adorned with Nazi swastikas and an inscription that asked Germans to honor these soldiers for their commitment to comradery (*Kameradschaft*) and people's community (*Volksgemeinschaft*) See: *Die Gasmaske* 8 (March 1936)

[1161] Degea Aktiengesellschaft (Auergesellschaft) Berichte, Korrespondenz 1933 (EIA) Degussa IW 24.5./2-3

[1162] Eduard Smolczyk, "Die neue Gasschutzschule in Oranienburg," *Gasschutz und Luftschutz* 10 (March 1933)

[1163] Peter Hayes, From Cooperation to Complicity: Degussa in the Third Reich, 130-131.

[1164] Degea A.G., *Farbspritzen und Gasschutz*. In one gas mask contract from the 1940s, over 30 firms were commissioned to produce gas mask filters. Vertrag über die Herstellen von Gasschutzfiltern (BArch-B) Signatur: 376 Standort: 51 Magazin: M 108 Reihe: 76

[1165] Otto Frisch, *What Little I Remember*, 89. ; Peter Hayes, *From Cooperation to Complicity: Degussa in the Third Reich*, 132. Degussa, on the other hand, experienced significant gains in profit from the Nazi Four Year Plan. Like

The boom in gas mask production even inspired Hugo Stoltzenberg to attempt to reenter the German chemical industry. He spent about 90,000 Reichsmark on the development of a new gas mask that featured a fully transparent face shield. Writing to the Ministry of Aviation, Stoltzenberg boasted that, "The construction of this mask is based solely on German inventions, while the previous mask types were invented and developed primarily by Jews."[1166] In a second letter, Stoltzenberg claimed that Auer was a Jewish monopoly that was now driving his Aryan factory out of business.[1167] This attempt to curry favor with the Nazis failed and Stoltzenberg's mask was never widely adopted by state services. However, his effort to drive Jewish competitors out of business by utilizing the rhetoric of Nazi "Aryanization" was a common practice.[1168] Stoltzenberg did not give up in his attempts to court the Nazis and he joined the party in 1941. Ever the opportunist, Stoltzenberg struggled to create a lasting business relationship with committed members of the party. In fact, he was detained for a month by Nazi authorities under the suspicion of treason due to his continued international business deals.

Aero-Chemical Rearmament and Mobilization in the Third Reich

The 1933 Nazi takeover brought swift measures for the rearmament of the Reichswehr. Minister of the Interior Wilhelm Frick and Minister of Economics Hjalmar Schacht introduced several convert financial structures that could effectively funnel state money into the German

IG Farben, Degussa stood to gain even more from Nazi warfare and conquest in the 1940s. Peter Hayes, "The Chemistry of Business-State Relations in the Third Reich," 69. Degussa's Degesch subsidiary, now under 42% I.G. Farben control, continued to sell Zyklon-B canisters as pesticides. Military contracts for Degesch increased between 1939 and 1945, as Zyklon-B was used to delouse military quarters, uniforms, and supplies. Paul Weinling, "The Uses and Abuses of Biological Technologies: Zyklon B and Gas Disinfestation Between the First World War and the Holocaust," 295.

[1166] Geratetechnisches, Konstruktion, Erfindungen, Versuche, Formveranderungen usw. 1933-36 (BA-MA) RH/12/4 sig 84 ort22 mag H3EG reihe 125 Regal 2 Gefach4

[1167] Gasschutz-Volk 1934-36 (BA-MA) RH/12/4 sig 63 ort 22 Mag H3EG Reihe 125 Regal 2 Gefach 3

[1168] Between 1933 and 1944, Degussa spent 18 million Reichsmark buying formerly-Jewish businesses. Peter Hayes, *From Cooperation to Complicity: Degussa in the Third Reich*, 74.

armed forces. For instance, in May 1933, Schacht set up the dummy company MEFO, which produced promissory notes used to contract the major Germans armaments manufacturers to produce arms. Other seemingly civil organizations like the *Deutsche Verkehrsfliegerschule* (or German Air Transport School) operated as covert military academies. Poison gas training was part of this renewed military spending and Reichswehr soldiers learned to both employ and defend against the gasses of World War I. Often using old gas masks, soldiers entered pitch black training rooms that would be subsequently filled with tear gas. Testing composure in an imagined gas attack, the army expected men to be able to don their gas masks in fifteen seconds while holding their breath. [1169] Like the German regulars of 1918, the Reichswehr soldiers of the 1930s also learned to properly fit and clean their masks, reporting to their NCO if their masks malfunctioned or exhibited any holes.[1170]

By March 16, 1935, the Nazis openly disobeyed the Treaty of Versailles and publicly announced that they were rearming Germany.[1171] They described their plans for rearmament as assurances for peace, gesturing towards the dangers of the Soviet Union as a justification for a strong German military.[1172] The best practices for Wehrmacht poison gas training now became an open topic for German commanders. Understandably, new guidelines drew heavily on the experience of chemical warfare in World War I. Major General Friedrich von Tempelhoff wrote,

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[1169] Gas und Entseuchungsraume 1931-36 (BA-MA) RH/12/4 sig 71 ort 22 mag H3EG Reihe 125 Regal 2 Gefach 3
[1170] Anweisung für die Handhabung der Gasmaske 30; mit Abbildungen 1936 (LBWH) M 635/1 Nr 1461
[1171] On March 7, 1936, the Nazis reoccupied the Rhineland. Hitler avoided confrontation with Great Britain and France by making vague overtures to détente and international limits on bombers and poison gas in his Peace Plan. Richard Overy, *The Bombing War: Europe 1939-1945*, 31.
[1172] A 1937 article in *Gasschutz und Luftschutz* expressed the importance of German rearmament and poison gas training by demonizing the chemical capabilities of the Soviet Union. The article read: "what Bolshevism really means is the absence of culture: the Russian people desire the destruction of the noble and good and the saving of the low and the bad! To meet this impending possibility, we see more and more people ready to take defensive measures and make sacrifices, and this is especially true for those who feel particularly threatened by the Bolshevik danger on the eastern border of Europe." *Gasschutz und Luftschutz* Jahrgang 7 Heft 1, 1937. For more on rearmament as an assurance of peace see: "Deutschland will den Frieden!" *Gasschutz und Luftschutz* no. 1 (January 1935)

"Gas warfare is not a technical, but a tactical affair. It is not a black art of learned chemists, but a task of the soldier."[1173] Tempelhoff further reiterated the idea that success in chemical warfare relied on the gas discipline of each soldier. Indeed, soldiers who learned to live among toxic gasses were best prepared to utilize chemical weapons.[1174] The general continued, writing that "progress depends not only on the technology, but also on how the soldier understands how to use both gas and gas protection devices."[1175]

The technology behind gas protection had progressed slowly but significantly since World War I. After the public announcement of German rearmament, Wehrmacht soldiers trained with full-body rubberized gas suits that could resist vesicants like mustard gas. Their Gas Mask 30 filters were designed to resist more variants of gas for longer periods of time, and their auxiliary protective devices like gas blankets and gas alarms were intended for mobile combat.[1176] Nevertheless, with gas masks affixed, visibility and audibility remained major problems for troop cohesion.[1177] Understandably, the soldiers' inability to hear their group leaders still greatly concerned military commanders. The direction of a strong and decisive leader was essential to both the completion of any mission and basic survival in gas attacks. One military report stated that:

> There is a danger that the troops, who are not used to fighting, will lose their nerve during the first fierce aero-chemical attack and that those of morally weak natures will take this

[1173] Friedrich von Tempelhoff, *Gaswaffe und Gasabwehr: Einführung in die Gastaktik*, vi. For similar arguments see: Generalmajor a.D. von Tempelhoff, "Die Gasabwehr im Felde," 1018.
[1174] A German military report from 1938 claimed that "the individual man is only a full-fledged soldier if he can complete all operations under the gas mask." Gasschutz Vorschriften und andere Vorschriften 1938 (BA-MA) RH/12/9 Sig 36, Ort 22, Mag H3EG, Reihe 125, Regal 5, Gefach 2
[1175] Friedrich von Tempelhoff, Gaswaffe und Gasabwehr: Einführung in die Gastaktik, 210.
[1176] RH/12/9 Sig 4 1938 (BA-MA) Sigatur 4, Standort 22, Magazin H3Eg, Reihe 125, Regal 5, Gefach 2
[1177] Gasabwehrubung 1937 (BA-MA) RH/12/4 sig 67 ort 22 mag H3EG Reihe 125 Regal 2 Gefach 3. Infantryman Dieter Finzen's diary entry from February 14, 1940 reveals a common visual problems under the gas mask: "We shoot with gas-masks on in nasty snow flurries. You can see nothing. The results are as you would expect." Dieter Finzen, *Kriegstagebuch: Das Tagebuch von Dieter Finzen aus beiden Weltkriegen.* https://dieter-finzen.blogspot.com/search?q=gas.

> opportunity to flee the battlefield. In this way, the attack power of whole units may be called into question before the force has even come into the area of fire.[1178]

Many German military theorists assumed that aero-chemical attack would produce some of the greatest damage on the battlefields of the future. According to the Army Office, traditional chemical weapons could no longer surprise an unprotected enemy. Battlefield successes would only come from new gasses that could penetrate current gas protection devices or attacks that could cripple army supply lines. Aero-chemical attacks seemed particularly valuable for shutting down enemy depots and arms manufacturing. A 1937 military report argued that the Wehrmacht should throw "all available chemical weapons" at the enemy to shut down military production. The production of at least 10,000 tons of chlorine per year was apparently necessary to achieve such a goal.[1179] Conversely, commanders drew up hundreds of detailed plans for protection against enemy aerial gassing. At the Wehrmacht Academy, they regularly discussed and delivered these plans through lectures on "gas fighting" and "gas protection."[1180]

While the military required the manufacture of millions of gas masks as part of the rearmament program, directives from Hermann Göring and the *Reichsluftschutzbund* spurred much of the gas mask production in the mid-1930s. As early as the spring of 1933, the Hitler Youth and the SA began handing out air protection literature and rattling tins to solicit funds for the newly formed *Reichsluftschutzbund* (RLB or Civil Defense League).[1181] As the RLB grew, it engaged in an increasing number of air and gas protection activities. The league focused much of its attention on the classroom, where it attempted to inform children of air and gas protection

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[1178] Gasabwehrubungen 1938 (BA-MA) RH/12/9 Sig 31, Standort 22, Magazin H3EG, Reihe 125, Regal 5, Gefach 2
[1179] Gaskampf. Grundlegende Erlasse und Arbeitspläne II. 1937 (BA-MA) RH/12/9 Sig 28, Standort 22, Magazin H3Eg, Reihe 125, Regal 5, Gefach 2. The German army also had plans to develop a gas that could disrupt airplane engines, but the project was abandoned due to the possibility that the gas might poison pilots and be deemed "poison gas warfare." Samuel A. Goudsmit, *Alsos*, 53.
[1180] RH/12/9 Sig 22 (BA-MA) Signatur 22, Standort 22, Magazin H3EG, Reihe 125, Regal 5, Gefach 2
[1181] Dietmar Süß, Death from the Skies: How the British and Germans Survived the Bombing in World War II, 36-37.

guidelines and to instill collective responsibility at an early age. Outside of schools, the *Reichsluftschutzbund* dropped paper bombs filled with sand to express the looming possibility of aerial attacks against civilians. Further dramatizing the German nation's vulnerability to aero-chemical attack, they set off sirens and stopped traffic to stage sensational displays of bomb diffusions in the middle of crowded city streets.[1182] On a more prosaic yet omnipresent level, the RLB put up posters, handed out pamphlets, and erected massive dummy bombs in the center of public spaces. One American observer of these activities claimed that "Military preparedness…pervades every aspect of life in modern Germany...Every house bears the placards of an organization for defense against air attack. The language of the street, the press, the radio, the newsstand and even the library and classroom smacks of war."[1183]

RLB members even conducted air defense shows where firefighters, members of the Technische Nothilfe, and Red Cross workers would douse fires and rescue victims from small-scale wooden cities. The finale of one specific air show entitled, "Kiel in Flames," featured the firing of tear gas into the crowd of spectators.[1184] While the RLB was aware that these measures could potentially lead to civilian panic, the prevailing logic claimed that any visible measure was better than the inaction of the Weimar government. As such, practically no method was off limits if it could impart the seriousness of aero-chemical warfare to German civilians.

A combination of these scare tactics and Nazi pressure to participate in civic duties motivated millions of German civilians to join the *Reichsluftschutzbund*. By 1936, the RLB boasted 8.2 million members in over 7,000 local branches, making it one of the largest civic organizations in Nazi Germany. Putting its membership into perspective, historian Peter

[1182] Peter Fritzsche, Life and Death in the Third Reich, 55.
[1183] Ibid.
[1184] Internationales Luftfahrt Archiv, 6 Oct. 1933

Fritzsche writes that the total number, "included one out of every six Berliners and over 10 percent of Germans living in Hesse, the Palatine, and Baden…As many as 350,000 block wardens surveyed the civil vigilance of their neighbors."[1185] By the mid-1930s, the RLB was conducting large-scale air raid exercises across Germany, forcing civilians to enter air raid shelters, don gas masks, and turn off lights on a regular basis. In 1934 and 1935 alone, an incredible 28% of all Germans in twenty-one select cities visited an air-defense show. In cities and towns close to German borders, these percentages increased drastically. 40% of the population of Heidelberg, 46.7% of Frankfurt an der Oder, and 48% of Dusseldorf spent at least one day learning the basics of aero-chemical defense.[1186]

Theoretically, all of the activities of the RLB could have been carried out by the former Ministry of the Interior under the Weimar government. The league incorporated all of the state services that had previously been tapped by Weimar leadership to serve in national air and gas protection. In fact, there were few structural differences between the RLB and the Weimar institutional apparatus. Admittedly, the RLB consolidated the work of the private air and gas protection organizations, but it placed itself precisely where the Ministry of the Interior had previously sat atop the administrative structure of air and gas protection services. Indeed, it was not the nominal changes to institutional structures that provided the RLB with its success, but rather its grass roots activities and ground-swell support. Reflecting the consolidation of this national allegiance in 1933, Hermann Göring wrote, "Under the leadership of the National Socialist state, the period of individualized air protection is no longer compatible with the

[1185] Peter Fritzsche, *A Nation of Fliers*, 211. The RLB also ran 5,088 air raid protection schools with 28,000 air protection teachers. See: Generalmajor a.D. von Tempelhoff, "Chemische Kampfmittel und Gasabwehr in der 'Russischen Felddienstordnung!'" *Gasschutz und Luftschutz* 1 (August 1938)
[1186] Die Sirene, no. 6 (March 1936) ; Luftschutz ist Selbstbehauptungswille : Aufgaben und Erfahrungen über die Ausbildung im zivilen Luftschutz, 5.

modern age. With all acknowledgement of the work done by the air defense advisors in a difficult time, I ask you to dissolve private local air defense groups immediately."[1187]

While the private air defense organizations disappeared, state services and ministries like the Technische Nothilfe, Ministry of Transportation, German Railroad, Ministry of Work, Ministry of Agriculture, Postal Service, Ministry of Science, Ministry of Finance, German Red Cross, Ministry of Propaganda, consulting VDCh chemists, and local police and fire departments all served underneath Göring's RLB in the push to prepare German civilians for aero-chemical warfare.[1188] Part of the decision to keep these smaller bureaucratic structures in place was purely practical. Not only did they already have air protection experience from Weimar-era exercises, but it was also apparent that local authorities fared the best in leading air raid drills. Through intimate knowledge of a specific town or area, local police and firefighters could most quickly diagnose regional air defense problems and build the civic community structures that could best respond.[1189]

At the same time, the localized RLB institutional structure created the kind of disjointed polycracy that often-defined Nazi government.[1190] While Hermann Göring served as the face of the organization, much of the real work was carried out by the undersecretary of the German Air Ministry and the RLB director of Civilian Air Protection, Kurt Knipfer. Knipfer, a former air force pilot and Weimar bureaucrat in the Prussian Ministry of Commerce, was responsible for creating the RLB's institutional push toward a militarized national community of air protection.

[1187] Einzel-u. Sammelschutz (1933-36) (BA-MA) RH/12/4 sig 59 ort 22 mag H3EG Reihe 125 Regal 2 Gefach 3
[1188] The local SA was also often integrated into municipal police and fire brigades during air protection drills. Richard Bauer, *Fliegeralarm: Luftangriffe auf München 1940-1945,* 10.
[1189] Peter Fritzsche, "Machine Dreams: Airmindedness and the Reinvention of Germany," 698.
[1190] Jurisdictional conflicts pervaded air defense in the Reich. While the RLB controlled all civilian preparations, Himmler's Order Police struggled to maintain control of the state air defense services over the Reich Interior Ministry. Richard Overy, *The Bombing War,* 412. ; Jörn Brinkhaus, *Luftschutz und Versorgungspolitik: Regionen und Gemeinden in NS-Staat, 1942-1944/45,* 16.

Already in conversation with many of the gas specialists through *Gasschutz und Luftschutz,* Knipfer picked up many of his organizational ideas from theorists like Erich Hampe. Accordingly, Knipfer and the RLB demanded that each German locality create an authoritarian structure that reflected the larger national regime. This necessitated strong leaders and independent services in each neighborhood but it did not always foster inter-community communication.[1191] While daily conditions in each locality might differ, the RLB's insistence on individual responsibility to a militarized and collective national community permeated the entire endeavor.

The Air Defense Act of 1935 placed the RLB under the newly established air force structure.[1192] The RLB was divided into fifteen regional groups that oversaw approximately 66,300 local district departments and 644,000 public officials.[1193] Local RLB leaders each controlled their own "air-defense sector" and were expected to direct police and fire brigades in the event of an attack. Furthermore, each city apartment building elected a "house warden" who would then assign a fire detail for the individual building. House wardens reported to block wardens, who then sent information up an extensive chain of command that ended with Göring himself. The editor of *Gasschutz und Luftschutz,* Heinrich Paetsch, described these mini-dictatorships of air and gas protection:

> Decisions to be taken are for the good of the entire population; there cannot be any debate, any conflicts of opinion, or any half-hearted resolutions. Only the man who demonstrates that he is a leader, who has iron nerves, who is cold-blooded and fearless, who has a clear and quiet aspect, and shows endurance, will serve in the air defenses.[1194]

[1191] The Nazis instructed local police and firefighters to work under the broad guidelines of the local RLB group leader and the closest stationed commander of the Wehrmacht. Einzel-u. Sammelschutz (1933-36) (BA-MA) RH/12/4 sig 59 ort 22 mag H3EG Reihe 125 Regal 2 Gefach 3

[1192] In 1939, Kurt Knipfer's Air Protection Department and the RLB were placed under Air Force Inspectorate 13, but the Luftwaffe interfered very little with civilian measures and Knipfer retained real power over the RLB.

[1193] Generalmajor a.D. von Tempelhoff, "Chemische Kampfmittel und Gasabwehr in der 'Russischen Felddienstordnung!'" *Gasschutz und Luftschutz* 1 (August 1938) ; Hugo Grimme, *Der Reichsluftschutzbund: Ziele, Leistungen und Organisation,* 40.

[1194] Heinrich Paetsch, "Oertliche Führung im Luftschutz," *Gasschutz und Luftschutz* 2 (May 1932), 97-100.

While the bureaucratic structure under the RLB remained complicated, the league placated air protection advocates with its aggressive programs and daily visual presence.[1195] Even if state protective services were still difficult to organize, German civilians were now very much aware of the dangers of aero-chemical attack. Clearly, Göring and the RLB had no problem with using scare tactics and sensational propaganda to make air and gas protection a near existential issue in the minds of German citizens.

Scientific Research or Authoritarian Spectacle: The Gas Specialists in the Third Reich

While the Nazis disbanded the private air and gas protection organizations and integrated their members into the RLB, the scientists and engineers who referred to themselves as gas specialists continued their efforts to raise air and gas protection awareness through public lectures and their various professional journals. The journals *Gasschutz und Luftschutz* and *Beruf und Stand* specialized in questions of aero-chemical protection, while *Luftschutz-Rundschau* focused on broader questions of national air protection.[1196] The Auergesellschaft's *Die Gasmaske* and the Dräger company's *Drägerheft* continued to feature scientific articles alongside purchasing catalogs. In addition to these slightly older journals, *Die Sirene*, the RLB's monthly publication, first appeared in late 1933.

Heinrich Paetsch and Rudolf Hanslian remained the editors of *Gasschutz und Luftschutz* after the Nazi takeover. Most of the contributors, a veritable "who's who" list of powerful men in the police, fire brigade, Technische Nothilfe, Wehrmacht, and chemical research laboratories

[1195] This structure was further complicated by political arguments between the RLB and Heinrich Himmler. Himmler wished for his Order Police to control all air protection activities as way to maintain internal security. In 1938, the RLB agreed to a comprise, stating that the RLB would maintain responsibility for all air defense but Himmler's Order Police would run any emergency operation in the case of a real aerial attack. German municipal fire services were also disjointed until they were placed under the control of the Order Police in 1938. Richard Overy, *The Bombing War: Europe 1939-1945*, 413.
[1196] *Beruf und Stand* was controlled by the *Verein Deutscher Chemiker*.

continued to write for the journal under the Nazi regime. In the early months of 1933, the journal remained purely focused on technical and scientific issues, although articles frequently agreed with the Nazis' broadly stated insistence on the importance of air and gas defense. But in June of 1933, Dr. Kurt Kniper wrote of the Nazis' rise as a "national revolution," pointing out the significance of the centralization of air and gas protection under the *Reichsluftschutzbund.*[1197] By the fall of that same year, contributors were cheering the end of pacifist international agreements and quoting sections of *Mein Kampf.*[1198] In this same vein, the 1935 reestablishment of the Wehrmacht inspired a long paean to the Nazis' tireless work. According to the article, now every German man, woman, and child was "genuinely indebted to carry out the tasks assigned to them to the best of their knowledge and ability."[1199] While *Gasschutz und Luftschutz* was never officially controlled by the Nazi party, the use of Nazi insignia and propaganda increased over the course of the 1930s.[1200] Both managing publishers, Dr. August Schrimpff and Dr. Franz Ebeling, joined the Nazi Party, with Ebeling going so far as to become a member of the SS in 1933.[1201]

Through their publications, the RLB supported the gas specialists in their continued political struggle with opponents who claimed that air and gas defense was merely an indirect form of rearmament. Articles, books, and pamphlets by the RLB called these pacifists enemies of the state, while simultaneously legitimating the arguments of gas specialists like Rudolf Hanslian and Hermann Büscher by championing their ideas and referring to them as *Fachleute,* or

[1197] Andreas Linhardt, "Die Fachzeitschrift "Gasschutz und Luftschutz" unter dem Einfluss des Nationalsozialismus," 4.
[1198] Vgl. K. Sckerl, "Deutschland vor einer Revolution der Bauwirtschaft," *Gasschutz und Luftschutz* 3 (October 1933): 256-260.
[1199] Gasschutz und Luftschutz no. 1 (January 1936)
[1200] See for instance: *Gasschutz und Luftschutz* no. 2 (1938)
[1201] Andreas Linhardt, "Die Fachzeitschrift "Gasschutz und Luftschutz" unter dem Einfluss des Nationalsozialismus," 8.

technical experts.[1202] Air protection literature continued to deny any overtly political aim, repeatedly referring to "facts" and "reality" in an attempt to simply "educate" and "help the German people."[1203] Air and gas specialists were insistent that education and the technical application of knowledge was Germany's best hope for salvation in the newly dangerous modern world. Given that they had already been providing public lectures in the late 1920s, members of the *Verein Deutscher Chemiker* continued their consulting role under the RLB. In fact, Dr. Heinrich Remy attempted to formalize this position, demanding the institution of a state examination to qualify "air-raid chemists."[1204] From June 8th to 11th of 1933, between 700 and 800 of these chemists met in Würzburg, where members like Hugo Stoltzenberg gave lectures on gas protection to a packed room. The Würzburg conference ended with a massive air raid demonstration that simulated a gas attack on the front lawn of the conference building.[1205]

While couched as civilian protection, such public displays revealed the *Verein Deutscher Chemiker's* general move toward more military concerns. This was further displayed by the 1934 awarding of the association's Liebig Medal for excellence in chemistry to Ferdinand Flury. In his acceptance speech, Flury proclaimed that:

> The threat posed by chemical warfare agents, which only previously threatened front-line soldiers in the war, can become an existential question for all of us, for the entire German homeland, tomorrow. This creates a serious duty for all of us to prepare and expand air defense…[this honor] is an outward sign of the gratitude that the German chemists of today have for their wartime peers, who silently sacrificed their lives in the scientific laboratories, on the test fields, and in the chemical warfare companies, just like the countless unknown soldiers of the World War.[1206]

[1202] Ausnutzung der deutschen chemischen Industrie fur eine entscheidungsuchende Kriegfuhrung 1938 (BArch-B) R/3113/ Sig 133 Standort 51 Mag M 2 05 Reihe 24
[1203] Ulrich Müller-Kiel, Die Chemische Waffe: Im Weltkrieg und Jetzt, 1.
[1204] Helmut Maier, Chemiker im "Dritten Reich", 271.
[1205] A subsequent meeting of chemists took place at the Auergesellschaft gas school at Oranienburg in September 1933.
[1206] Helmut Maier, Chemiker im "Dritten Reich", 278.

In their writings from the mid-1930s, gas specialists claimed poison gas as a real existential threat in their own geopolitical terms. Contributors to *Gasschutz und Luftschutz* sustained their denouncement of anti-air protection pacifists by continually pointing to the dangers posed by the United States' and the Soviet Union's chemical weapons.[1207] One article warned that "The Russian air force is powerful, considering both the quality of their weapons and the training of their crews. The Soviets are in the process of creating an air force that will be terrible to behold in the future."[1208] Another mocked the Women's League for International Peace and Freedom, describing the female pacifists' commitment to international diplomacy as dangerously naïve.[1209] At the same time, the gas specialists also discredited many of the apocalyptic visions of a future gas war that had become so popular in the Weimar Republic.[1210] One Dr. Curt Rosten wrote:

> The stupid idea [that gas is the greatest public danger] has been rife for a long time. The press has done its part to perpetuate the gas danger, endlessly tending towards a sentimental fear of poisons and intoxicants…but the fear of chemical warfare agents is only justified if one is not aware of the measures that can be taken to avert this danger.[1211]

In the sometimes contradictory minds of the air and gas specialists, the continual reminder of a serious but measured anticipatory threat best spurred the German people to participate in air and

[1207] For German fears of America's chemical arsenal, see: Erich Hampe, Der Mensch und die Gasgefahr: Einführung in die Gaskunde und Anleitung zum Gasschutz, 63.
[1208] "Der Gasaufklärungs-, Gasbeobachtungs- und Gasalarmdienst in der Roten Armee." *Gasschutz und Luftschutz* no 11 (May 1936). See also: *Luftschutz Rundschau* no 4 (April 1933) ; Ölberg, translator, *Sei Bereit zum Luft und Gasschutz*. This is a German translation of Soviet calls for air and gas defense.
[1209] Another gas protection publication claimed that scientists had not developed any new military poison gasses since the end of the First World War. Heinrich Hunke, *Luftgefahr und Luftschutz: Mit Besonderer Berücksichtigung des Deutschen Luftschutzes*, 62.
[1210] See also: "Gas War Danger Exaggerated" in the May 22, 1938 edition of *The Obeserver*. RH/12/9 Sig 71. 1937-1938 (BA-MA) Signatur 71, Standort 22, Magazin H3EG, Reihe 125, Regal 5, Gefach 3
[1211] Curt Rosten, Was man vom Luftschutz wissen muss,75.

gas protection. Undoubtedly, with the rise of the Nazis and the creation of the RLB, the gas specialists had won their political debate with the proponents of international treaties.[1212]

Regardless of the increased attention and esteem that the RLB garnered for the air and gas specialists and their aligned interest in a buildup of national defense, many of the gas specialists remained critical of the RLB's specific guidelines for aero-chemical protection in the early 1930s.[1213] Some experts were still unsure whether civilians could remain calm and perform air raid activities under the threat of aerial bombing. The chaotic failures of several air raid exercises underscored these doubts. For instance, in 1938, a whole community in Hesse fled after a fighter plane crashed in the town center.[1214] An article in the Auergesellschaft's *Die Gasmaske* pointed out that civilian air and gas protection was a psychological matter, and that correct guidelines could be instilled only after all fear and doubt had been banished from the collective civilian mind.[1215] A military report from 1938 imagined how an improperly trained citizenry might act:

> In the battle in the hinterland—even against the civilian population—the poison gas will be used as the weapon of war, and here too, its unpredictable and uncanny effects will create long-term panic and lead to a complete stalling of life in a besieged city. The feelings of insecurity among the population will grow, industry and the traffic will be suspended for a long time, the psychosis of poisoning will cause the hospitals to overflow, and the sanitary and detoxification measures will fail.[1216]

[1212] See the laudatory biography of Rudolf Hanslian in *Gasschutz und Luftschutz* no.3 (March 1933). "Our German people need men like Dr. Hanslian, who manages to guide and help in difficult situations with knowledge and ability." A similarly laudatory biography for Ferdinand Flury can be found in *Gasschutz und Luftschutz* no. 5 (April 1937) ; The journal congratulates its own success in its first edition from 1934: "Since air protection has now come to fruition, we can say that *Gasschutz und Luftschutz* has contributed to this considerable task over the past three years." *Gasschutz und Luftschutz* no. 1 (1934)

[1213] The Technical University at Karlsruhe even created a university chair in air and gas protection technology for Dr. Karl Theodor Nestle. Errichtung eine Lehrstuhls fur Luft- und Gasschutztechnik, 1935-38 (LBWK) 235, 30460

[1214] Bernd Lemke, Luft- und Zivilschutz in Deutschland im 20. Jahrhundert, 85.

[1215] "Übungen mit Gasmasken von Dilp-lng Paul Maack, Führer des Luftschutzdienst der Technischen Nothilfe Hamburg" *Die Gasmaske* (January 1936): 13.

[1216] Ausnutzung der deutschen chemischen Industrie fur eine entscheidungsuchende Kriegfuhrung 1938 (BArch-B) R/3113/ Sig 133 Standort 51 Mag M 2 05 Reihe 24

Reflecting on these problems, some gas specialists prioritized civilian evacuation over defense. One expert wrote, "The difficulties faced by the problem of accommodation in evacuation are very great; but they do not seem to be insurmountable. Even if only small successes can be achieved, they are better than none and worth the work."[1217] However, the most common concern among gas specialists remained the gas mask. While the RLB extolled the importance of the device in civilian air and gas protection, experts were unsure whether civilians could properly handle the mask or if masks would ultimately be necessary in the war of the future.[1218] If gas masks were not entirely necessary, then their frightening appearance might simply serve to sow anxiety and panic among the German populace.

Undoubtedly, providing gas masks for millions of German civilians would also prove incredibly costly, and the RLB struggled to deliver enough masks throughout the 1930s.[1219] Relating these problems, one gas specialist wrote:

> With regard to gas protection, it is important to say that gas masks are not enough to provide all of the population with total protection. They are prohibitively expensive and they are of limited use, assuming they receive careful maintenance and are in constant readiness.[1220]

In 1934, the newly designed Auer and Dräger S-Mask cost twenty-two Reichsmark, a one-third reduction in price from the previous year.[1221] Given its pared down simplicity, the S-Mask was not the highest performing device, but it still cost far too much for public distribution.[1222] For this reason, only members of the air and gas protection services and industrial workers received S-Masks.[1223] Beyond the problems of price, experts claimed that some civilians would certainly

[1217] *Gasschutz und Luftschutz* no. 10 (October 1935)
[1218] Viktorit-Antiplyn, eds, Was ein jeder über die Gasmaske wissen soll und muss, 1.
[1219] Dräger Geräte Gesellschaft 1933 (TMA) III.2 08746 ; Fritz Wirth and Otto Muntsch, *Die Gefahren der Luft und ihre Bekämpfung im täglichen Leben, in der Technik, und im Krieg* (Berlin: Hermann Reinshagen Verlag, 1940)
[1220] Heinrich Hunke, Luftgefahr und Luftschutz: Mit Besonderer Berücksichtigung des Deutschen Luftschutzes, 185.
[1221] "Die S-Maske" *Gasschutz und Luftschutz* no. 4 (April 1934)
[1222] "Ober Kritik an der S-Maske," *Gasschutz und Luftschutz* no. 4 (April 1935)
[1223] Luftschutzdienst der Gruppe Karupfalz 1935-37 (LBWK) 465 c Zugang 1991-7, 83

forget their masks or fail to put them on fast enough.[1224] Still others worried that civilians would be outfitted with the wrong type of filter if an enemy dropped an unknown or unusual gas. Consequently, the pages of *Gasschutz und Luftschutz* teemed with related technical questions throughout the 1930s.

Toward the end of the decade, Erich Hampe, a regular contributor to *Gasschutz und Luftschutz*, began to strongly affirm that German civilians could in fact conduct successful air protection drills. In a demonstrative publication, he wrote:

> Man can protect himself against the danger of gas. He will overcome it if he has acquired the necessary skills and has made the necessary preparations. As the fatherland demands of every soldier that he sell his life as dearly as possible, so the newly united German people demand the same from every citizen, man or woman. This duty is imposed on them, not just so that they may live as long as possible, but also so that Germany lives![1225]

Hampe's arguments aligned with the RLB's belief in collective protection, encouraging the organization to attempt to solve universal gas mask distribution by introducing the *Volksgasmaske* (or the people's gas mask/ VM 37) in 1937. The *Volksgasmaske* only cost five Reichsmark and RLB propaganda exhorted all Germans to buy one as part of a national safety campaign.[1226] The editors of *Gasschutz und Luftschutz* responded to the introduction of the *Volksgasmaske* by triumphantly proclaiming that:

> It can be said that Reich Minister for Aviation has taken a step here which is of the utmost importance to German civil air defense and has introduced a new phase in its development…In a short time, they have managed to make millions of copies of this device as a reasonable price.[1227]

[1224] Henry F. Thuillier, *Gas im nächsten Krieg,* xi.
[1225] Erich Hampe, Der Mensch und die Gasgefahr: Einführung in die Gaskunde und Anleitung zum Gasschutz, 117.
[1226] Jedem Volksgenossen seine Volksgasmaske! 1937 (SBB) Einbl. 1937, 008 kl ; Julius Meyer, *Die Grundlagen des Luftschutzes,* 90. ; Reichschutzluftbund 1937 (BArch-B) R/43/II Sig 1299 Ort 51 Haus 901/EG
[1227] Gasschutz und Luftschutz no. 6 (June 1937)

This heroic declaration ignored the fact that both the Auergesellschaft and Drägerwerks were struggling to produce the millions of masks that total civilian defense required. Furthermore, in order to make the mask affordable, manufacturers significantly reduced the quality of construction.[1228] These basic masks often sat awkwardly on the head and their filters could only withstand the basic gases used in World War I. For this reason, the RLB required propaganda campaigns that could inspire high levels of civilian confidence in such a flimsy piece of technology.

The distribution of gas masks most clearly represented the RLB's increasing move away from the advice of the gas specialists. Throughout the mid-1930s, gas specialists had complained of the lack of specialist consultants in influential RLB positions. For instance, the air-raid chemist Kurt Stantien decried the RLB's spotty employment of chemists as "handmaids."[1229] Indeed, between 1934 and 1936 the number of official *Verein Deutscher Chemiker* lectures on air and gas protection decreased significantly.[1230] After 1937, the RLB clearly controlled the direction of German air and gas defense through propaganda campaigns that extolled the strength of the Reich's air and gas defense measures. The gas specialists gradually served to support this rhetoric, if they were willing to promote the party line. In the pages of *Gasschutz und Luftscutz,* they did continue to debate the specific details of the RLB's protection plans and to apply scientific research to new questions related to air and gas protection. For instance, some argued that only German civilians living in major cities should be provided with a gas mask, while others pointed out that the physical difficulties of wearing a gas mask could hamper any air and

[1228] Even Hitler admitted that the *Volksgasmaske* was a "product of two weeks labor" and that its production was "all a mess. It collapse[d] right away." Helmut Heiber and David M. Glantz, editors, Hitler and his Generals: Military Conferences 1942-1945, 431-432.
[1229] Helmut Maier, Chemiker im "Dritten Reich", 278.
[1230] In 1934, there were twenty-two official lectures and in 1936, there were two. Helmut Maier, Chemiker im "Dritten Reich", 279.

gas protection activities.[1231] But overall, the decision to transform German civilians into members of an air and gas protection community was no longer up for public debate.[1232] Now, the most pressing question was how to best achieve this transformation without creating civilian panic. While the *Volksgasmaske* might not provide much real protection against aerial bombs and gas, both the RLB and the gas specialists realized its value as a tool for creating a disciplined and chemically-minded German subject. For precisely this reason, an article in the July 1938 edition of *Die Sirene* sported the dramatic title "The Gas mask: The Symbol of Fate for both the Army and the Homeland."[1233]

The *Reichsluftschutzbund* and Aero-Chemical Defense in Daily Life

The *Reichsluftschutzbund* made its most immediate mark in the daily lives of Germans through air and gas defense education. The RLB director of Civilian Air Protection, Kurt Knipfer, pronounced the importance of educational programs, writing in 1935 that:

> Aerial attack threatens every house, every family and every business. All people must collectively protect themselves against the threat. The German people have been enlightened in the past years by books, lectures and meetings on air protection and have been educated to a large extent through courses.[1234]

Indeed, by 1935, air and gas protection courses were mandatory in every German school. Teachers taught their students about the basic chemical structures of the most common poison

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[1231] Heinrich Hunke, *Luftgefahr und Luftschutz: Mit Besonderer Berücksichtigung des Deutschen Luftschutzes*, 185. ; General a.D. von Tempelhoff, "Welchen Einfluß haben die angelegten Gasmasken auf die Marsch- und Gefechsfähigkeit der Truppe?" *Gasschutz und Luftschutz* no. 9 (September 1938)

[1232] Tellingly, the decision to militarize civilians came around the same time that the Wehrmacht began to draft more offensively-minded military theory. After years of building a primarily defensive force, conscription and rearmament allowed the Wehrmacht to reconsider its offensive capabilities in the mid-1930s. Matthias Strohn, *The German Army and the Defense of the Reich*, 222. The shift in tone of *Gasschutz und Luftschutz* publications can best be represented by a 1937 addendum to an article on civilian evacuation by General Grimme. Grimme claimed that French forms of evacuation were not an option for the German people, who would never show such cowardice. Julia S. Torrie, *"For Their Own Good": Civilian Evacuations in Germany and France, 1939-1945*, 19.

[1233] "Die Gasmaske, das Symbol gleichen Schicksals von Heer und Heimat" *Die Sirene* no. 14 (July 1938)

[1234] Kurt Knipfer and Werner Burkhardt, Luftschutz in Bildern: Eine gemeinverständliche Darstellung des gesamten Luftschutzes für jeden Volksgenossen

gasses and the types of weapons that could deploy them. In fact, school curricula integrated the dangers of aerial attack into many class sessions. For instance, common math questions asked students to calculate the trajectories and explosive power of various bombs and bullets, while writing assignments asked students to reflect on blackout measures.[1235] One aero-chemical specialist wrote of these lessons: "Enlightenment begins best in school. It is the patriotic task of the German teaching staff…[to present] chemical experiments and the weapons of aircraft squadrons."[1236] To aid in this patriotic task, the Auergesellschaft offered both films and slides that teachers could use to expose students to the dire consequences of aero-chemical attack.[1237] Teachers could also attend RLB courses where they would learn information that could then be relayed to their students.[1238]

A significant portion of these class sessions were dedicated to teaching children how to best protect themselves in the event of an aero-chemical attack. An article in *Gasschutz und Luftschutz* wrote, "The most valuable asset of a nation is its children. It is therefore self-evident that in the preparation of gas protection measures for the general public special attention will be paid to children."[1239] However, the effective protection of children proved to be both technically and conceptually difficult. Children's small faces did not fit the three sizes of either the S-Mask or the *Volksgasmaske.* To account for this, Auer and Dräger produced smaller masks specifically

[1235] Historian Richard Evans writes of a student who crafted an essay in 1934 that envisioned the bombing of Dresden: "The sirens, he wrote, howled, and the people fled into their air-raid shelters. The bombs fell with a deafening noise, blowing in windows and destroying all the houses. 'Vast flames rage over Dresden.' A second wave of enemy planes came over, dropping gas bombs. Almost everyone in the bomb shelters was killed." The student received a poor grade for this essay and his teacher wrote in response: "You write about nothing about defenses. The essay is crawling with errors." Richard J. Evans, The Third Reich at War, 435. See also: Lisa Pine, Education in Nazi Germany, 51-52. ; Nicholas Stargardt, Witnesses of War: Children's Lives Under the Nazis, 24.
[1236] Dr. K. Schütt, Die chemischen und physikalischen Grundlagen des Luftschutzes in der Schule, 6.
[1237] Auer-Gesellschaft, Schulungs- und Lehrmittel für den Gasschutz, 13.
[1238] See the advertisement for a teacher training course in Hannover in: *Luftschutz-Rundschau* no. 4 (Dezember 1932) ; Reichsluftschutzbund Unterrichts-Anweisung (TMA) II.Kleine 1906
[1239] Dr. W. Mieienz, "Gasschutz für Säuglinge und Kleinkinder," *Gasschutz und Luftschutz* no. 1 (January 1939)

for children. Teachers or RLB members would measure each child's head and try to find an appropriate mask.[1240] Sometimes this would be done as part of a school-wide air and gas protection course where large numbers of children would all line up to be fitted at once.

Younger children presented even greater difficulties. In order to protect toddlers and infants, the gas mask companies produced bag-like hoods and air tight cribs in which mothers could place their children.[1241] Foot pumps allowed parents to pump air into the sealed chamber. The April 13, 1939 edition of the *Berliner Illustrierte Zeitung* enthusiastically cheered the development of these technological solutions, publishing a cover page that featured a mother and child wearing gas masks. The cover triumphantly read "The Gas Mask for the German Child is Here!"[1242]

Beyond the fact that child gas masks were often as flimsy in construction as the adult version of the *Volksgasmaske,* experts doubted whether children could properly put them on. Their lack of coordination and their shorter attention spans worried both parents and air protection theorists. Even if children did manage to properly don their masks, experts assumed that they were liable to take them off due to discomfort. For this very reason, gas mask education was intended to convey the seriousness of aero-chemical attack and to normalize the process of donning a mask.[1243] One gas protection publication summed up this process, writing that, "The child must be taught to overcome the fear of the gas mask."[1244]

[1240] Karl Wollin und Pepp Seidl, "Gesichter und Gasmasken," *Die Gasmaske* no. 5 (September, 1933)
[1241] In a certain sense, these gas tight bags resembled the gas hoods that the German military used to protect soldiers with head trauma in World War I.
[1242] *Berliner Illustrierte Zeitung* (April 13, 1939) cover page.
[1243] Hans Helbig, Dr. E. Sellien, Der Luftschutz in Schulen und Hochschulen: eine Erläuterung der LDv 755/2 mit einer Sammlung der einschlägigen Gesetze, Verordnungen, Erlasse, 13.
[1244] Olmütz-Luttein, Die Gasmaske : Auszüge aus den in den Gas- u. Luftschutzkursen in Olmütz-Luttein Vorgetragenen Vorträgen, 9.

While some British children received gas masks that resembled the faces of elephants or mice in an attempt to make the mask more approachable, German children could only hope for a black leather *Volksgasmaske.*[1245] RLB cartoons tried to make the gas mask appear friendly and dependable through anthropomorphic depictions, but German mask shortages and the inability of the already-strained manufacturers to even consider customization insured that all German masks looked alike.[1246] At the same time, this uniformity served the purpose of entering German children into the national community of air and gas protection. Looking just like any adult, children wearing "people's gas masks" would also help protect Nazi Germany from aero-chemical attack. Air and gas protection courses through the Hitler Youth and the League of German Girls further attempted to give German children the knowledge and skills necessary to serve as auxiliaries for the RLB.[1247] Thus, the idealized German child was extremely familiar with the gas mask, trusting it to help them perform their duties for the Reich.[1248] Air and gas protection training provided at least some of its desired effect, and many children did become accustomed to the mask. A report from a school in Munich claimed that the children were proud to bring their masks to school, and that those who did not own one pleaded with their parents to buy them a mask.[1249]

[1245] Gabriel Moshenka, "Gas masks: material culture, memory, and the senses," 616.
[1246] See: Gasmaske Plakatt (IZM) PS 152. This is a poster the tells German children that the gas mask can protect them from Russian attacks. The good German child is seen sleeping alongside his gas mask canister, which has its own friendly face.
[1247] Historian Michael Kater claims that the Hitler Youth often hazed each other by forcing a young member to wear gas masks for long periods of time while singing or climbing trees. Michael Kater, Hitler Youth, 176. For propaganda from the League of German Girls, see: "Annemarie under der Volksgasmaske" *Die Sirene* no. 19 (September 1938). This is a story of a young German girl who brings a *Volksgasmaske* into school and instructs the other children how to use it. The story encourages young Germans to gain technical knowledge and to be brave in the face of aero-chemical attack.
[1248] A children's book from 1934 tells the story of a young boy who learns about poison gas. Inspired by his school lectures, he joins the Hitler Youth and informs his family and neighbors about air and gas protection. The RLB congratulates him for his community service and treats him as a hero. Georg Erich Griesbach, *Lost wird Luftschutzhauswart* (Leipzig: A. Anton & Co, 1934)
[1249] Richard Bauer, Fliegeralarm: Luftangriffe auf München 1940-1945, 14.

Of course, air and gas protection courses were not solely geared towards children. 3,400 permanent air and gas protection schools and local courses in first aid, firefighting, and gas detection provided similar instruction for adult citizens.[1250] Much of this training was conducted through RLB exhibitions or adult education centers.[1251] Like the children, German adults had to at least learn how to correctly don a gas mask and file into an air raid shelter. An SA air and gas protection training course claimed that:

> The goal of the training is to create feelings of safety and confidence in the mask. Further, the principles of gas combat allow civilians to master the ability to do any service under the mask for prolonged periods of time. Basic knowledge in the field of civil air defense is required.[1252]

The RLB and the gas experts insisted that chemical knowledge would prevent communal hysteria in the event of an aero-chemical attack. They banked on the fact that the correct levels of knowledge and the collective spirit of air defense would override fears of imminent attack. One gas training leader wrote that the best protection against gas was "the disciplined behavior of the population and the most comprehensive explanation of the nature of aerial warfare in every school and house."[1253] Thus, numerous civilians learned about the various types of poison gasses and regularly practiced wearing their gas masks amidst tear gas.[1254] An article in *Gasschutz und Luftschutz* even claimed that citizens should test their gas mask in a gas chamber at least once per year.[1255] Another wrote that:

[1250] R.J. Overy, The Bombers And The Bombed: Allied Air War Over Europe 1940-1945, 235.
[1251] The gas training course at the Auergesellschaft's Oranienburg plant cost five Reichsmarks and lasted two days. Dr. E. Meyer, Dr. E. Sellien, Pol-Major Borowietz, *Schule und Luftschutz* (München: Verlag von R. Oldenbourg, 1934)
[1252] Organisation (Luftschutz) 1934 (LBWK) 465 c Zugang 1991-7, 14
[1253] Wilhelm Lichtenberg, Luft- und Gasschutz-Fibel als Instruktion für die Hitler-Jugend und B.D.M., 20.
[1254] The RLB also instructed civilians on how to clean their gas masks. Due to the shortage of masks, civilians could not afford to have their mask wear out through improper handling. Vorschriften uber Gasschutz 1935-36 (BA-MA) RH/12/4 sig 58 ort 22 mag H3EG Reihe 125 Regal 2 Gefach 3
[1255] Karl Quasebart, "Kann der Bürger gegen Kampfgase geschützt werden?" *Gasschutz und Luftschutz* (September 1931)

> discipline is the first civic duty in an air raid. The population is educated to keep calm, to avoid panic and not to lose nerve. Nowhere is composure as necessary as in a gas attack...With this knowledge, psychological danger will be minimized.[1256]

After 1937, German civilians could buy exactly one *Volksgasmaske* from distribution centers or at RLB exhibitions. Given that extra gas masks were rarely available due to production shortages, the RLB encouraged Germans to carry their gas mask at all times.[1257] To this end, the RLB sold a handy carrying case that people could wear as a satchel bag during their daily routines. In the climate of pervasive aero-chemical fear that had permeated Germany since at least 1928, Germans lined up in droves to buy the *Volksgasmaske.*[1258] Reflecting on the popularity of masks in the 1930s, the pacifist Waldus Nestler acerbically wrote:

> Thousands of fathers and mothers have bought this indispensable piece of equipment for young and old alike, and last Christmas the gas mask was successfully pitched as the gift of the year. Even the little marzipan angels and the Santa Clauses in the shop windows had gas masks and gas suits. It is understandable then that in those days, just about every second person was wearing a gas mask. So instead of asking about someone's health, they would ask "Is your gas mask in working order?"[1259]

Much like the children at school, German civilians would line up at a mask distribution center to have their face measured by a member of the RLB.[1260] After receiving one of three sizes, they paid their five Reichsmarks and took home the device that they were supposed to wear, in one way or another, at all moments of their waking lives. In this way, the gas mask became one of the omnipresent artifacts of the Third Reich, which "embodied the new standards of cooperation, training, and expertise to which members of the people's community expected one another to adhere."[1261] Alongside their new gas masks, Germans also received a user manual that described

[1256] Max Peachmann, "Psychologische Wirkungen von Luftangriffen" *Luftschutz-Rundschau* no. 4 (December 1932)
[1257] Reichsfinanz-ministerium 1935 (BArch-B) Signatur: 9220, Standort: 51, Haus 901/EG
[1258] C.E. Brigham, "Der chemischer Krieg zer Zukunft," *Die Gasmaske* no. 6 (November/December 1937)
[1259] Andreas Pehnke, Der Hamburger Schulreformer Wilhelm Lamszus (1881-1965) und seine Antikriegsschrift "Giftgas über uns" : Erstveröffentlichen des verschollen geglaubten Manuskipts von 1932, 131.
[1260] Karl Wollin, "Gesichter und Gasmasken" *Die Gasmaske* no. 5 (September 1934)
[1261] Peter Fritzsche, Life and Death in the Third Reich," 52.

the best practices for mask care and use. The pamphlet warned, "Take care of your gas mask even better than you take care of your clothes, because the gas mask could possibly save your life!"[1262]

Aside from RLB and municipal service workers, only industrial workers might be able to procure more than one gas mask.[1263] Considered essential to the Reich in the event of an aero-chemical attack, many industrial workers received an S-Mask that remained at their place of work.[1264] Depending on their industry, factories also provided rubberized gas suits and the necessary cleaning tools to detoxify the factory floor.[1265] Not surprisingly, chemical factories took extra precautions against both aerial attack and accidental gas leaks. Aside from receiving personal protective equipment, workers at chemical factories under the I.G. Farben umbrella, for instance, were required to participate in regular gas drills.[1266] These drills included gas mask exercises meant to simulate the physical labor involved in evacuating a factory. Workers would line up in rows and columns and proceed to perform knee bends and jumping jacks while wearing their gas masks.[1267]

Public air raid exercises among city-dwelling civilians involved less programmed calisthenics, but they were not necessarily any less strenuous. Given that the Nazis endeavored to turn every German citizen into a member of an idealized national air raid community through the creation of the RLB and the proclamation of the 1935 Air Defense Act, people of all ages,

[1262] Die deutsche Volksgasmaske (TMA) III.2 08754
[1263] Luftschütz 1939-1945 (GStA) I HA Rep 178 B Nr 795 ; Freimachung von Gasmasken bei den Dienststellen 1943 (SL) 11690 XIX, 1/13
[1264] *Gasschutz und Luftschutz* no. 1 (January 1935). Industrial air protection was placed under the supervision of the Reich Group Industry, a subsection of the *Reichsluftschutzbund.*
[1265] Werkluftschutz- Entgiftung 1933-1941 (BASF) BASF PB/A.8.7.3./9 Pertinenzbestand
[1266] Direktions Abteilung Luft- und Gasschutz 1934-40 (BA) 329-0350-02
[1267] *Die Gasmaske* no. 3 (July 1933): 113. ; Dräger Gasschutz im Luftschutz: Individual-Gasschutz Kollektiv-Gasschutz; Charakter des Chemischen Krieges Chemische Kampfstoffe; Organisation des Luftschutzes Städtebau und Luftschutz, 242.

genders, and physical constitutions were required to take part in aero-chemical defense exercises. Indeed, the RLB attempted to create a distinct hierarchy of civilian responsibility and duty in which each German would help to protect themselves, their family, and the community at large. This was best represented through gas mask protocol, which dictated that each person was to put on their own mask before they assisted their children and other family members. After taking care of their family, individuals were then expected to help their friends and neighbors, especially the elderly and infirm. All of the necessary training to create this hierarchy of responsibility would be done under the benevolent eyes of the RLB air wardens. Hugo Stoltzenberg summed up this structure:

> The emergency community of the German people should cover all parts of the population in air protection. The household needs to get together first. Suitable women and men who want to dedicate themselves to this task are available everywhere and will be happy to cooperate. The local groups of the Reichsluftschutzbund will direct air raid protection.[1268]

Over the course of the late 1930s, increasing numbers of able-bodied German men either served in the expanded Wehrmacht, worked in what were deemed essential industries, or belonged to a municipal service like the police corps or fire brigade. The preoccupation of so many men forced the RLB to rely on increasing numbers of women to serve as local air wardens. The Third Reich's employment of women in air and gas protection services contradicted many of the Nazis' own stated position on the role of women in society as well as much of the rhetoric that air and gas protection proponents had used to encourage national defense since the end of World War I. [1269] From 1918 on, the gas specialists and other advocates of national defense had repeatedly asked Germans how women could possibly survive an aero-chemical attack.

[1268] Hugo Stoltzenberg, Experimente und Demonstrationen zum Luftschutz, 59.
[1269] The Nazis frequently argued that women's work should be restricted to the home. As mothers of the German race, they were essential to the rearing of Nazi children. While necessity required the acceptance of women in the air protection services, propaganda continued to distinguish female roles. For instance, one RLB poster read "The woman in a soldier's post, but still a woman."

According to their accounts, the weak female constitution and the disordered female mind would never be able to effectively conduct air raid drills. Women, they claimed, were not psychologically composed enough to protect themselves, let alone others. Thus, advocates of aero-chemical defense used the necessary protection of German women to drum up support for national defense measures.

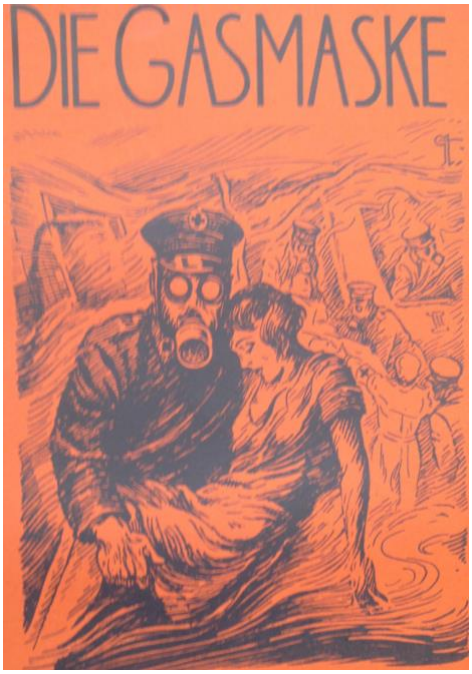

Figure 7: A 1930 depiction of a red cross member saving a defenseless woman from poison gas fumes. The image comes from the front cover of a 1930 edition of the Auergesellschaft trade journal, *Die Gasmaske*. It presents German women as entirely defenseless during a gas attack. Indeed, they require men to ensure their protection.[1270]

In need of serviceable bodies, however, the RLB turned this logic on its head. With the proclamation of the 1935 Air Protection Act, all Germans were now required to assist in air protection. With men serving in other state-required roles, approximately 280,000 women now became the heroines of local air and gas protection.[1271] This number made up about 34% of the

[1270] *Die Gasmaske* no. 6 (1930)
[1271] Jill Stephenson, The Nazi Organization of Women, 206.

RLB's officials, and in some localities like Bad Lauterbach, women comprised up to 50%.[1272] As block wardens, members of local fire brigades, and apartment building caretakers, these women helped to train the rest of the civilian population in air and gas protection practices.[1273] The head of RLB propaganda, Otto Teetzman, wrote, "A very important part of the most important self-protection tasks must rest on the shoulders of women. Accordingly, every German woman who is physically fit, must be incorporated and trained [in the RLB]."[1274] For Teetzman, a physically fit woman was any able-bodied female under sixty years of age.

The RLB trained large numbers of women in gas mask use, fire suppression, chemical detoxification, and collective air raid procedures.[1275] While the inclusion of women in the RLB was largely motivated by necessity, it also served the purpose of seemingly integrating all Germans into the community of national defense. If gas bombs did not discriminate between genders, nor would the Nazis. In fact, one RLB publication read, "The separation of the terms front and home will no longer exist as before. As such, *all of the civilian population* must come to reckon with being exposed to the dangers of chemical warfare agents in an upcoming war."[1276] The pamphlet further claimed that "helping one's fellow citizen is the definition of National Socialism."[1277]

RLB officials now crafted new arguments to justify the value of female air wardens. For instance, a publication from the Dräger company claimed that women were psychologically more apt to instinctively feel than to think rationally. For this reason, Dräger claimed, women asked fewer questions about the necessity of air protection and learned to trust protective

[1272] Nicole Kramer, "'Kämpfende Mütter,' und 'gefallene Heldinnen'—Frauen im Luftschutz," in *Deutschland im Luftkrieg*, 88-89.
[1273] "Luftschutz- die Dienstpflicht der Frau" *Die Sirene* no. 11 (June 1935)
[1274] Otto A. Teetzmann, Der Luftschutz Leitfaden für alle, 94.
[1275] Furthermore, 111,000 German women served in the national anti-aircraft defense system by 1944.
[1276] Karl Hummel and Friderich Schweinsberg, Erste Hilfe im täglichen Leben und im Luftschutz, 59.
[1277] Ibid, 7.

technologies more completely. Due to their inherent docility, the article stated, they were even better at maintaining an even pattern of breathing while wearing gas masks.[1278] Furthermore, RLB officials argued that mothers were especially capable in helping both children and the elderly. The firm and authoritarian mother could quickly direct her family into an air raid shelter while keeping them calm with her matronly presence.[1279] On the most intimate level, the imagined German mother would provide the stoicism and diligence that the then president of the RLB, Hugo Grimme, deemed necessary for all civilians in the fight against aero-chemical attack.[1280]

Collectivity and Responsibility: The National Community of the Air Raid Shelter

Under the RLB, public air raid exercises were part of both air defense exhibitions and city-wide preparations. Large-scale drills usually required preparatory planning so that citizens knew when to don gas masks, head to public air raid shelters, or turn out their house lights.[1281] For instance, in a special air defense exhibition in Karlsruhe, marked planes from the local flying club flew over the city in six separate waves. Civilians were told that these planes dropped both explosives and gas bombs. Once the planes were detected from the ground, various pre-selected industrial firms set off their air raid sirens. The citizens of Karlsruhe then closed their windows and shop doors to protect against imaginary shrapnel and splinters, and filed into apartment-building basements. Police officers ushered people out of the street and into public shelters as the

[1278] Dräger Gasschutz im Luftschutz: Individual-Gasschutz Kollektiv-Gasschutz; Charakter des Chemischen Krieges Chemische Kampfstoffe; Organisation des Luftschutzes Städtebau und Luftschutz, 252.
[1279] Nicole Kramer, "'Kämpende Mütter' und 'gefallene Heldinnen'- Frauen im Luftschutz," in *Deutschland in Luftkrieg*, ed. Dietmar Süss, 91.
[1280] Hugo Grimme, Der Reichsluftschutzbund: Ziele, Leistungen und Organisation, 9.
[1281] For example, air protection practice in Würzburg required that civilians turn off all lights at specific times and then head to air raid shelters once they heard the air sirens. See: Luftschutzubungen mit Nebel, 1931-36 (BA-MA) RH/12/4 sig 121 ort 22 mag H3EG reihe 125 regal 2 gefach 5

planes began to drop red smoke canisters down on the city. Even the hospital prepared for the drill, creating a separate ward for imaginary patients exposed to either phosgene or mustard gas. The hospital staff wore gas masks to protect themselves from secondary contamination while they provided chlorinated lime, warming blankets, and hot water bottles to the pretend gas victims.[1282]

Figure 8: An air raid exhibition in Bremen. Emergency workers carry off supposedly injured children as smoke billows in the background.[1283]

In urban areas like Karlsruhe, air raid authorities designated large underground structures such as subway stations as public air raid shelters.[1284] The RLB sometimes conducted these drills at night to simulate an evening air raid. Darkness, of course, made it extra difficult for German civilians to find their way to shelters or to descend into basements. Air and gas protection

[1282] Major a.D. von Laer, "Schutz der Heimat: Die erste Lufschutzübung der Stadt Karlsruhe," *Luftschutz-Rundschau* no. 6 (June 1933)
[1283] Dräger Gasschutz im Luftschutz: Individual-Gasschutz Kollektiv-Gasschutz; Charakter des Chemischen Krieges Chemische Kampfstoffe; Organisation des Luftschutzes Städtebau und Luftschutz, 152.
[1284] There was a continual shortage of public shelters throughout the war. In 1939, the Reich calculated that it would cost 3 billion Reichsmarks to provide shelter for every German citizen. This money was not available. Richard Overy, *The Bombing War*, 417. See also: David Crew, Bodies and Ruins, 26.

companies like Auer and Dräger sold powerful flashlights that wardens could use to help direct people. However, Germans also had to contend with the visual and auditory impairment of the gas mask. Just as soldiers in World War I struggled to see through the lenses of their mask and to hear the commands of their officers through the rubberized hood, civilians found it difficult to coordinate themselves once they had donned masks.[1285] Regardless of civilians' level of familiarity with the mask, these sensory difficulties made wearing it extremely unpleasant. A young girl in Dresden described her experience with the gas mask, writing:

> An air protection kit next to your bed—Quiet horror oozes from the gas masks nearby. Their handling had to be practiced regularly; they were drawn like bathing caps taut over the face, creating a feeling of suffocation and filling the nose with a penetrating rubber odor. The eyes sitting behind the glass eye pieces and the snout-like ventilation filter make people appear like monstrosities from another world. We sat together silently because we could not speak, listening anxiously to the dull drones of the bomber squadrons above our heads, destined to drop their deadly load on German cities.[1286]

German air protection authorities were well aware of the difficulties and fear associated with wearing a gas mask. They hoped that by demanding careful preparation and providing step-by-step instructions for an aero-chemical attack, they could inspire civilians to effectively protect themselves and buy into the national endeavor. This kind of rote learning could not be accomplished through sporadic, or even regularly scheduled, large-scale air raid exercises. Thus, the apartment building or apartment block air raid drill became the primarily site for molding civilians into soldiers in the struggle for air and gas protection. From 1933 on, the RLB attempted to assign a caretaker for every residential building in Germany.[1287] In many instances, this caretaker also served as the building's air warden. In more urban areas, building caretakers

[1285] Heinz Denckler, ed., *Gasschutz und Gasmaske,* 10.
[1286] Karin Husmann, Es bleibt unsagbar... Zwei Kinder erleben das Inferno Dresdens 1945 und die Kriegs- und Nachkriegsjahre, 1999 (DTA) Reg 452
[1287] Finding a caretaker for every building was particularly difficult in rural areas. "Gasschutz tut not" *Neuer Vorwärts* no. 69, 3 (1934)

reported to an RLB air warden who oversaw a city block or designated zone. The apartment caretakers and the local air wardens conducted regular air and gas exercises for their residents and neighbors. On this more intimate level, wardens could teach civilians to prepare food and water in case of attack, to turn off lights and ovens once the air sirens blared, and to keep a well-serviced gas mask near them at all hours.[1288] According to historian Peter Fritzsche, by 1944, these measures had produced the desired effect in Berlin: "Germans got used to going to bed in their clothes and packing gas masks to work; and the once-busy streets of Berlin set scenes of misery for passerby."[1289]

During practice air raids, air wardens also served to lead residents from their individual apartments to the building's basement. Newer buildings often featured a well-constructed air raid shelter that maintained supplies and emergency equipment.[1290] While the Nazi building authorities tried to retrofit older buildings with purposefully designed air raid shelters, the prohibitive cost of this construction forced most urban residents to rely on ground-floor storage rooms or cellars.[1291] The RLB viewed these impromptu air raid shelters as essential to the larger air and gas protection program.[1292] Indeed, even though many of them were structurally dubious and not gas-proof, the shelters provided a means of collective mental comfort. While civilians might be lacking equipment like the gas mask, they could still mentally rely on the strength of

[1288] Luftschütz in der Familie (TMA) II.Kleine 1907
[1289] Peter Fritzsche, The Turbulent World of Franz Göll, 175-176.
[1290] Schutzraum (TMA) II.Kleine 1656
[1291] Retrofitting apartment buildings involved strengthening the basement walls and creating an air tight barrier. The air tight seal required the installation of a venting system for oxygen circulation. Schutzmassnahmen in Unterkunften, 1935-36 (BA-MA) RH/12/4 sig 72 ort22 mag H3EG Reihe 125 Regal 2 Gefach 3
[1292] The Nazis built large concrete bunkers for civilian air protection in the Rhine and Ruhr regions and in some other major cities like Berlin and Hamburg. Hermann Knell, *To Destroy a City: Strategic Bombing and Its Human Consequences in World War II*, 281. Even Walter Gropius wrote extensively about his proposed Reichsbank building's ability to withstand bombs, gas, and bacterial agents. Jonathan Petropoulos, Artists Under Hitler, 75.

both their building's air raid shelter and their local community. An RLB official described this psychological value, writing:

> The air raid shelters do not only protect the life of the civilian population and help to maintain the spiritual resilience of the homeland…their presence is still one of the most important prerequisites for the material capabilities of the people.[1293]

Once huddled together in an air raid shelter, civilians would ostensibly be surrounded by family members and neighbors. However, with gas masks affixed, these companions could resemble a collection of giant insects or aliens. Like for soldiers in World War I, gas masks created an entirely new life-world in which the familiar features of human faces were replaced by technologically altered visages. Ultimately, the RLB believed that civilians could and would learn to accept this fact, given that the gas mask might mean the difference between life and death. For civilians, one of the best means for normalizing this odd sensory experience was humor. In newspaper comics and passing jokes, Germans laughed about the fact that they resembled elephants or Carnival revelers. Women joked that the mask was the newest and most modern trend in fashion, while men quipped that at least their wives could not look any worse.[1294]

Propaganda, Ideology, and the Attempted Creation of a Nazi Gas Protection Community

Propaganda and ideology were undoubtedly essential components of the RLB's attempt to ready Germany for an aero-chemical war that might strike at any moment and in any place. In fact, a 1933 *Gasschutz und Luftschutz* article claimed that "propaganda and the press is the solid foundation for the entire air defense program. The propaganda must do the necessary work to

[1293] Hans Frommhold, Luftschutzraum-Bauweisen, 5.
[1294] *Die Sirene*, no 26 (December, 1938)

create a willing und knowledgeable population."[1295] Reflecting on the difficulties that the Weimar government faced in creating national air and gas protection services, RLB publicists recognized the tensions between realist preparation and apocalyptic predictions.[1296] Many pacifists in the Weimar Republic wished to warn Germans of the dangers of aero-chemical warfare by illustrating the horrors of the potentially violent future. But this tactic often backfired, encouraging the German public to demand greater national defense. The RLB further realized that the technological solutions available for national defense could never provide complete protection. Gas masks and air raid shelters were reactive technologies, and they could not prevent bombers from flying over German cities and dropping gas, nor could they prevent enemy scientists from developing new lethal gasses. Even more aggressive technologies like anti-aircraft guns or a strengthened Luftwaffe could not entirely protect the country because all technological solutions were prone to human error.

For these reasons, the RLB believed that, in coordination with specific technologies, ideology and national collectivity were required to make Germans resistant to aero-chemical attacks. The creation of a national air raid community, populated by *Volksgenossen* (or national comrades), would force Germans to fully face the threat posed by aircraft and poison gas.[1297] Civilians could not fully rely on government services or protective technologies to shield them from danger. In the new world of imminent risk and contingency, German civilians would have to mobilize and educate *themselves* if they were to survive. This ideal was represented by the RLB's slogan: "One People, One Danger, One Defense." As Ernst Jünger had prophesized in the early 1930s, the distinction between civilian and soldier was no longer tenable in a world defined

[1295] "Propaganda und Presse," *Gasschutz und Luftschutz* no. 8 (1933)
[1296] Bernhard Rieger, Technology and the Culture of Modernity in Britain and Germany 1890-1945, 252.
[1297] Peter Fritzsche, "Nazi Modern", 7.

by technologically amplified violence.[1298] Just like soldiers in the Wehrmacht, members of the envisioned national air raid community (i.e. all German civilians or the *Volksgemeinschaft*) would have to face the ultimate sacrifice of death if Germany was to endure.[1299] In fact, Herman Göring claimed that "the air defense warrior has as much responsibility and honor as any front-line soldier."[1300] The intention behind militarizing the nation was to create a civilian form of "war fatalism" that would, according to the Nazis, prevent the home-front dissention of World War I and force Germans into a life or death struggle for national supremacy.[1301] Historian Peter Fritzsche has described this ideological campaign as a quest to create a German civilian who stood between "the lords in the air and the victims of the lords of the air," the two sociological categories that dominated geopolitical thinking the 1930s.[1302]

RLB air protection propaganda first made its geopolitical ideas explicit by continuing the gas specialists' denunciation of international chemical weapons treaties.[1303] These treaties, the RLB continued to insist, could not possibility protect Germans from future warfare. In fact, they were Allied schemes that aimed to weaken Germany's military defenses in preparation for a future war.[1304] The RLB supported this claim by pointing to the continued development of chemical weapons and long-range bombers in Great Britain, France, the Soviet Union, and the

[1298] See also: Erich Ludendorff, *Der totale Krieg*, 5.
[1299] Historian Michael Geyer has described this Nazi commitment to sacrifice as "catastrophic nationalism." He remarks that this ethos led to more German deaths in the final year of World War II than in all of the previous years combined. Michael Geyer, "There is a Land Where Everything is Pure: Its Name is Land of Death: Some Observations on Catastrophic Nationalism," in *Sacrifice and National Belonging in Twentieth-Century Germany*, 121-122.
[1300] Richard Schröder et al, eds, *Luftschutz : die deutsche Schicksalsfrage* (Stuttgart: Verlag Heinrich Plesken, 1934)
[1301] Peter Fritzsche, "Machine Dreams: Airmindedness and the Reinvention of Germany," 705.
[1302] Peter Fritzsche, *An Iron Wind,* 42-43. Indeed, the interwar period, aviation was more than just a technical field. Flight served as a metaphor for domination and control. Robert Wohl, A Passion for Wings: Aviation and the Western Imagination, 288.
[1303] Hermann Büscher claimed that pacifist claims for disarmament were Jewish conspiracies and defeatism. Hermann Büscher, *Giftgas und wir?: Die Welt der Giftgase Wesen und Wirkung, Hilfe und Heilung*, x.
[1304] Ulrich Müller-Kiel, Die Chemische Waffe: Im Weltkrieg und Jetzt, 5.

United States.[1305] In the Nazi conception of zero-sum geopolitics where national struggle was an inevitable fact of life, arms production could only mean war. One RLB member made this clear when writing:

> Air protection is necessary! In the deep sleep lies the German nation, probably dreaming of the everlasting peace. But outside with a busy hand, they continually forge new weapons. Ten thousand airmen are ready to start! Gas and bombs bring death. Wake up, you German people, already time is pressing! Wake up, my people, air defense is needed![1306]

Under these black and white geopolitical terms, the RLB felt that they could utilize their own form of carefully constructed alarmist messages. In their pamphlets and posters, they made it clear to the German people that the Americans and Russians were producing new and more deadly forms of gas.[1307] Furthermore, RLB propaganda routinely pointed out Germany's weak geographic position at the center of Europe, claiming that air raids could come from any cardinal direction.[1308] A 1936 *Gasschutz und Luftschutz* article claimed that "the Russian air force is powerful, considering both the quality of their technology and the enthusiasm of their trained crews. The Soviets are in the process of a creating a national air force that will be terrible to behold in the future."[1309] Reflecting the success of such geopolitical arguments, one German stated that:

> If one sees all around the huge preparations for a gas war, then the demand of Germany for equal rights to re-arm becomes ever more urgent, and the tasks of passive air protection for our defenseless country become fully comprehensible.[1310]

[1305] Walther Doering, *Luftschutz und Gasschutz: Markbuch für den Wehrfähigen*, 4-5. ; Orts-Gruppe Heidenheim des Reichsluftschutzbundes, *Die Luftschutzgrundschule: Ein Laitfaden für die Schulung im Luftschutz*, 1. ; Militar und Kriegssachen: Luftschutzmassnahmen in Heil- und Pflegeanstalten 1933-45 (SF) G 1215/3, 711.
[1306] Curt Rosten, *Was man vom Luftschutz wissen muss* (Berlin: Verlag Deutsche Kultur-Wacht, 1935)
[1307] "Russland," *Gasschutz und Luftschutz* no. 3 (1935) ; RH/12/9 Sig 70 1934 (BA-MA) Signatur 70, Standort 22, Magazin H3Eg, Reihe 125, Regal 5, Gefach 3
[1308] Josef Weber, Das neue Handbuch für den Luftschutz: Ein Buch für Jedermann!, 10.
[1309] "Der Gasaufklärungs-, Gasbeobachtungs, und Gasalarmdienst in der Roten Armee," *Gasschutz und Luftschutz* no. 11 (1936)
[1310] Deutsche Luftschutz und Gasschutz Korrespondenz 1933 (BArch-B) R/36/ Sig 2698 Ort 51 Mag Haus 901/KG

The creation of a sense of imminent danger afforded the Nazis a justification for both their build-up of chemical weapons and their reevaluation of the history of chemical warfare. According to this story, the Nazi production of poisons like phosgene and mustard gas and the official creation of the Luftwaffe were merely an assurance of peace.[1311] In his acclaimed semi-autobiographical novella *Goodbye to Berlin*, Christopher Isherwood recounted a political debate with a young Nazi that exposed the power of this argument for rearmament. In this particular encounter, the Nazi argued that "the Führer does not want war. Our program stands for peace with honor." After the man makes a comparison between the Nazis and the ancient Greeks, the British pacifist Isherwood responds, "the ancient Greeks…didn't use gas."[1312]

The Nazis further claimed that Germans did not need to feel guilty for the deployment of poison gas in World War I. They assured their subjects that the French had first used gas grenades, and that the Germans had always fought defensively.[1313] This argument guided the publication of Rudolf Hanslian's well-received history of the 1915 German gas attacks at Ypres. Hanslian, writing in 1934, claimed that the French were undoubtedly the first to use chemical weapons and that post-war attempts to ban Germany's chemical arsenal were Allied efforts to unjustly gain a future military advantage.[1314] The official Nazi historical account treated the gas pioneers of World War I as national heroes and the anniversary of the Second Battle of Ypres served as a rejuvenated national holiday. On the 25th anniversary of the battle, both the Dräger company and the Auergesellschaft donated money to construct large monuments to fallen gas

[1311] Ernst Ohlinger, *Bomben auf Kohlenstadt*, 128.
[1312] Christopher Isherwood, *The Berlin Stories*, 95. Of course, some Germans knew that rearmament meant the possibility of future war, but the rhetoric of militarily-assured peace provided mental justification.
[1313] Deutscher Jägerbund 1934 (TMA) I.4.040 08039 ; Reichsluftschutzbund betr. Luftschutz, Vortragsmaterial, 1944 (TMA) KE 1656
[1314] Gas und Nebel im Volkerrecht, 1933-36 (BA-MA) RH/12/4 sig 42 ort22 Mag H3EG Reihe 125 Regal 2 Gefach 2.

pioneers. The living veterans held a celebration in Berlin that ended in three "Sieg Heils" in praise of the Führer, whose regime had positively reappraised their wartime service.[1315]

While national rearmament might have eased some minds, the Nazis' imagined aero-chemical war still ran the risk of sending Germans into a panic. To counter this, rhetorical propaganda walked a fine line, relying on descriptions of collective hardness and resiliency to bolster the psychological resistance of German civilians. Frequently, RLB literature described the "iron will" of the German people and their undeniable desire to survive.[1316] Hermann Göring claimed that "a people that carries the iron will of self-preservation, will successfully defy the dangers of the air attacks."[1317] This *Lebenswille* or "will to live" created a level of rhetorical agency for the German people that interwar apocalyptic visions lacked. The Germans could indeed survive the future gas war, according to the Nazis, if they had the fortitude to resist it. In a 1937 air protection publication, Erich Hampe bolstered this idea, writing:

> Never before in history has a danger so determined the future of a people. What will be decisive is how the people as a whole react to this danger. In this same way, every German can contribute to shaping the future of his people. He has the duty to do so before the judge of history.[1318]

Here, Hampe argued that individuals certainly could protect themselves if they bound together in a community of personal responsibility. Fellow propagandists frequently used such eschatological language like the "judge of history" or the "will of God" to express the world-historic quality of the German struggle.[1319] However, by positing God's will as open-ended, they

[1315] Rundschreiben an die Mitglieder der Kameradschaft der Offiziere der ehemaligan Gestruppen 1940 (MPG) Abteilung III Laufzeit 1940 Repositur 14A Blatzahl 4 Bestell-NR 5748 ; Lieber Kamerad Hahn 1944 (MPG) Abteilung III Laufzeit 1944 Repositur 14A Blatzahl 1 Bestell-NR 5432
[1316] Walther Doering, Luftschutz und Gasschutz: Markbuch für den Wehrfähigen, 8.
[1317] Josef Weber, Das neue Handbuch für den Luftschutz: Ein Buch für Jedermann! (Berlin: J. Weber Buch-Verlag, 1935)
[1318] Dr. E.h. Kniper and Erich Hampe, Der zivile Luftschutz" Ein Sammelwerk über alle Fragen des Luftschutzes, 131.
[1319] Friedrich Krüger, Der Luftschutz für Jugend und Schule, 28.

expressed the agency of the German nation in shaping its own historical outcome. Nevertheless, the Germans were entirely alone in their fight for survival, forcing them to only rely solely on their national comrades. An article calling for diligent air and gas protection in *Die Gasmaske* quoted Johann Gottlieb Fichte in claiming that:

> It can be rigorously proven, and we will find this out in our own time, that no man, no god, and no event of any kind in the realm of luck can help us. We must alone help ourselves if we are to be helped.[1320]

Following this same logic, the RLB frequently used the slogan "Luftschutz ist Selbstschutz" or "air protection is self-protection" to express the importance of personal responsibility in an effective national air and gas protection program.[1321] Another popular motto, "Ein Volk hilft sich selbst," or "a people helps itself" was emblazoned throughout RLB publications.[1322]

While the RLB acknowledged that no technological solution could entirely protect the population in an aero-chemical raid, they clearly did not reject the use of technology in the creation of a disciplined and authoritarian national air raid community.[1323] In fact, one military report from 1938 claimed that chemical weapons technologies were inherently German in nature because they "corresponded to the special scientific-technical talent of the Germans."[1324] According to such ethno-racially inflected logic, the disciplined German constitution, coupled with technological augmentation, would allow Germans to live, if not thrive, in a world permeated by poison gases. Responding to interwar fears over the uncontrollability of poison gas, the Nazis insisted that it was indeed the Germans who were destined to dominate a modern world soaked in chemicals. I.G. Farben similarly averred that, "chemical weapons are the

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[1320] Fritz Geisler, "Schutz der Zivilbevölkerung und die Abrustungskonferenz," *Die Gasmaske* no. 5/6 (October 1932)
[1321] Luftschutz ist Selbstschutz Plakatt 1939 (IZM) 11/ZGa 035.005
[1322] *Die Gasmaske* 1937-1938 (SBB) 4 Ona 30/98-9/10
[1323] Bernhard Rieger, Technology and the Culture of Modernity in Britain and Germany 1890-1945, 250.
[1324] Ausnutzung der deutschen chemischen Industrie fur eine entscheidungsuchende Kriegfuhrung 1938 (BArch-B) R/3113/ Sig 133 Standort 51 Mag M 2 05 Reihe 24

weapons of superior intelligence and superior technical-scientific thinking. As such they are able to play a decisive role for Germany."[1325] This rhetoric was also a return to the attempted creation of the "chemical subject" in World War I. However, this theorized social engineering project was now not exclusively applied to soldiers. Under the direction of the Nazis and the RLB, all Germans could be recast as the masters of a new chemical modernity. Even women, children, and the elderly could be taught to live with the gas mask permanently affixed to their faces. For just this reason, the *Kameradschaft* of the trenches morphed into the *Volksgemeinschaft* of the nation, and the technically exclusive S-Maske became the *Volksgasmaske.*

While technological solutions were undeniably fallible, the gas mask was the ideal tool for Nazi technological discipline. With the mask on, Germans visually resembled a new race of chemically immune cyborgs. Admittedly, the mask could often elicit fear but, according to RLB propaganda, it rather provided a sense of comfort and heightened the human will to live. Germans under masks could tangibly see and feel the steps that their regime was taking to protect the population. Indeed, feelings of safety in a world defined by risk could often justify or obscure the authoritarian discipline that air and gas protection devices demanded.[1326] The continually sensationalized reminder that enemy planes were waiting on the borders of Germany created the social myth that encouraged so many Germans to don the mask and join this partially-realized community of defense.

Civilians with gas masks that obscured their individual facial distinctions populated this invented community of defense, thereby supposedly heightening the sense of national

[1325] Rolf-Dieter Müller, "World Power Status through the Use of Poison Gas? German Preparations for Chemical Warfare 1919-1945," in *The German Military in the Age of Total War,* 186.
[1326] The call for national discipline was again tied in to the Nazi call for Germany's national renewal. In *Goodbye to Berlin,* a doctor attempts to convince Isherwood of the value of the Nazi regime, stating, "Five years ago I used to think as you do. But…what people need is discipline, self-control. I can tell you this as a doctor. I know it from my own experience." Christopher Isherwood, *The Berlin Stories,* 87.

collectivity and encouraging cooperation and compliance. In this sense, the mask served as the new uniform of the "totally mobilized" and "totally militarized" society.[1327] By simply attempting to protect themselves, countless Germans entered into a community of national defense predicated on modern aerial warfare. In pulling the mask over their heads, even those who did not join organizations like the RLB or the Hitler Youth gave their implicit consent, in that distinct moment, to the violent world of Nazi geopolitics and became complicit in the martial actions of the regime.[1328] In turn, the RLB could at least claim that this process of collective vestiary discipline, driven by anxieties over future chemical warfare, was entirely voluntary. Indeed, there can be little doubt that such anxieties led to a certain level of self-policing within German society. With RLB propaganda's persistent stress on collectivity, a citizen who failed to douse their lights during a blackout or refused to wear a gas mask at designated times could easily be marked as a traitor to the larger community. It was the pervasive atmosphere of interwar fear that obscured the exceptionality and the rigidity of the RLB's requirements. Thus, in 1935, Kurt Knipfer was able to plausibly pronounce that, "the German people, with their *own* idealism and their self-sacrifice, have done an outstanding job [in air and gas protection] through *voluntary* action."[1329]

The Munich Crisis and the Stillborn Fate of the Nazi "Chemical Subject"

It is difficult to deny the fact that Nazi preparations for aero-chemical warfare did, in fact, provide Germans with emergency plans more detailed than those of the French and English. While other western European nations had continued to both expand their air forces and research

[1327] Gabriel Moshenka, "Gas masks: material culture, memory, and the senses," 611.
[1328] Susan Buck-Morss, "Aesthetics and Anaesthetics: Walter Benjamin's Artwork Essay Reconsidered," 38-41.
[1329] Kurt Knipfer, "Zum neuen Luftschutzgesetz," *Gasschutz und Luftschutz* no. 7 (1935)

chemical weapons throughout the 1920s and 30s, they did not formally prepare their civilian populations for aero-chemical attack. The French and British only began to provide civilian gas masks in the late 1930s in response to increased Nazi aggression in central Europe.[1330] However, once these two nations began to ready their citizens for the impending war, they relied on more comprehensive technological solutions.

Both the 1937 bombing of Guernica and the 1938 Munich Crisis spurred the British and French to action.[1331] Convinced that Hitler would invade Czechoslovakia and an aero-chemical war would break out across Europe, the British began distributing more than 35 million gas masks to civilians.[1332] Seeing the gas mask as a necessary evil in a now fascist-dominated Europe, the British government soon provided every English adult with a mask.[1333] Tracking the usage of these masks in a large-scale market research project, the British government noticed that significant percentages of citizens carried their masks with them at all times during moments of political or military tensions, such as the aforementioned Munich Crisis or the evacuation of Dunkirk.[1334] Certainly, the British also attempted to create a national civil air raid community based on the ideal of cooperative service, and in moments of real or perceived national danger,

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[1330] Peter Fritzsche, "Machine Dreams: Airmindedness and the Reinvention of Germany," 705.

[1331] The Munich Crisis was a series of diplomatic talks between ambassadors from France and Britain and those of Nazi Germany on September 29-30, 1938 in Munich. The Nazis had expressed their intention to invade Czechoslovakia and much of Europe anticipated war. However, due to France and Britain's overwhelming desire to avoid war, the two nations signed agreements stating that they would not intervene in a Nazi invasion. In an attempt at appeasement, the Nazis were given the predominantly ethnic-German part of Czechoslovakia called the Sudetenland. The Wehrmacht entered the Sudetenland on October 1, 1938, thus weakening Czechoslovakia's national sovereignty. This led to the subsequent German invasion of the remainder of the country on March 15, 1939. German newspapers attempted to justify this invasion by claiming that the Czechs had threatened gas attacks against ethnic Germans in the Sudetenland. Richard Evans, The Third Reich in Power: 1933–1939, 671. Many Europeans assumed that the Munich Crisis would assuredly lead to war, rather than ultimately postponing military actions.

[1332] Gabriel Moshenka, "Gas masks: material culture, memory, and the senses," 609. In turn, gas masks were also distributed to civilians in Czechoslovakia in 1938. Roger Manvell and Heinrich Fraenkel, Goering, 197.

[1333] Many British citizens received their mask on what the press called APR Sunday. Vans with loudspeakers rolled through London, encouraging civilians to be fitted for a gas mask. Brett Holman, *The Next War in the Air: Britain's Fear of the Bomber, 1908-1941*, 207-208.

[1334] Gabriel Moshenka, "Gas masks: material culture, memory, and the senses," 624.

British directives could appear rather similarly authoritarian.[1335] However, the British never desired civilian resignation to obedience, violence, and death to the same extent as the Nazis.[1336] For this reason, British best practices during an aero-chemical attack remained an open topic of debate throughout the Second World War.[1337]

In her book *Future Tense*, historian Roxanne Panchasi has made it clear that the French also harbored intense fears of a future aero-chemical war throughout the interwar period. Panchasi claims that the gas mask served as both a literal and figurative barrier between the French body and the dangers of the modern chemically-impregnated world.[1338] However, the gas mask was not the only French defense against aero-chemical warfare. Fearing civilian panic during the Munich Crisis, France planned and organized large population transfers away from the eastern border with Germany. While these transfers were not obligatory and male heads of households would ultimately decide if French families moved, mass evacuation remained a seemingly viable option in the event of a German gas bombing.[1339] In Paris, too, as many as three million civilians left the city during the Munich Crisis due in part to gas mask shortages.[1340] Ultimately, these evacuation plans proved disastrous during the German invasion of France in 1940, but the willingness to move civilians rather than expose them to aerial bombardment represented a distinct difference from Nazi air protection theory.

[1335] Bernd Lemke, Luftschutz in Grossbritannien und Deutschland 1923 bis 1939, 91-95.
[1336] Dietmar Süss, "Wartime Societies and Shelter Politics in National Socialist Germany and Britain," in *Bombing, States and Peoples In Western Europe, 1940-1945*, 43. See also: Marc Wiggam, The Blackout in Britain and Germany, 1939–1945 (Cham: Palgrave Macmillan, 2018)
[1337] Dietmar Süss, *Death from the Skies: How the British and Germans Survived the Bombing in World War II*, 117. Historian Susan Grayzel claims that the difference between the British and German air and gas protection practices lies in Britain's ability to "domesticate the air raid" rather than militarize the civilian. Susan R. Grayzel, *At Home and Under Fire: Air Raids and Culture in Britain from the Great War to the Blitz*, 223.
[1338] Roxanne Panchasi, *Future Tense: The Culture of Anticipation in France Between the Wars*, 96. ; RH/12/9 Frankreich XII 1938 (BA-MA) Signatur 61/ Standort 22/ Magazin H3EG/ Reihe 125/ Regal 5/ Gefach 3
[1339] Julia S. Torrie, "For Their Own Good": Civilian Evacuations in Germany and France, 1939-1945, 32.
[1340] Peter Fritzsche, *An Iron Wind,* 53.

Under the Nazis, all German civilians theoretically became members of the militarized air raid community. Their personal responsibilities and their supposed fortitude precluded them from leaving their city or town. In any case, there was no escape in a nation that was allegedly surrounded by enemy long-range bombers.[1341] In many ways, the Munich Crisis proved to the Nazis that their methods of air protection were superior. Hearing of the desperate preparations of the French and British, the RLB appeared comparatively calm and collected.[1342] Indeed, the cloud of fear that hung over France and Britain was omnipresent and stifling. British civilians reported people "clamping snouts and schnozzles into rubber masks, parceling them and distributing them to queues of men and women…Streets were crowded and people talked loudly of war."[1343] Another Briton reported "anxiety, tension, uncertainty; throngs of people in the streets; the indignity and black humor of being fitted with gas-masks."[1344] One Harold Macmillan further claimed that:

> the act of trying on one's mask was also for many the first tangible sign of the approaching slaughter, and gave rise to a sense of fear. The strong smell of rubber made people sick, the elderly sometimes fainted, and there were no masks available for children and babies.[1345]

This situation carried on through the first week of August 1928, with the imminent threat of aero-chemical war wafting through the air and penetrating to the bones of contemporary observers. Gas mask distribution centers stayed open through all hours and citizens were instructed to stay near air raid shelters.[1346] Conjectures about preparations for war spread like wildfire through the national media and Harold Macmillan wrote that British civilians "had been

[1341] Julia S. Torrie, "For Their Own Good": Civilian Evacuations in Germany and France, 1939-1945, 24-25.
[1342] Gasschutz und Luftschutz no. 1 (1939)
[1343] Peter Fritzsche, *An Iron Wind,* 52.
[1344] Michael Graham Fry, "The British Dominions and the Munich Crisis," in *The Munich Crisis, 1938,* 307.
[1345] David Faber, Munich, 1938: Appeasement and World War II, 357.
[1346] In a February 9, 1942 conversation with Albert Speer, Hitler proclaimed that the British distribution of gas masks was merely a media circus, intending to spur the British aero-chemical defense industry. Richard L. Weinberg, *Hitler's Table Talk 1941-1944: Secret Conversation,* 232.

told that the devastation of an air attack would be beyond all imagination. They had been led to expect civilian casualties on a colossal scale. They knew, in their hearts, that our military preparations were feeble and inadequate."[1347] Thus, British and French civilians waiting with bated breath for Hitler to accept the deal that granted Germany the Sudetenland.

On the other hand, in Germany, civilians lauded the RLB and other air protection agencies from 1938 until late 1944.[1348] This was particularly striking since the Nazis insisted that Germans not evacuate during these moments of heightened international tension, and many German civilians (mostly in rural areas) still lacked gas masks or effective air raid shelters.[1349] The price to produce gas masks for every German citizen remained too high. As both chemical and gas mask technologies continued to evolve, civilians needed new gas masks and filters that the Reich could not possibly hope to provide.[1350] Even if the RLB could afford such an expense, the gas mask manufacturers did not have the production capacity to promptly generate so many masks. While the likelihood of bombing raids in rural areas was low, the Nazi reliance on the ideology of an air raid community allowed for larger gaps and flaws in their technological preparations for aero-chemical attack. This collective resolve only grew in importance over the

[1347] David Faber, Munich, 1938: Appeasement and World War II, 357

[1348] This civilian approval impressive given the amount of leadership turnover for the RLB. In 1936, Hugo Grimme was replaced by Karl von Roques as president of the organization. In 1939, Ludwig von Schröder became president, followed by Hermann Sautier in 1941 and Friedrich Hirschauer in 1942. RLB leadership was not considered active duty and as more generals were required for the Second World War, RLB presidents were shuffled off to artillery and Luftwaffe positions. Peter Fritzsche, "Machine Dreams: Airmindedness and the Reinvention of Germany," 706.

[1349] Between 1938 and 1940, the RLB continued in their quest to provide a gas mask for every German civilian. This included taking inventory of all old iterations of the German gas mask. However, only 12 million masks were distributed outside of major industrial centers. Göring divided the Reich into three zones of air protection. Only Zone 1, comprised of major industrial cities, received state funding for civil defense. Richard Overy, *The Bombing War*, 416. ; Militar und Kriegssachen: Luftschutzmassnahmen in Heil- und Pflegeanstalten 1933-45 (SF) G 1215/3, 711.

[1350] *Die Sirene* no. 16 (1942): 218. The RLB spend a total of 4.6 million Reichsmark for gas protection during World War II. 2 Weltkrieg Chemische Waffen (BA) 204-006

course of the Second World War as financial difficulties and destroyed factories led to greater shortages in gas mask production.[1351]

While the Nazis insisted that collective German resolve created efficient and effective air and gas protection measures, daily German experience was more of a mixed bag. For the Wehrmacht soldier, the gas mask was an essential part of military training throughout the 1930s. Men ran in gas masks, conducted target practice in gas masks, and sat in tear gas filled chambers in gas masks for extended periods of time.[1352] By 1939, Wehrmacht soldiers, or at least their commanders, were certain that this training would be put to the test against the French and British.[1353] Two years later, the German invasion of the Soviet Union gave this prediction even more credibility. A military report from 1941 claimed that "the gas mask is not an arbitrarily interchangeable piece of equipment, but it is rather inseparable from the soldier…the fact that chemical weapons have not yet been used should not lead to laxity in this important training."[1354] Indeed, Wilhelm Moers, a Wehrmacht soldier, reported that he was ordered to constantly march in his gas mask, just in case the enemy chose to deploy chemical weapons.[1355] Even as late as 1944, the German military demanded that soldiers maintain gas discipline and train in their gas masks, despite the fact that chemical weapons had never been intentionally used on the battlefields of World War II.[1356]

[1351] Degea Aktiengesellschaft (Auergesellschaft 40-43 (EIA) Degussa IW 24.5./2-3 ; Between 1940 and 1943, the Dräger company cut production by 50% due to rubber shortages. Michael Knoll, *Die Drägerwerke im Dritten Reich*, 11-12.

[1352] See, for instance: Hedda Kalshoven, Between Two Homelands: Letters across the Borders of Nazi Germany, 146.

[1353] In fact, a German radio report from mid-September 1939 announced that the Polish army had used gas in one sector and some soldiers of the 82nd Mountain Engineer Battalion had been killed or wounded. Daniel Uziel, The Propaganda Warriors, 212.

[1354] Anhaltspunkte fur die Prufung des Standes der Ausbildung in der Gasabwehr bei Besichtigungen Ubungen usw 1940 (BA-MA) RH/11/IV Sig 9 ort 22 Mag H3EG Reihe 124 Regal 1 Gefach 6

[1355] Martin Rüther, Köln im Zweiten Weltkrieg: Alltag und Erfahrungen zwischen 1939 und 1945, 662.

[1356] RH/12/9 Sig 72 1944 (BA-MA) Signatur 72, Standort 22, Magazin H3EG, Reihe 125, Regal 5, Gefach 3 ; Hans-Adolf Jacobsen, *Generalaoberst Halder Kriegstagebuch: Der Russlandfeldzug bis zum Marsch auf Stalingrad*, 190. On December 2, 1943, an American freighter ship carrying mustard gas exploded off the coast of Italy. 620 soldiers

Given both the discomfort of wearing the gas mask and the weight that it added to their packs, German soldiers increasingly resented the orders that required them to perpetually carry and train with the mask. Following a young Wehrmacht soldier named Helmut Paulus, historian Nicholas Stargardt writes that "it was the daily claustrophobia of wearing gas masks which made [the soldiers] fear the worst for their families at home."[1357] Ultimately, many soldiers threw their gas masks away during highly mobile operations or desperate retreats.[1358] In one anecdote, a soldier named Bodelshauser admitted to throwing away his gas mask while in Russia so that he could keep his camera in the gas mask carrying case.[1359] Always keeping his carrying case nearby to snap photos, Bodelshauser received praise from his officers for his supposed gas vigilance. Far more men simply no longer saw the purpose of the mask in a war that increasingly appeared as if it would not feature chemical weapons.

Over the course of the Second World War, gas discipline also broke down among German civilians. Even in the 1930s, plenty of civilians disobeyed air raid orders and failed to carry their gas masks at all times. Like for so many soldiers in World War I, the gas mask became a physical and mental burden for civilians in the 1940s. The gas mask carrying case constantly hugged the body, reminding Germans of the imminence of aero-chemical attack and its violent disruption of daily life. The mask itself stifled breathing and smelled of synthetic rubber, seemingly choking the life that it was meant to protect. Discomfort, apathy, and even indifference encouraged Germans to comply with the regime at one moment and to break with its

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and 1000 civilians were injured. This is the only documented military release of poison gases in World War II. Florian Schmaltz, *Kampfstoff-Forschung im Nationalsozialismus" Zur Kooperation von Kaiser-Weilhelm Instituten, Militär und Industrie*, 28.

[1357] Nicholas Stargardt, The German War: A Nation under Arms, 1939-45, 92.

[1358] Ben H. Shephard, War in the Wild East: The German Army and Soviet Partisans, 146.

[1359] Wolfgang Sannwald, Schiefertafel, Gasmaske und Petticoat: Erlebte Dinge und Erinnerungen aus dem Landkreis Tübingen, 78.

rules and regulations in the next.[1360] To combat air raid laxity, the RLB increasingly relied on fear-mongering propaganda, often claiming that poor gas discipline helped the enemy and would surely lead to a violent death.[1361] In her letters and diaries from 1942, the author Anna Haag wrote that this ever-present propaganda ensured that chemical warfare haunted her imagination.[1362]

It is also important to note that the Nazis used authoritarian punishment to encourage proper air and gas protection. Civilians could be fined or imprisoned for not adhering to air defense regulations.[1363] Infractions included failing to turn out lights during a mandated blackout, not partaking in an air raid drill, and forgetting/refusing to carry one's gas mask. The Nazis' 1935 Air Defense Act made Germany unique among European nations in that civilians were even legally compelled to find a public air raid shelter during an attack. The complex local structure of the RLB made sure that air wardens and apartment caretakers could monitor the activities of all civilians. The air raid warden Franz Göll revealed the amount of effort that this surveillance took, writing "I often felt very pressured and mentally drained."[1364]

Both these authoritarian measures and RLB propaganda encouraged most German civilians to follow air and gas protection guidelines, and to either explicitly or tacitly join the RLB's idealized air protection community. However, as these guidelines increasingly appeared inadequate during the bombing campaigns of the Second World War, civilians and municipal

[1360] This would suggest that German subjects could alternate between complicity and opposition to the regime at any given moment based on their ability or desire to align themselves with the national air raid community. For this reason, it may be useful to consider the categories of "apathy" and "indifference" in German relationships to the Nazi regime. For the classic example of this kind of study, see: John F. Sweets, *Choices in Vichy France: The French under Nazi Occupation* (New York: Oxford University Press, 1986)
[1361] Ludwig Hohlwein, Kannst du das Verantworten? Du hilfst dem Feind! 1940
[1362] Edward Timms, Anna Haag and her Secret Diary of the Second World War: A Democratic German Feminist's Response to the Catastrophe of National Socialism, 151.
[1363] Richard Overy, The Bombing War: Europe 1939-1945, 414.
[1364] Peter Fritzsche, The Turbulent World of Franz Göll, 170.

services began to deviate from them. Rather than dropping gas bombs, the Allies released millions of tons of explosives and fire bombs on German cities. The sheer destruction of these raids forced the Germans to consider, and eventually conduct, civilian evacuations from western cities. Given the lack of initial planning, the idea of massive evacuations of a city the size of Cologne appeared daunting if not impossible to many civilians.[1365] Daily and nightly life in many German cities was defined by constant air raid sirens, numbing some Germans to the reality of the danger.[1366] A letter between a married couple reveals the monotonous and dreary nature of the air raid at the end of 1944: "Working every day from morning to evening...an air raid almost every day, a life surrounded by ruins."[1367]

For many civilians, it was the absence of gas bombs that invalidated much of the gas training that they had received. One civilian wrote:

> We were never told against what types of gases the masks would protect us and what we should do in the event of a gas attack. Could one smell the lethal gas? When would one put the device on and when would one take it off? Was there to a be a public warning like the siren indicating enemy aircraft approaching? The planning was sketchy at best and the saving grace was that, fortunately, there was never a need.[1368]

Air raid questions like the ones above flooded the offices of *Die Sirene* in the early 1940s, forcing the journal to redirect all inquiries to local RLB offices.[1369] Regardless of the apparent confusion, the RLB continued to demand that civilians stay vigilant for gas attacks by carrying their gas masks and conducting gas drills through 1944.[1370] This demand became increasingly

[1365] Eva Schwedheem, Kriegsjahre in Köln 1943/44 1943-44 (DTA) Sig 150 reg 154
[1366] Carolyn Birdsall, *Nazi Soundscapes*, 120. ; Tagebucher 1941, 1942, 1943 (TMA) II. Kleine 2090. In some cities, including Cologne, bombing eventually destroyed the air siren system as well as power grids and water services. Martin Rüther, *Köln im Zweiten Weltkrieg: Alltag und Erfahrungen zwischen 1939 und 1945*, 812.
[1367] Christian Packheiser, "Personal Relationships between Harmony and Alenation: Aspects of Home Leave during the Second World War," in Private Life and Privacy in Nazi Germany, 252. In her 1942 novel *The Seventh Cross*, Anna Seghers expressed a similar sentiment through the character of Paul: "I'd rather do overtime any day than air-raid drill." Anna Seghers, *The Seventh Cross*, 204.
[1368] Hermann Knell, To Destroy a City: Strategic Bombing and Its Human Consequences in World War II, 289.
[1369] Carolyn Birdsall, *Nazi Soundscapes*, 121.
[1370] NS/6/ Signatur 345 standort 51 Haus 901/EG 1943 (BArch-B)

unreasonable as the Reich continually failed to provide enough gas masks over the course of the war.[1371] Local air and gas protection authorities continually complained that they were underfunded and undersupplied. The need to constantly exchange old gas mask filters turned gas protection into an even greater headache.[1372] One anti-Nazi pamphlet from 1939 pointedly asked German citizens if they truly had enough gas masks for their families. Claiming that French and British citizens as well as Nazi government officials all received state of the art gas masks, the pamphlet stated that the *Volksgasmaske* would be "useless after a few weeks."[1373] To many Germans, it increasingly appeared that civilian gas protection was merely a chimera.[1374] While air defense certainly remained important, the social myth of collective national gas protection seemed meaningless. With attention and materials turned towards combatting the traditional bombing raids that took 600,000 German lives and destroyed 3.5 million homes, the gas protection journals met slow deaths.[1375] Only *Gasschutz und Luftschutz* remained in publication up to 1945, shifting its focus to fire bomb protection in 1943.[1376]

The Allied used of fire bombs intensified the feelings of deadly irony that now tainted poison gas protection. In the early 1940s, the U.S. Chemical Service developed many of the incendiary substances (such as napalm) that were famously dropped on Dresden in 1945. These fire bombs could certainly be viewed as chemical weapons, even though they little resembled the

[1371] However, Nazi government officials were all provided with free gas masks. Fabrice d'Almeida, High Society in the Third Reich, 74.
[1372] Luftschutz hier: Versorgung der Bevolkerung mit Gasmasken 1944-45 (SF) B 702/1, 4852
[1373] Hast du eine Gasmaske Volksgenosse? 1939 (SBB) Einbl. 1939/45, 4422. H-J
[1374] Images of postwar Germany depict women with handbags made with gas mask straps, revealing civilians' willingness to destroy and repurpose gas protection technologies. Irene Guenther, *Nazi Chic?*, 264. Perhaps even more strikingly, gas mask straps were also used as stretchers to haul off dead bodies. Christopher E. Mauriello, Forced Confrontation, 70.
[1375] *Die Sirene*, (1944) ; *Die Gasmaske* (October/December 1940)
[1376] The editors postponed the publication of *Gasschutz und Luftschutz* in 1945. The journal was reintroduced as *Ziviler Luftschutz* in 1952, focusing more on issues of nuclear protection. *Gasschutz und Luftschutz* no. 15 (1945) ; *Gasschutz und Luftschutz* no. 13 (1943)

poison gases of World War I. German civilians certainly described these *Brandbomben* as such, frequently decrying the Allied *Terrorangriffe* (or terror attacks) after 1942.[1377] Incendiary bombs set fire to large swaths of German cities, creating firestorms that could quickly suck the oxygen from the affected area. The *Volksgasmaske* was ineffective without exterior oxygen and it provided no protection against carbon monoxide. Death awaited even those few Germans who had time to don their masks during a fire bombing.[1378] Author Jörg Friedrich estimates that 70 to 80 percent of all casualties in the bombings of Kassel and Hamburg were carbon monoxide gassings.[1379] The ineffectiveness of the gas mask during the arrival of the long-awaited future air war often voided its perceived technological utility. If the mask provided no real protection, then its sole use was in organizing and militarizing German civilians through totalitarian coercion.[1380] In fact, in fire bomb attacks, both the gas mask and the air raid shelter could become individual gas chambers. Carbon monoxide produced by the fires frequently seeped into German shelters and asphyxiated any present civilians. The literary scholar W.G Sebald claims that "after the rubble had cooled down, [German civilians] found people still sitting at tables or up against walls where they have been overcome by monoxide gas."[1381]

While German air protection services remained active and relatively effective until 1944, the RLB's failure to accurately predict the nature of the aerial war destroyed full civilian confidence in gas protection.[1382] Admittedly, the Nazis continued to pitch air raid activities as a

[1377] Peter Doebel, ed., "So etwas wie Weltuntergang": Günter Goebel Kriegstagebücher 1939-1945, 200.
[1378] Hermann Knell, To Destroy a City: Strategic Bombing and Its Human Consequences in World War II, 271.
[1379] Friedrich graphically describes the dead: "They had no injuries. Some laid an arm across their face, others lay on their backs with their arms outstretched, and yet others had drawn up their legs...It was a chaotic pile of human limbs, torsos and heads." Jörg Friedrich, *The Fire*, 273, 331.
[1380] This civilian loss of faith in gas mask technology mirrored that of German soldiers in 1918. With the arrival of new offensive technologies, many soldiers no longer felt that the mask could protect them.
[1381] W.G. Sebald, On the Natural History of Destruction, 28.
[1382] Nazi Germany's civilian air defense was remarkably resilient until late in the Second World War. Nevertheless, the Wehrmacht and the Nazis were hesitant to recognize the work of the often-female air defense wardens and

form of national struggle and rebirth with some success, but the bomber's ability to overwhelm German air and gas protection services forced some civilians to reconsider the supposed strength of the RLB's national air raid community.[1383] With broken supply lines and inadequate protective technologies, some now felt that they were now on their own.[1384] Reflecting on their individual fortitudes, many were unsure if they could survive, let alone thrive, in this newly violent modernity. While German civilians would never actually have to face poison gas, contemporaries never knew if the RLB's predicted attacks would come to fruition and overwhelm the nation. In *After Midnight,* a novel on life in the Third Reich, the German author Irmgard Keun provided a scene that most clearly displayed this realization:

> Old Pütz is a pensioner, leading a quiet, peaceful life on his own. He has nicely brushed white hair and walks with neat, tottery little footsteps. Aunt Adelheid made him come to air raid drill. That day we had to put on gas masks, which practically smothered you, and then run up a staircase. Old Pütz stood in a dark corner, all shaky, holding the gas mask in his thin little hands and no doubt hoping nobody would notice him. But Aunt Adelheid's beady black eyes noticed him all right. He had to put his gas mask on, and Aunt Adelheid chased him up the staircase ahead of her. Up in the loft he collapsed. Putz's crumpled body lay there on the floor in his one good, dark blue Sunday suit, and we could hear him breathe stertorously inside his mask. Aunt Adelheid had put the mask on him wrong, and it was difficult getting his head out again.[1385]

After seeing Old Pütz nearly die from exhaustion, the young female narrator reflects, "I mean, it's pure chance that poison gas isn't eating my body away right now. The Führer doesn't mind taking risks. He can say the word and declare war tomorrow, and kill the lot of us. We're all in his hands."[1386] In this moment, she realizes that she cannot become the RLB's idealized "chemical subject." The frailties of human life would always break through the German's

volunteers, claiming that their work could never equal the sacrifice of front-line soldiers. Bernd Lemke, *Luftschutz in Grossbritannien und Deutschland 1923 bis 1939,* 209.

[1383] For the success of the social myth surrounding German air protection see: Matle Thießen, Eingebrannt ins Gedächtnis. Hamburgs Gedenken an Luftkrieg und Kriegsende 1943 bis 2005 (Munich: Dölling und Galitz, 2007)

[1384] Hermann Knell, To Destroy a City: Strategic Bombing and Its Human Consequences in World War II, 278.

[1385] Irmgard Keun, *After Midnight,* 10.

[1386] Irmgard Keun, *After Midnight,* 32.

exterior armor, and they would all perish in the world that they themselves had envisioned. The German-Jewish artist Max Busyn expressed a similar idea in a series of drawings from 1939. Reminiscent of Käthe Kollwitz's pacifist reflections on war, Busyn used the gas mask as a symbol of death in his depiction of helpless (often female) civilians suffering amid gas attacks.[1387] For Busyn, there was no possible mastery of a poisoned world, just as there was no possible mastery of death itself. This realization became increasingly apparent to the German civilians who suffered through the Allied bombing attacks of the Second World War. Poison gas may not have been present, but its very absence represented the inability to predict and protect against the technological means of war. In trusting the only forms of possible technological salvation that they had, Germans under the gas mask existed in a complicated position somewhere between perpetrators, bystanders, and victims.

[1387] A 1983 photo exhibition on the bombing of Kassel expressed similar themes. One particular photo "focuses on two unknown female figures, both sitting on suitcases. The woman to the right looks straight at the photographer, and thus at the observer, clutching a gas mask in her left hand and a bundle of blankets under her arm. Her facial expression is one of distress and exhaustion." Jörg Arnold, The Allied Air War and Urban Memory, 303.

EPILOGUE

The envisioning of a distinctly German "chemical modernity" provides us with a unique historical story of scientific and technological development. From 1915 to 1945, the German nation was inextricably tied to the advancement of modern industrial chemistry. This relationship was the result of the well-documented national strength in chemical research and production that Germany enjoyed in the late nineteenth and early twentieth centuries. Fritz Haber's use of chlorine gas at the Second Battle of Ypres mobilized the full power of industrialized chemical firms like Bayer, BASF, and Hoechst for German military endeavors. However, rather than providing a breakthrough for the German army, the use of chlorine gas created an arms race that would increase the lethality of both the gasses themselves and the means of delivering them. As such, the thousands of tons of chemical weapons that Germany produced between 1915 and 1918 represented a Pandora's Box of warfare technology and the beginnings of what was later referred to as the military-industrial complex, an essential component of "Big Science."

Following the war, foreign national chemical arsenals would haunt the Germans, making them fully aware of both their military losses and their weakened geopolitical position throughout the 1920s and 30s. Feelings of national weakness and uncertainty provided German ultra-nationalists and militarists with one of their central political messages. According to men like Hitler and the leaders of the National Socialist Party, the Germans had a right to national security in a world that they saw as defined by Social-Darwinian conflict. Chemical weapons, they claimed, represented German ingenuity and ruthlessness in this newly modern world where even the atmosphere could be immediately weaponized. In this way, a populist message of rearmament and the reassertion of national pride masked a willingness to play on the fears of total chemical war. Regardless of whether the Nazis would ultimately elect to use poison gas on

the battlefield, German chemical rearmament was an assumed necessity for national survival. Ironically, while IG Farben produced nerve gases like Tabun, Sarin, and Soman in the name of said national security, this buildup of chemical weapons again contributed to a war that would ultimately bring German downfall in 1945.

With a ten-year head start in nerve gas production, Germany maintain stocks that far outnumbered those of the Allies during World War II. Between 1942 and 1943 alone, the production site at Dyhernfurth produced enough Tabun to kill approximately 7.5 billion humans.[1388] Hitler apparently knew of these stocks by December 2, 1941 at the latest, which has subsequently led historians and political scientists to try to explain why Hitler and the Nazis never chose to employ these weapons on the battlefield.[1389] Some have claimed that Hitler's personal experience as a victim of gas in World War I prevented him from using nerve agents. As a message-runner for the List Regiment, Hitler apparently witnessed the utterly demoralizing effect that gas had on German troops.[1390] He also had first-hand experience with gas masks, since he spent the February of 1918 testing old gas masks for three Marks a day.[1391] On October 14, 1918, Hitler himself was exposed to mustard gas outside of Ypres, sending him to a military hospital in Pasewalk and effectively ending his military service. Indeed, this trial by gas was a highly symbolic story in Nazi Germany and members of the Hitler Youth were forced to memorize this heroic part of the Hitler mythology.[1392] Recently, however, scholars have exposed possible embellishments to Hitler's personal story, claiming that he was only exposed to trace

[1388] IG AG Kampfstoffe P 70/I Diverse Ausarbeitungen zu Kampfstoffen im Allgemeinen Dyhernfurth Gendorf finden sich in IG A 866/1 (BASF) IG A 866/1
[1389] In their rise to power, the Nazis and other radical right-wing political groups were no strangers to tear gas and other forms of poison. For instance, in 1927 right-wing agitators shut down the jazz operetta *Jonny Spielt Auf* by throwing tear gas bombs in the Bavarian theater. Anthony McElligott, Rethinking the Weimar Republic: Authority and Authoritarianism, 1916-1936, 143.
[1390] Thomas Weber, Hitler's First War: Adolf Hitler, The Men of the List Regiment, and the First World War, 196.
[1391] Ian Kershaw, Hitler, 1889-1936: Hubris, 117.
[1392] Frederic C. Tubach, German Voices: Memories of Life during Hitler's Third Reich, 44-45

amounts of mustard gas and that he suffered subsequent psychosomatic blindness.[1393] Regardless of the medical specifics regarding Hitler's gassing, the Pasewalk story reveals the salience of gas in the decades following World War I and points to a personal distaste that Hitler may have harbored for chemical weapons. On the other hand, some scholars have conjectured that Hitler's time in a military hospital proved crucial for formulating the rhetoric of the Final Solution. For instance, in his 1976 work *Hitler among the Germans,* historian Rudolph Binion used psycho-historical methods to claim that Hitler, while lying in his hospital bed in 1918, dreamed to "remove Germany's Jewish cancer and to poison out Germany's Jewish poison."[1394] Of course, as historian Fritz Stern has pointed out, a direct connection between Hitler's experience in 1918 and the events of the Holocaust is tenuous at best.[1395]

If Hitler was initially made averse to chemical weapons in World War I then this position was certainly not unique and one can find denouncements of gas in ego documents from all segments of German society.[1396] This would suggest, as some political scientists have postulated, that chemical weapons might naturally disgust the human mind. As World War I soldiers came to realize, the weapon destroyed the idea of fairness and chance in war, leading to regular descriptions of gas as perfidious, treacherous, barbarous, and/or inhumane.[1397] Thus, such an argument maintains that humans are intrinsically appalled by gas' insidious form of atmo-terrorism and the subsequent horrors of asphyxiation. However, this supposedly natural aversion did not stop German soldiers in World War I from cheering on their own chemical weapons when they terrorized British and French soldiers. It also did not stop Hitler and the Wehrmacht

[1393] Thomas Weber, Hitler's First War, 220. ; Alan Kramer, Dynamic of Destruction: Culture and Mass Killing in the First World War, 324.
[1394] Rudolph Binion, Hitler among the Germans, 114.
[1395] Fritz Stern, Dreams and Delusions: The Drama of German History, 64-65.
[1396] For great examples, see: Eva Schwedheem, Kriegsjahre in Köln 1943/44 (DTA) Sig 150 reg 154 ; Unnamed Private, Tagebucher 1941, 1942, 1943 (TMA) II.Kleine 2090
[1397] James W. Hammond, Poison Gas: The Myths Versus Reality, x.

from stockpiling nerve and mustard gas up until 1945.[1398] This apparent willingness to deal in chemical weapons casts doubt on the claim that Germany's ultimate decision not to use gas in the Second World War was purely based on either moral considerations or a general aversion toward the weapon.

Political scientist Jeffrey Legro has stressed that it was, in fact, the Wehrmacht that mostly avoided the use of gas. The speed of the Blitzkrieg could best be achieved without a weapon that hampered mobility and delineated the battlefield.[1399] Furthermore, as historian Florian Schmaltz has made clear, the Nazis did in fact fear that the Allies would gas both German soldiers and civilians as a reprisal for their own chemical attacks.[1400] This threat of equal retribution was particularly effective because the Nazis erroneously believed that the Americans and Russians had the ability to produce Tabun and Sarin early in the war.[1401] Trusting that the Allies now had an advantage in chemical weapons, Hitler ordered an increase in nerve gas production in 1943 but became increasingly hesitant to use his super weapons.[1402] The Nazi Minister of Armaments and War Production, Albert Speer, claimed that Hitler considered using nerve gas against the Russians once the Wehrmacht was already in retreat, but by then, the

[1398] In December 1941, Wehrmacht commanders seriously considered using mustard gas to take the city of Leningrad. They viewed gas as an ideal method for clearing urban spaces and demoralizing/killing off Russian civilians. Adrian E. Wettstein, "Urban Warfare Doctrine on the Eastern Front," in *Nazi Policy on the Eastern Front, 1941. Total War, Genocide, and Racialization*, 63-64.
[1399] Jeffrey W. Legro, Cooperation under fire: Anglo-German Restraint During World War II, 180.
[1400] Churchill made it explicit to the Nazis that if they used gas on the Russians, then the RAF would drop gas on German cities. Florian Schmaltz, *Kampfstoff-Forschung im Nationalsozialismus" Zur Kooperation von Kaiser-Weilhelm Instituten, Militär und Industrie*, 25-28. ; Luftkrieg und Gaskrieg (SBB) Einbl. 1939/45, 4319.125;125Vor; 125.2.Ex.
[1401] IG AG Kampfstoffe P 70/I Diverse Ausarbeitungen zu Kampfstoffen im Allgemeinen Dyhernfurth Gendorf finden sich in IG A 866/1 (BASF) IG A 866/1
[1402] The Nazis invested over 200 million Reichsmarks in chemical weapons productions over the course of World War II. IG AG Kampfstoffe P 70/I Diverse Ausarbeitungen zu Kampfstoffen im Allgemeinen Dyhernfurth Gendorf finden sich in IG A 866/1 (BASF) IG A 866/1

hesitancy of Wehrmacht generals and the destruction of German chemical production sites made this plan infeasible.[1403]

Of course, Hitler did order a scorched earth policy at the very end of the war with the intention of slowing down the American and Russian advance. This directive, however, did not include the use of chemical weapons.[1404] For this reason, political scientist Richard Price has argued that it was a shared "cultural taboo" against the use of chemical weapons that prevented even the Nazis from employing them. Price's constructivist study has added to any normative or rationalist claims about Nazi restraint. He writes:

> Chemical weapons appeared at a germinal moment that witnessed an emerging awareness that a civilization based upon progress in technology might be turned upon itself. This category of weapons was impregnated with institutionalized symbolic value. Chemical weapons portended that humankind might already have reached the moment of ultimate self-mastery implied by technology—the very capability to decide the fate of the species itself.[1405]

Much like the atomic bomb, poison gas served as a "litmus test and symbol of unease" for humanity's ability to control its own destructive technologies in the twentieth century.[1406] The restraint that this symbol creates is, according to Price, purely irrational when weighed against the tactical value of gas on the battlefield. Nevertheless, a combination of irrational restraint,

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[1403] Albert Speer, *Inside the Third Reich*, 413. While Speer's account of the Third Reich has been proven flawed, he also claimed that he considered assassinating Hitler in his bunker with poison gas. Roger Moorhouse, Killing Hitler, 304. ; Martin Kitchen, Speer: Hitler's Architect, 296.

[1404] Although historian Perry Biddiscombe has claimed that the Nazis sought to transfer stocks of chemical weapons to the Werewolf resistance movement in 1945. Perry Biddiscombe, Werwolf! The History of the National Socialist Guerrilla Movement, 1944–1946, 37.

[1405] Richard Price, The Chemical Weapons Taboo, 166.

[1406] Ibid. Certainly, anxieties over poison gas maintain much resonance with atomic fear. In many ways, the discourses surrounding poison gas, especially cultural visions of a toxic apocalypse, were early iterations of those imagined for nuclear weapons. The image of the empty city streets of Chernobyl, contaminated by unseen radiation, echoes Walter Benjamin's earlier descriptions of a gassed urban center. Bill Rawling, *Surviving Trench Warfare: Technology and the Canadian Corps, 1914-1918*, 3.

individual abhorrence, and rational calculations seem to have protected soldiers and civilians alike from an unrestrained chemical war in the 1940s.[1407]

Of course, none of these theories account for the fact that the Nazis did actually employ chemical weapons against both unwanted and former citizens of the Third Reich. Price and others can attempt to explain the reticence to use chemical weapons under the precepts of formalized warfare among sovereign nations, but these rational calculations and cultural taboos did not hinder the Nazi use of poison gas on powerless internal populations. The mentally and physically disabled, Roma, Slavs, and Jews were never part of the imagined *Volksgemeinschaft* that defined German citizenship under the Nazis. For this reason, they were also excluded from the chemical protections that the RLB's national air raid community afforded German citizens. This created a biological (often ethno-racial) demarcation between the Germans who would survive the envisioned aero-chemical war and those who would clearly perish. Indeed, as early as 1934, Jews and *Mischlinge* were barred from all state air protection activities.[1408] Only Jewish World War I veterans could serve as air wardens for buildings inhabited solely by other Jews. The Nazis formalized this separation of Jews in air and gas defense through a 1937 Air Defense Law and a further decree in the following year.[1409] In a rather symbolic scene from the summer of 1942, a Jewish man named Gustav reportedly asked a German official where he could obtain gas masks for his family. The official responded, "Gas masks are surely pointless for Jews," making it clear that the Nazi air raid community was sincerely exclusionary.[1410]

[1407] Richard Price, "A Genealogy of the Chemical Weapons Taboo," 102-103. Following the defeat of the Nazis in 1945, the Allies began the destruction of over 75,000 tons of German chemical weapons. 2 Weltkrieg Chemische Waffen, 1933-45 (BA) 204-006
[1408] Julia S. Torrie, "For Their Own Good": Civilian Evacuations in Germany and France, 1939-1945, 129.
[1409] Dietmar Süss, Death from the Skies: How the British and Germans Survived the Bombing in World War II, 38-39.
[1410] Marion A. Kaplan, Between Dignity and Despair: Jewish Life in Nazi Germany, 224.

As this study has made clear, the processes of "disinfection" and "extermination" were strongly associated with poison gas since World War I. Fritz Haber and his pest control units had used hydrocyanic acid to de-louse soldiers and trenches since 1917. This led to the adoption of both Zyklon-A and then Zyklon-B as the preferred German pesticides. Throughout the 1920s and 30s, the pesticide industry's research always remained central to the larger desire for new chemical applications. If men like Haber could find civilian uses for poison gas, then this could potentially justify chemical weapons as a mere stepping stone in the long history of scientific progress. Thus, the gas specialists even debated the best means and methods for the elimination of rats and insects in their trade journals, while advertisements for household pesticides began to appear in daily newspapers and magazines.[1411] At the same time, these advertisements for pest control relied on allusions to inter-human violence in order to plainly express their stated purpose. Because vermin often carried disease, attacked pets and humans, and were notoriously difficult to kill, pesticide companies had little qualms over describing the violent effects of their products. During a 1920 "Rat week" in Steglitz, the authorities used a pesticide called "Pogrom" in an attempt to rid the city of vermin.[1412] Viewing pest control as a matter of war, another pesticide company named their product *Rattenkrieg,* or rat war.

The ability of vermin to destroy crops and spread life-threatening disease was seen as a biological struggle which pitted humans against lesser members of the animal kingdom. In a public announcement from 1920, German health officials averred this Darwinian struggle, writing, "the rat plague is a major threat to the health of the people (*das Volk*)."[1413] When viewed

[1411] Ratten 1931 (BArch-B) R/154/ Sig 1466 Ort 51 Mag M 1 08 Reihe 89 ; Chemische Werke vorm H & E Albert Rattenbekampfung 1934 (BArch-B) R/154/ Sig 1452 Ort 51 Mag M 1 08 Reihe 89 ; Bakterielle Ratten und Mause bekämpfung 1926 (BArch-B) R/154/ Sig 1448 Ort 51 Mag M 1 08 Reihe 89 ; Rattenbekämpfung 1929/3- (BArch-B) R/154/ Sig 1540 Standort 51 Mag M 1 08 Reihe 89 ; Die Gasmaske 1937-1938 (SBB) 4 Ona 30/98-9/10
[1412] Ratten IV, 1920- (BArch-B) R/154/ Sig 1330 Ort 51 Mag M 1 08 Reihe 89
[1413] Ibid.

as a fight for life itself, few Germans decried this new use of previously vilified poison gas. Clearly, any weapon could be used on inherently lesser forms of life, especially when they supposedly threatened the collective health of the German people.

Scholars have long documented the importance of Nazi conceptual ties between vermin and Jews for the genocidal efforts of the Holocaust.[1414] In a process of dehumanization, the Nazis used animals such as swine, rodents, or insects to describe the Jews and others. According to the Nazis, Jews maintained a parasitic relationship with the German *Volkskörper* (or collective people's body), and they slowly sapped the German people of their wealth and power.[1415] Of course, these non-human descriptors for Jews predated the Nazis' rise to power and spread beyond the ranks of the party, serving to normalize the assertion that Jews and Germans were biologically different and at odds. For instance, in decrying the historical influence of the Jews in Germany, the 19th century German orientalist Paul de Lagarde wrote, "You don't negotiate with trichina or bacilli. You don't cultivate trichina or bacilli. You exterminate them, as quickly and carefully as possible."[1416] Similarly, in a 1925 letter, the former Kaiser Wilhelm II wrote, "Jews and mosquitos, a nuisance that humankind must get rid of some way or other."[1417]

Throughout the interwar period, similar vermin metaphors proliferated.[1418] Anti-Semites saw parasites as perfect parallels for the Jews, who they believed to be increasingly siphoning off the resources of Germany. After the Nazi rise to power, these metaphors and analogies swiftly and violently entered mainstream political discourse. Historian Johann Chapoutot goes further,

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[1414] See: Alex Bein, The Jewish Question: Biography of a World Problem, 378.
[1415] Andreas Musolff, "What role do metaphors play in racial prejudice? The function of anti-Semitic imagery in Hitler's Mein Kampf," 25 ; For a 1937 novel by a *Kriegserlebnis* author in which Jews are compared to vermin and swin see: Hans Zöberlein, *Der Befehl des Gewissens*, 6. Of course, this form of dehumanization was not exclusive to the Nazis. See: David Livingstone Smith, *Less Than Human*, 15-17.
[1416] Cited from Johann Chapoutot, *The Law of Blood*, 400.
[1417] David Reynolds, The Long Shadow: The Great War and the Twentieth Century, 292.
[1418] Boria Sax, Animals in the Third Reich, 160.

arguing that, "What had been a virulent and hate-filled—but still largely metaphorical—discourse [on Jews as vermin] in the nineteenth century became a literal truth in Nazi Germany."[1419] Certainly, the metaphor was widely used and popularized. For instance, in a daily edition from the mid-1930s, a Pomeranian newspaper even described Mickey Mouse as a Jewish rodent.[1420] With the increased use of infestation metaphors came fittingly violent metaphorical solutions. Following his 1925 description of Jews as insects, Wilhelm II stated, "I believe the best thing would be gas!"[1421] Similarly, in 1935, an SS man who was tracking down Jews for the Nazi state wrote, "One does not hunt rats with a revolver, but with poison gas."[1422]

In the pesticide industry, clearly the use of poison gas was already conceptually linked to the extermination of life that was deemed inherently subordinate.[1423] By the 1930s, this conceptual link was enacted in the inter-human world through real anti-Semitic action and violence. As early as 1932, Nazi street gangs reportedly threw tear and stink gas bombs into Jewish businesses.[1424] As Jews were later evicted from their homes, it was not uncommon for the Nazis to fumigate confiscated Jewish residences before they were given to Aryan families.[1425] Similarly, the Nazis later described their use of carbon monoxide in the killing of Jews as "fumigation," "disinfection," "cleansing," and "extermination," or as the destruction of the weak by the strong in the struggle for life.[1426] Indeed, in 1943, Heinrich Himmler claimed that:

[1419] Johann Chapoutot, *The Law of Blood*, 400.
[1420] Ibid. ; Alon Confino, *A World Without Jews*, 29, 84.
[1421] David Reynolds, The Long Shadow: The Great War and the Twentieth Century, 292.
[1422] Claudia Koonz, *The Nazi Conscience*, 246. The German press often referred to men who made their money through Depression-era speculation or black market dealing, often assumed to be Jews, as the "Rat Kings." Michael Berkowitz, *The Crime of My Very Existence: Nazism and the Myth of Jewish Criminality*, 21.
[1423] Historian Tiago Saraiva has argued that the German extermination of the Colorado Potato Beetle provided many of the conceptual and techno-scientific tools necessary for the Holocaust. Tiago Saraiva, *Fascist Pigs*, 87-90.
[1424] Michael Wildt, Hitler's Volksgemeinschaft and the Dynamics of Racial Exclusion: Violence Against Jews in Provincial Germany, 1919-1939, 110, 203.
[1425] For a fictional example see: Anna Seghers, *The Seventh Cross*, 72.
[1426] Raul Hilberg, The Destructions of European Jews, 1097.

We are the first to have resolved the issue of blood with concrete actions…The same thing goes for anti-Semitism as for de-lousing. Destroying lice is not an ideological question. It is a matter of cleanliness. Anti-Semitism, in the same way, has not been a worldview, but an issue of hygiene—indeed, one that the will soon be resolve. We will soon be rid of our lice. We still have twenty thousand nits among us. Then it will be over and done with, in all of Germany.[1427]

Figure 9: A Political cartoon from the December 1917 edition of the Nazi publication *Der Stürmer*. The image is titled "When the Vermin are Dead, the German Oak Will Flourish Once More." The gassed rats are labeled as "stock exchanges," "the press," and "trusts" while the branches of the German oak tree are labeled "industry, agriculture, commerce, the arts, business, the sciences, social welfare, civil service, and workers."[1428]

[1427] Cited from Johann Chapoutot, *The Law of Blood,* 400.
[1428] *Der Stürmer,* December 1917.

As historian Boaz Neumann has pointed out, the Nazis conceived of the *Volkskörper* (or people's body) in a very literal and biological way.[1429] In plenty of speeches and correspondence from Hitler, Himmler, and scores of other high-ranking Nazis, Jews and other unwanted peoples were continually described as parasitic vermin that had infiltrated the German body throughout the Weimar Republic.[1430] As Claudia Koonz has made clear, this form of biological racism remained a cultural undercurrent, while the glorification of the racially pure *Volksgemeinschaft* shaped the real sense of "insiders" and "outsiders."[1431] With the arrival of war in 1939 and feelings of national grievance permeating Germany, the Nazis involved in the Final Solution felt that only a similarly literal extermination of Jews and other internal threats could renew the health of the German nation.[1432]

According to this brutal logic, poison gas was the most fitting method for a technical extermination of now de-humanized pests.[1433] Indeed, historian Michael Thad Allen points out that the:

> Nazi terms for the gas chambers as 'disinfecting chambers' and 'sanitary installations' stems less from a need to avoid confronting the actual fact of killing through euphemism than from the actual technological trajectory within which these systems evolved.[1434]

[1429] See also: Martina Steber, "Regions and National Socialist Ideology: Reflections on Contained Plurality," in Heimat, Region, and Empire: Spatial Identities under National Socialism, 29.
[1430] Boaz Neumann, "The Phenomenology of the German People's Body (Volkskörper) and the Extermination of the Jewish Body", 156. It seems that some concentration camp inmates, in the face of incredible suffering, eventually took on their own de-humanization. For instance, the writer Tadeusz Borowski continually wrote of camp inmates as ants or a "wriggling mass of vermin." Tadeusz Borowski, This Way for the Gas, Ladies and Gentlemen, 24.
[1431] Clauia Koonz, The Nazi Conscience, 15.
[1432] Indeed, Hitler was quoted to say that "If valuable men had to die each day at the front, then it was really of no consequence if such vermin like the Jews were killed. They were no different from 'tuberculosis bacilli'." Beth A. Griech-Polelle, Anti-Semitism and the Holocaust: Language, Rhetoric and the Traditions of Hatred, 203.
[1433] Christopher R. Browning, Nazi Policy, Jewish Workers, German Killers, 47. ; Gideon Greif, "Between Sanity and Insanity: Spheres of Everyday Life in the Auschwitz-Birkenau Sonderkommando," in Gray Zones: Ambiguity and Compromise in the Holocaust and Its Aftermath, 40. ; In her 1951 work *The Origin of Totalitarianism*, Hannah Arendt wrote that "the Nazis' proclamations repeated ad neuseam, that the Jews would be exterminated like bedbugs (i.e. with poison gas), prevented anybody from not believing them." Hannah Arendt, *The Origins of Totalitarianism,*137.
[1434] Michael Thad Allen, "Ideology Counts: Controlling the Bodies of Concentration Camp Prisoners," in *Cultures of Control*, 195.

World War I warfare and the pesticide applications of the interwar period showed that gas could prove extremely lethal in a closed space, allowing Nazi doctors and SS members to conduct mass executions with little human contact. This is not to say that World War I or interwar experience with poison gas led directly to the implementation of gas chambers in the Holocaust. However, it does suggest an admixture of biological rhetoric and technological vocabulary seamlessly moved from one application to the next. As historian Paul Weindling puts it, "Overall, the institutions, technologies, and experts for pest control, once mobilized to combat…epidemics as racial threats, accelerated the 'final solution.'"[1435]

The Turn to Gassings: Cleansing the National Body through Ritual Fumigation

In October of 1939, the head of the Nazi Criminal Police, Arthur Nebe, asked his department's chemist, Albert Widmann, if they maintained the necessary amounts of poison gas "to kill animals in human form: that means the mentally ill, whom one can no longer describe as human and for whom no recovery is in sight."[1436] This question was related to the early stages of the T4 program, which, operated through the Criminal Technical Institute, had begun to euthanize mentally and physically disabled Germans in late 1938. Widmann's response was to send the mid-level SS functionary, August Becker, to the BASF factories in Ludwigshafen in order to procure gas cylinders to begin testing. In early trials, carbon monoxide gas was channeled through metal pipes into the rooms in which the disabled victims suffocated.[1437] The success of these early tests led to the Nazi employment of more than one hundred technicians to

[1435] Paul Weindling, Epidemics and Genocide in Eastern Europe, 1890-1945, 312.
[1436] Michael Burleigh, Death and Deliverance: 'Euthanasia' in Germany, c.1900 to 1945, 119.
[1437] Ulrike Winkler and Gerrit Hohendorf, "The Murder of Psychiatric Patients by the SS and the Wehrmacht in Poland the Soviet Union, Especially in Mogilev, 1929-1945," in Mass Violence in Nazi-Occupied Europe, 157.

operate six gassing installations throughout Germany.[1438] Located at Bernburg, Brandenburg, Grafeneck, Hadamar, Hartheim, and Sonnenstein, these installations and the chemists/physicians who ran them were responsible for the deaths of 70,273 people.[1439] In a cruel twist of fate, it was precisely those who were deemed most unable to survive the toxic world who were first gassed.[1440]

In 1941, the T4 Program was stopped due to public protest.[1441] The physically and mentally challenged often had familial connections to allegedly healthy Germans, thus assuring them a circumscribed place in the *Volksgemeinschaft.* This would suggest that the Nazi use of poison gas was not entirely dependent on ethno-racial or national belonging. Indeed, it appears that Nazi officials, like the Wehrmacht, realized that the Germans never fully controlled gas. Indeed, Hitler's possible fears of poison gas have already been documented and Joseph Goebbels reflected on the weapon's inherent caprice after visiting the scene of a 1936 underground railway fire in Berlin. He wrote in his diary, "We must only take care...that we are not involved unforeseen in a war. That would now be the most worrying thing that could happen…A huge heap of ruins. One gets an impression from it of what a future fire, air, and gas war will look like.

[1438] Gassing installations employed carbon monoxide, a gas that was never intentionally weaponized during World War I, to suffocate its victims. Many World War I soldiers did, however, die of carbon monoxide. This most often occurred when smoke suffocated men in dugouts or trenches. Throughout the 1920s, accidental carbon monoxide poisoning remained a serious point of concern in Germany, often discussed alongside phosgene and chlorine leaks such as the 1928 Hamburg Accident.
[1439] Each installation maintained a chief physician and one or two junior physicians alongside the necessary police force. Beth A. Griech-Polelle, Anti-Semitism and the Holocaust: Language, Rhetoric and the Traditions of Hatred, 134. ; Dagmar Herzog, Unlearning Eugenics: Sexuality, Reproduction, and Disability in Post-Nazi Europe, 44.
[1440] It is unclear if any of the World War I soldiers who developed "gas neurosis" were gassed by the Nazis. Nevertheless, it is fair to say that the gassed war veteran's voice was finally silenced under the Nazis. Jason Crouthamel, "Nervous Nazis: War Neurosis, National Socialism and the Memory of the First World War," 71.
[1441]Götz Aly and Susanne Heim, *Architects of Annihilation: Auschwitz and the Logic of Destruction*, 164. ; Cornelie Usbourne, "Social Body, Racial Body, Woman's Body. Discourses, Policies, Practices from Wilhelmine to Nazi Germany, 1912-1945," 154.

A gruesome vision!"[1442] With such concerns in mind, chemical weapons could not simply be levied against the enemies of the Reich without a certain level of technological protection and assumed risk. Pulling on the ideas of interwar theorists like Ernst Jünger, poison gas served not as a wonder weapon, but rather as a form of ritual baptism or cleansing that could determine the survivors and masters of a chemically impregnated world.

In this formulation, all Germans would inevitably have to pass through poison gas in order to prove their merit as supposedly technologically superior Germanic people, or in Oswald Spengler's terms "Faustian Men." This position fits with the RLB's insistence that Germans remain in their home towns and fortify themselves for aero-chemical attack. It further explains the Nazis willingness to apply gas to German citizens, albeit those who had no hope of protection. Historian Paul Weindling seems to agree with this interpretation, writing that "Immersion in a lethal gas was a baptism of destruction and cleansing—a macabre rite of purification in the name of the extinction of parasites and the conservation of resources."[1443] The extent of this ideological construction was perhaps best revealed in the popular 1933 Nazi film, *Hitler Youth Quex.* The plot of the film followed a family in which the communist father repeatedly beat the mother. In an effort to escape this situation, the mother attempted to commit suicide with her son by leaving the stove gas in their apartment on. The mother dies, but the son survives and ultimately goes on to join the Hitler Youth and to sacrifice himself for the German nation. Clearly, sacrifice is a recurrent theme and it is only through the death and survival of the gas that meaningful sacrifice becomes possible. In the Nazi mind, the sacrifice of lives in the gauntlet of poison gas appeared to the Nazis as a path to national rebirth.

[1442] Toby Thacker, Joseph Goebbels. Life and Death, 196. Goebbels also wrote about the "chaos" and "fermentation" that George Kaiser's play *Gas* inspired in him. See: Peter Longerich, Goebbels: A Biography (New York: Random House, 2015).
[1443] Paul Weindling, Epidemics and Genocide in Eastern Europe, 1890-1945, 91.

Of course, the Nazis' imagined gauntlet of poison gas was not just a requirement for the Germans. In fact, "racial undesirables" like Jews, people of mixed race, "asocials," and "delinquents" enjoyed even less protection as Nazi technocrats involved in the T4 Program shifted their focus towards the idea of national "disinfection."[1444] On December 8, 1941 at Chelmo, the SS first used three hermetically-sealed vans to gas local Jews.[1445] As the in war in the East became increasingly predicated on mobility, the SS expanded what they saw as an incredibly efficient operation to murder hundreds of thousands of Jews, gypsies, and mentally ill people on the Russian front.[1446] In 1942, the SS erected more permanent versions of these carbon monoxide chambers at the Belzec, Sobibor, Maidanek, and Treblinka camps. Many of the same SS technicians such as Erwin Lambert, Lorenz Hackenholt, and Christian Wirth who were originally employed in the T4 Program were sent to Poland in order to help run these top-secret installations. The head of the Waffen-SS's Hygiene Institute, Kurt Gerstein, and the Professor of Hygiene at the University of Marburg, Wilhelm Pfannenstiel, were assigned to the Belzec camp.[1447] There, prisoners were told to enter large shower rooms so that they could be "disinfected." Once the victims were inside, camp guards would seal the room and start large diesel engines to pump in carbon monoxide. These gas chambers were created an attempt to industrialize the killing and cremating of up to 150 people at a time.[1448]

[1444] The possibility of using gas on Jews in the East was first discussed by Heinrich Himmler and Odilo Globočnik on October 13, 1941. Globočnik was involved in the construction of the gas facilities at Belzec. Of course, the Nazi classification of "asocial" and "delinquent" also could include homosexuality. See: Clayton Whisnant, Male Homosexuality in West Germany, 15.

[1445] In the fall of 1941, gas trucks were tested on Soviet POWs at the Sachsenhausen concentration camp. Along with the Chelmo vans, others were sent to Riga and Ukraine. The gas vans were primarily used in territories closer to the borders of the Third Reich, while more far-flung areas experienced more mass shootings. Beth A. Griech-Polelle, Anti-Semitism and the Holocaust: Language, Rhetoric and the Traditions of Hatred, 184. ; Donald Bloxham, The Final Solution: A Genocide, 216.

[1446] Omer Bartov, Hitler's Army: Soldiers, Nazis, and War in the Third Reich, 66. Saul Friedlander, The Years of Extermination, 16. ; Walter Manoschek, "The Extermination of the Jews in Serbia," in National Socialist Extermination Policies Contemporary German Perspectives and Controversies, 180.

[1447] Nicholas Stargardt, The German War: A Nation under Arms, 1939-45, 252.

[1448] Henry Friedlander, The Origins of Nazi Genocide: From Euthanasia to the Final Solution, 96-97.

Creating still more parallels to pest control, the SS designed their early gas installations based on Degesch de-lousing chambers.[1449] However, these carbon monoxide gassings were not always well-executed industrial operations. The SS used discarded engines to produce the gas and often struggled to sufficiently seal the chambers. According to accounts like the Gerstein Report, these faulty installations could sometimes take up to half an hour to kill their victims. By October 1941, SS gassing technicians were ordered to find a more efficient method for the mass gassing of Soviet prisoners and Jews. Thus, they began testing Zyklon-B at the Sachsenhausen and Birkenau camps, relying on the expertise of Bruno Tesch and Gerhard Peters, two chemists involved in the production and sale of the pesticide.[1450] In early experiments, Zyklon-B proved that it could kill large numbers of humans at a faster pace and lower cost.[1451] The commandant at Auschwitz, Rudolf Höss, later testified to the trial basis of the entire ordeal:

> I must even admit that this gassing set my mind at rest, for the mass extermination of Jews was to start soon, and at that time neither [Adolf] Eichmann nor I was certain as to how these mass killings were to be carried out. It would be by gas, but we did not know which gas and how it was to be used. Now we had the gas, and we had established a procedure.[1452]

In 1942, SS engineers at Auschwitz began constructing ten cubic meter chambers with chutes for Zyklon-B pellets and built-in ventilation systems.[1453] While these gassing chambers

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[1449] Michael Thad Allen, "The Devil in the Details: The Gas Chambers of Birkenau, October 1941," 193.
[1450] Degesch, the supplier of Zyklon-B and a subsidiary of Degussa, sold 3.6 million Reichsmarks worth of fumigants between 1943 and 1944, mostly to the SS. Peter Hayes, "The Chemistry of Business-State Relations in the Third Reich" in *Business and Industry in Nazi Germany,*73. According to Rudolf Höss, the SS commandant at Auschwitz, Karl Fritzsch was the first to suggest using Zyklon B after testing it on Russian prisoners of war.
[1451] Zyklon-B was first tested at Auschwitz on September 3, 1941. Yitzhak Arad, The Operation Reinhard Death Camps, 9. ; Paul Weindling, "The Uses and Abuses of Biological Technologies: Zyklon B and Gas Disinfestation Between the First World War and the Holocaust," 296.
[1452] Yitzhak Arad, The Operation Reinhard Death Camps, 10.
[1453] Michael Thad Allen, "The Devil in the Details: The Gas Chambers of Birkenau, October 1941," 194. Zyklon-B was slowly lowered to the floor in Crematoriums II and III. For details on the construction of the various gas chambers see: Daniel Keren, Jamie McCarthy, Harry W. Mazal, "The Ruins of the Gas Chambers: A Forensic Investigation of Crematoriums at Auschwitz I and Auschwitz-Birkenau," 69. The ventilation systems were provided by the J.A. Topf und Söhne engineering firm. According to postwar testimony, Adolf Hitler "showed a direct interest in the development of the gas chambers" and the gas vans. Ian Kershaw, Hitler, the Germans, and the Final Solution, 109.

remained fairly crude in design, the use of pesticides for genocidal killing has remained the central image of the Nazi standardization and mechanization of murder. Once victims were ushered inside these so-called "disinfection chambers" and the gas was released, suffocation would usually occur within twenty minutes.[1454] Historian Konrad Jarausch has provided us with an unsettling first-hand description of the gassings from an SS man:

> A sergeant put on a gas mask and went to an air vent. He opened a can in his hand and poured the content into the opening. Immediately the cries inside got louder, because the powder in the can turned into a deadly gas…After a short while the shouts diminished and then ceased altogether.[1455]

Scholars estimate that several thousand people could be murdered in one day once the gas chambers were fully operational.[1456] Designed with efficiency as the leading precept, over one million people were killed in the four major gas chambers at Auschwitz.[1457]

Initial Interpretations

The story of chemical weapons in Germany, particularly during the Holocaust, has encouraged scholars to evaluate the role of technocratic thinking in the engineering of a

[1454] SS officers would hold stop watches to time the death. At times, victims would climb over top of each other and find pockets of clean air, which would delay the process. Raul Hilberg, The Destruction of European Jews Vol. III, 1041.
; N/2503/ (BArch-B) Sig 1721 ort 51 mag M 2 07 Reihe 64
[1455] Konrad Jarausch, *Broken Lives: How Ordinary Germans Experienced the 20th Century*, 211-212. One witness claimed that he never saw and SS man wear a gas mask when dropping Zyklon-B into the chambers. However, he admitted that this may have been done in other crematoria. Schlomo Venezia, *Inside the Gas Chambers: Eight Months in the Sonderkommando of Auschwitz*, 69. Indeed, the British picked up a coded German message in November 1942 that requested six hundred gas masks with special filters for Auschwitz. Some of these gas masks were set aside for the Sonderkommando units, who would enter the gas chambers to pull out and incinerate the dead bodies. When they entered, they often had to hose down the bodies to wash off the pockets of poison that could remain trapped between corpses. Richard Breitman, Norman J.W. Goda, Timothy Naftali, and Robert Wolfe, U.S. Intelligence and the Nazis, 31. ; Raul Hilberg, The Destruction of European Jews Vol. III, 1041-1042.
[1456] The gas chambers at Auschwitz were first pushed to capacity in the summer of 1944. Mary Fulbrook, Dissonant Lives: Generations and violence through the German dictatorships, 169. ; Donald Bloxham, The Final Solution: A Genocide, 251.
[1457] Eugen Kogon, Hermann Langbein, Adalbert Rückerl, eds. *Nazi Mass Murder: A Documentary History of the Use of Poison Gas*, 173. By 1942, Belzec could kill 15,000 people per day, Sobibor 20,000, and Treblinka 25,000. Naomi Baumslag, *Murderous Medicine: Nazi Doctors, Human Experimentation, and Typhus*, 62. ; Gideon Greif, We Wept Without Tears: Testimonies of the Jewish Sonderkommando from Auschwitz, 154, 271.

genocide. Admittedly, it is important to recognize the fact that most genocidal violence in World War II and the Holocaust was not conducted in the gas chambers; it was rather intimate violence enacted at close quarters.[1458] Focusing on this fact, of course, can drastically change the entire narrative and meaning of the Holocaust.[1459] However, it remains important to consider the gas chambers, even if they are not representative of the entire event. In fact, in many ways, studies of intimate killing in Eastern Europe ask perennial questions about human violence in a comparatively short historical lens, while studies of Nazi industrialized murder ask corollary questions about the possible connections between violence and science/technology throughout the modern period. Indeed, some scholars of the second line of inquiry have posited that the excitement of cutting-edge research and the belief that all science would eventually lead to progress ultimately stifled the Nazi technocrat's ability to empathize with human suffering and pain.[1460] Perhaps, for instance, this is what allowed Dr. August Hirt and his student Dr. Wimmer to conduct mustard gas experiments on prisoners at the Sachsenhausen and Natzweiler concentration camps between 1939 and 1945. In an attempt to find a pharmacological resistance to poison gas, Hirt and Wimmer entered gas chambers and rubbed mustard gas on 115 prisoners' bodies. The doctors then attempted to treat some subjects while leaving others to suffer and later die in the gas chambers.[1461] The former German chemist, Curt Wachtel, later defended poison gas research in a way that resonates with claims about scientific desensitization. He wrote, "A

[1458] Donald Bloxham, The Final Solution: A Genocide, 29.
[1459] Sometimes, the intimate violence of the Holocaust can be used to overstate the supposedly medieval methods and mindsets of the Germans. This was the case with Daniel Goldhagen's 1996 book.
[1460] Margit Szöllösi-Janze, "The Scientist as Expert: Fritz Haber and German Chemical Warfare During the First World War and Beyond," 19.
[1461] Alan F. Steinweis, Studying the Jew: Scholarly Antisemitism in Nazi Germany, 62. ; Florian Schmalz, "Otto Bickenbach's Human Experiments with Chemical Warfare Agents and the Concentrations Camp Netzweiler," in *Man, Medicine, and the State: The Human Body as an Object of Government Sponsored Research in the 20th Century*, 146-151. ; Alexander Mitscherlich, *Doctors of Infamy: The Story of the Nazi Medical Crimes*, 75-79. ; Michael H. Kater, Doctors Under Hitler, 237.

science guilty of creating the means of immeasurable destruction and human suffering may be considered more than fully exculpated through the great contributions to public hygiene and welfare which resulted from the same research on war gases."[1462] He continued, "Science itself is neutral; it equally serves the aims of the good and the evil. The scientist is devoted to science. The people and government determine, whether science should be used for destruction, defense, or construction."[1463]

Since Fritz Haber's early chlorine experiments, German scientists and engineers had repeatedly justified poison gas research and production in similarly utopian and/or agnostic arguments.[1464] They claimed that the creation of poison gas was not inherently immoral and that morality depended on the ways in which Germany employed their new weapons. As historian Peter Kenez has revealed, Nazi scientists and physicians felt similarly:

> The use of gas for killing people was not a crossing yet another moral boundary, it was simply a change of method, and from the Nazi point of view a more efficient way of carrying out their assigned task. The Nazis were experimenting: how to kill as many people as possible and as quickly as possible.[1465]

Indeed, poison gas actually appeared rather humane to many Nazi technicians who had watched people be shot, starved, and blown up in bunkers. Even Rudolf Höss, the SS commander at Auschwitz, personally found this technical method of genocide to be psychologically relieving, later writing of the gas: "I was always appalled by shootings, particularly when I thought of the women and children...Now I was relieved that we were going to be spared these bloodbaths."[1466]

[1462] Curt Wachtel, *Chemical Warfare*, 12.
[1463] Curt Wachtel, *Chemical Warfare*, 44.
[1464] Rudolf Hanslian described the "High Goddess of Science" as a double edged sword. "They can serve the good of humanity, but also lead to their ruin." Rudolf Hanslian, *Vom Gaskrieg zum Atomkrieg: Die Entwicklung der wissenschaftlichen Waffen*, 8.
[1465] Peter Kenez, The Coming of the Holocaust: From Antisemitism to Genocide, 264.
[1466] Frederic C. Tubach, German Voices: Memories of Life during Hitler's Third Reich, 92. ; Michael Thad Allen, "Introduction: A Bureaucratic Holocaust—Toward a New Consensus," in Networks of Nazi Persecution: Bureaucracy, Business, and the Organization of the Holocaust, 264.

Of course, this line of reasoning completely ignores the fact that poison gas was initially developed to elicit extreme human pain. The voices of men in the trenches of World War I made it appallingly clear how destructive gas could be. Furthermore, claims about the neutrality of science and technology repeatedly relied on a narrow conception of the term "use." Technologies, like poison gas, were and are not merely tools that humans can employ for their own ends. Rather, they are fully integrated into the structures of human life, shaping the social and cultural world that people inhabit. Theorist Langdon Winner has made this clear, writing, "As they become woven into the texture of everyday existence, the devices, techniques, and systems we adopt shed their tool-like qualities to become part of our very humanity."[1467] Thus, our technologies shape our political lives and ask us to evaluate the technological commitments of historical actors. Germany's 1915 development and use of poison gas in World War I fashioned a world in which the atmospheric extermination of human life became an ever-present question. Roughly twenty years later, in the hands of men driven towards the technical perfection of a biologically determined genocide, these technologies again revealed their fully destructive capabilities and assisted in a political and ethical system that championed death above all else.[1468]

Technocrats of all kinds were essential to the genocidal project of the Holocaust. In fact, the sociologist Zygmunt Bauman famously claimed that scientists and engineers served as the "prophets and priests" of Social-Darwinian Nazi ideology.[1469] This seems an overly dramatic statement when considering the vast range of scientific responses to the Nazi regime, but certainly many scientists and engineers did "eagerly" apply themselves to various technical

[1467] Langdon Winner, The Whale and the Reactor: A Search for Limits in an Age of High Technology, 12.
[1468] Eric Katz, "On the neutrality of technology: the Holocaust death camps as a counter-example," 420.
[1469] Zygmunt Bauman, Modernity and the Holocaust, 68.

problems involved in the Holocaust's mass gassings.[1470] Without their cooperation and guidance, the means of murder in the Holocaust would appear far more medieval to the contemporary cultural imagination.[1471] Equally important, the technocratic commitment to an amoral conception of science and technology made allowances for the development of this technologically assisted genocide.

While the gas scientists in this study did not directly work to engineer the Holocaust, they did promote the companies like Degesch, Dräger, and Auer that provided the technical means to create the gas chambers.[1472] Furthermore, they continually reified the envisioned future gas war and supported a chemical arms race that naturally fed into national and ethnic antagonisms. This should make us consider the overlap in values between the SS technicians who directly worked on genocidal methods, ancillary scientists and engineers like the gas specialists, and German civilians at large.[1473] Historian Michael Thad Allen has previously shown the ways in which the technocratic desire to "modernize" the Third Reich was very much tied to Nazi ideological convictions.[1474] For many German scientists and engineers, including many of the gas specialists, Germanic science and technology was a product of an essentialized national/racial ability. Poison gas, they claimed, was an inherently German weapon that relied on the powers of Germanic rational thinking. This again counters the claim that scientists and engineers were merely fulfilling their duty through the creation of value-neutral technologies under the Nazi regime. Given the continual desire for the efficient achievement of death that started in 1915 with the

[1470] Michael Thad Allen, *The Business of Genocide: The SS, Slave Labor, and the Concentration Camps*, 16. ; Eric Katz, "The Nazi Engineers: Reflections on Technological Ethics in Hell," 572.
[1471] Omer Bartov, Hitler's Army: Soldiers, Nazis, and War in the Third Reich, 12.
[1472] Jean Claude Pressac, "Engineering Mass Murder at Auschwitz" in *Death by Design: Science, Technology, and Engineering in Nazi Germany*, edited by Eric Katz, 46.
[1473] For similar arguments see: Götz Aly and Susanne Heim, *Architects of Annihilation: Auschwitz and the Logic of Destruction* (Princeton: Princeton University Press, 2015) ; Ingo Harr and Michael Fahlbusch, eds, *German Scholars and Ethnic Cleansing 1920-1945* (New York: Berghan, 2005).
[1474] Michael Thad Allen, The Business of Genocide: The SS, Slave Labor, and the Concentration Camps, 32.

research and development of poison gas, Germany's experience with chemical weapons up to 1945 was dominated by a mostly uninterrupted ideological commitment to human destruction. In 1961, the philosopher Karl Jaspers described this unique drive as a "new inhumanity" in which:

> combat is replaced by machinery, the victim cannot fight back, and the killer kills mechanically, without endangering himself in the moment of execution and without perceiving the act of killing as such, whether he is launching missiles that gut cities and will kill millions over thousands of miles or turning a handle to let gas stream into the chambers where hundreds are to die.[1475]

The only major difference in the development of poison gas under the Nazis versus that which had come before was the perceived level of control for the German aggressor.[1476] For this reason, it is interesting that most Nazi leaders, including Adolf Hitler, rarely spoke of poison gas in any public address. Hermann Göring's 1933 speech at a Nazi rally in Frankfurt on March 3, 1933 was one of the few to be permeated with the metaphors of gas.[1477] Charging the communists with poisoning the German nation, Göring encouraged his supporters to:

> Save the Germans in this bitter struggle with the eternally destructive poisons of Marxism, to make the German a valuable member of his nation again, to plant again the will to resist the tiring and lethargic suffocation of Marxism.[1478]

[1475] Karl Jaspers, The Future of Mankind, 52-53.

[1476] Omer Bartov, *Murder in Our Midst: The Holocaust, Industrial Killing, and Representation*, 49. A sense of control and advantage seems to have been central to the use of chemical weapons since World War I. In the 1920s and 30s, the Western powers often deemed the use of poison gas only suitable against non-Western peoples, such as in the Italian campaigns against Abyssinia. This was due to the native population's inability to defend against chemical weapons, their inability to retaliate with chemical weapons, and their inability to bring these issues to the international arena of law and public opinion. Aram Mattioli, "Entgrenzte Kriegsgewalt. Der italienische Giftgaseinsatz in Abessinien 1935-1936," 337. The Italians under Mussolini took racism and a sense of distance from the Italian nation into account when choosing to gas Abyssinians. Giulia Brogini Künzi, *Italien und der Abessinienkrieg 1935/36: Kolonialkrieg oder Totaler Krieg?,* 267. Similar dynamics were present in the Iraqi gassing of Kurds at Halabja in 1988 and the gassing of Syrian citizens that has occurred in the previous two decades. Joost R. Hiltermann, *A Poisonous Affair: America, Iraq, and the Gassing of Halabja,* 74. ; Michelle Bentley, *Syria and the Chemical Weapons Taboo: Exploiting the Forbidden,* 3.

[1477] After the Nazis staged a Polish attack on the German radio transmitter at Gleiwitz, Hitler addressed the German people on September 1, 1939, stating that: "He who fights with poison gas shall be fought with poison gas. He who distances himself from the rules for humane conduct of warfare can only expect us to take like steps. I will lead this struggle, whoever may be the adversary, until the security of the Reich and its rights have been assured." Roger Moorhouse, Killing Hitler: The Plots, the Assassins, and the Dictator who Cheated Death, 117.

[1478] Hermann Göring, Hermann Göring: Reden und Aufsätze, 21-22.

The general Nazi avoidance of such language raises questions about the meaning of poison gas for the regime. For technophiles like Göring, the availability of protective technologies like the gas mask proved that the Germans were chosen to dominate this chemically precarious world. While Göring was certainly willing to assert German dominance over poisonous chemicals during his tenure at the head of the *Reichsluftschutzbund*, other Nazi leaders were not so confident that the German public would agree. Their silence on the matter can be read as a particular attention to the possibility that chemical weapons might slip from their control. In this reading, the non-publicized use of gas in the Holocaust was part of the Nazis' reverent attitude to this arcane technology. By offering selected victims to the caprices of poison gas, the Nazis used the gas chambers as a form of controlled reconciliation with a dangerous and unknown chemical future. Indeed, the chambers were the shadow side of the gas mask, ensuring chemical death for those who maintained no protection. This argument is at least symbolically reinforced by the fact that so many Nazi leaders chose to end their own lives via poison once the Second World War had slipped from their grasp. Among those who chose to ingest cyanide rather than be captured, Hermann Göring, Max de Crinis, Richard Glücks, Odilo Globočnik, Heinrich Himmler, and Adolf Hitler were all directly involved in the use of, or protection against, chemical poisons.[1479]

Regardless of this historical outcome, neither Fritz Haber nor the Nazis were arguing in bad faith when they claimed that chemical weapons served as a distinctive assurance for German national security. Throughout the interwar period, perceived threats to national existence were

[1479] Max de Crinis was a leading psychiatrist involved in the T4 euthanasia program. Richard Glücks supervised medical practices in the death camps, including the use of Zyklon-B in the Final Solution. In another symbolic moment of retribution from 1946, an underground group of Holocaust survivors called NAKAM poisoned 3,000 loaves of bread with arsenic and sickened more than 2,000 German prisoners of war at the Langwasser internment camp. Jim G. Tobias and Peter Zinke, Nakam: Jüdische Rache an NS-Tätern, 44.

essential to the development of poison gasses and vice versa. Historian Michael Geyer has argued that a sense of unambiguous national superiority mixed with a constant sense of existential threat defined both the German way of war after 1918 and the "Nazi way of life and death."[1480] Chemical weapons appeared as both a possible proof of this biologically-rooted German superiority and an assurance against both external and internal threats. The losses of World War I, however, revealed the difficulties involved in safely harnessing the powers of poison gas. Once released into the air, gas had no master, and it could move with the wind in unpredictable ways. Therefore, gas protection might ultimately determine the winners and losers in a future chemical war. Playing on the widespread fears of aero-chemical attack, the Nazi search for an effective gas mask was not a humanitarian response to the evils of poison gas, but rather a technical quest for survival and mastery in a world that they themselves had poisoned. Visions of terror and protection were continually intertwined, feeding into each other and creating a political arena in which empty assurances of safety would assuredly win the day. For this reason, the gas mask, as the central object in aero-chemical protection, was/is inextricably linked to both a bounded history of German chemical weapons and the recurrently persistent human fears of chemical death.

This embodied reading of the mask has attempted to uncover the average German subjective experience with a newly unstable chemical world. The alien appearance of the gas mask in daily German life made both the novelty and the seriousness of chemical weapons unmistakable; in fact, it made it even more apparent to Germans that humanity was no longer the arbiter of existence. As Joseph Roth made clear in his essays on life in Berlin in the 1920s, technology (or "steady material") was now its own form of life, subjecting humans to its own

[1480] Michael Geyer, "How the Germans Learned to Wage War: On the Question of Killing in the First and Second World Wars," 48.

standard of resistance.[1481] The stuffiness and heat, the feeling of suffocation that Germans experienced when they put on the mask reinforced the life and death stakes of these new technologies. Thus, the mask served as the visual and tactile affirmation of the sense of risk and contingency that plagued Germany since the end of World War I.

In his famous 1938 work, *The Culture of Cities*, the American sociologist Lewis Mumford described technologies like the gas mask as a concrete result of modern life, leading to the:

> materialization of a skillfully evoked nightmare. The sirens sound. School-children, factory hands, housewives, office workers, one and all don their gas masks…Fear vomits: poison crawls through the pores. Whether the attack is arranged or real, it produces similar psychological effects. Plainly, terrors more devastating and demoralizing than any known in the ancient jungle or cave have been re-introduced into modern urban existence…Fear is thus fixed into routine: the constant anxiety over war produces by itself a collective psychosis comparable to that which active warfare might develop.[1482]

Mumford notably points out that the fear of imagined gas attacks is just as devastating to the citizens of the modern city as real violence. Germans certainly knew this constant anxiety in the 1920s, 30s, and 40s. The gas mask both intensified these feelings and seemingly offered the only potential salvation. By asserting the inevitability of a Second World War through its very materiality, the mask became a self-fulfilling prophesy, trapping Germans in a world of atmo-terrorism that only contained survivors and victims, all of whom were subservient to the technologies of poison gas. Playing it out on both ends of the spectrum as both the bombers and the bombed, this survivor/victim dichotomy appears central to the German experience of both poison gas and the gas mask. The insidious nature of gas destroyed human agency, while the gas mask offered potential salvation and/or control. Of course, this control did not come without conditions, namely the mask's territorializing and circumscribing of a mediated life.

[1481] Joseph Roth, What I Saw: Reports from Berlin 1920-1933, 106.
[1482] Lewis Mumford, *The Culture of Cities*, 275.

Nevertheless, with the encouragement of scientists and engineers with their careers on the line, many Germans grasped for the mask in an acknowledgement of the violently unstable zero-sum world that the Nazis posited.[1483] Trying to become the proclaimed masters of a chemically soaked modernity, these Germans tacitly sacrificed victims to their new god of industrialized violence since they believed that not all people could survive this chemical gauntlet. Those who actively embraced such a world, like the SS technicians at Auschwitz, donned their GM 38 military gas masks before pouring Zyklon-B pellets down on defenseless humans. In doing so, they transformed themselves into the executioners of their own chemical modernity.[1484] Nevertheless, it remains important to note that even these men later claimed that the gas "disagreed" with them and ultimately led to unpredictable health problems.[1485]

[1483] Reflecting the instability of the master/victim relationship in a chemically dangerous world, the SS converted Crematorium I into an air raid shelter in 1944. Daniel Keren, Jamie McCarthy, Harry W. Mazal, "The Ruins of the Gas Chambers: A Forensic Investigation of Crematoriums at Auschwitz I and Auschwitz-Birkenau," 73.
[1484] N/2503/ Sig 1721 ort 51 mag M 2 07 Reihe 64 (BArch-B) ; Eugen Kogon, Hermann Langbein, Adalbert Rückerl, eds. *Nazi Mass Murder: A Documentary History of the Use of Poison Gas,* 195. The GM 38 mask was produced by both the Auergesellschaft and the Dräger company. SS gas chamber operators used the GM 38 with a type J filter to protect against hydrocyanic acids like Zyklon-B. Jean-Claude Pressac, *Auschwitz: Technique and operation of the gas chambers*, 15-16.
[1485] Rebecca Wittmann, Beyond Justice: The Auschwitz Trial, 312.

CONCLUSION

While 1945 clearly demarcates an important curtailment of Germany's unique ties to chemical weapons, it certainly did not signify the nation's final confrontation with harmful chemicals or even chemical weapons. The Germans remained within a broader conception of a "chemical modernity" into which the world had been increasingly plunged since the discovery and synthesis of industrial gasses. Indeed, in this longue durée formulation of modernity, it is important to note the extent to which Europeans struggled with environmental concerns like industrial smoke abatement in the 19th century.[1486] Of course, the weapons of atmospheric terrorism like poison gas made such concerns far more universal and pressing. Immediately following the end of the Second World War, Germans would have to live among the real destruction wrought by the Allies' incendiary bombs. The literary scholar W.G. Sebald has found irony in the extent to which the Germans had to fight off the vermin and disease that proliferated in their ruined cities. Sebald writes, "the Germans, who had proposed to cleanse and sanitize all Europe, now had to contend with a rising fear that they themselves were the rat people."[1487] Even when the vestiges of the last war were finally removed, Germans then had to politically grapple with both the atomic bomb and napalm, weapons which conceptually resembled poison gas and its method of atmo-terrorism.[1488]

[1486] For more on 19th century smoke abatement and environmental concerns see: Frank Uekötter, The Age of Smoke: Environmental Policy in Germany and the United States, 1880-1970 (Pittsburgh: University of Pittsburgh Press, 2009).
[1487] W.G. Sebald, On the Natural History of Destruction, 34.
[1488] In her 1998 memoir, the American writer Joyce Maynard remembered her fears of atomic warfare from 1969. She wrote that they were "Not personal, individual fear but end-of-the-world fear, that by the time we were our parents' age we would be sardine-packed and tethered to our gas masks in a skyless cloud of smog." Thomas Robertson, The Malthusian Moment: Global Population Growth and the Birth of American Environmentalism, 162.

While the atomic bomb is often viewed as a conventional explosive, its emission of radioactive gas has perhaps always been the greater threat.[1489] In fact, upon its first use on Japan in 1945, various German scientists and newspapers assumed (in part, correctly) that the bomb was a form of chemical warfare.[1490] As the post-war world continued to unfold, Germans on both sides of the Iron Curtain certainly felt the immediacy of the nuclear threat. Situated in a potential ground-zero for an atomic war between the United States and the Soviet Union, Germans now frequently referred to their experience with chemical weapons to decry the new geopolitical situation.

By May 1955, the Americans had placed their first of many atomic weapons in West Germany, soon to be the most densely nuclearized country in the world.[1491] About 60% of West Germans opposed any American use of these weapons, even in retaliation. In American polls of nuclear attitudes, West Germans expressed their greatest fears by referring to their earlier anxieties of aero-chemical total war. They claimed, for instance, that, "Germany would become a desert. Everything would be lost," and that "any future war will be even more cruel."[1492] Several further stated their fears of radioactive dust, citing their "everlasting memories of the last war."[1493]

[1489] The reception of the atomic bomb as a large explosive device is primarily due to the U.S. military's public relations work. By insisting that there was no gas at the explosion sites in Japan, the Americans hoped to distance the atomic bomb from the legal and moral taboos of chemical weapons. Monica Braw, *The Atomic Bomb Suppressed: American Censorship in Occupied Japan*, 152. ; Janet Farrell Brodie, "Contested Knowledge: The Trinity Test Radiation Studies", in Inevitably Toxic: Historical Perspectives on Contamination, Exposure, and Expertise, 63-64.

[1490] When hearing of the successful use of the atomic bomb on Hiroshima, the German physicist Werner Heisenberg assumed that the bomb was "some chemical thing." Wolfgang Krieger, *The Germans and the Nuclear Question*, 11.

[1491] Jeffrey Boutwell, *The German Nuclear Dilemma*, 14. Of course, in places where atomic contaminants were released (like Chernobyl) conflicts over risk, mastery, and protection were eerily similar to those that played out during the era of aero-chemical fear. See: Kate Brown, *Plutopia*, 338.

[1492] Hans Speier, German Rearmament and the Atomic War: The Views of German Military and Political Leaders, 249.

[1493] German reactions to atomic weapons. Report. no. 216 (UIUC)

In this moment of renewed fear over atmospheric weapons, several distinct remnants of the interwar world resurfaced. The journal *Gasschutz und Luftschutz* rebranded itself as *Ziviler Luftschutz,* remaining under the direction of Rudolf Hanslian and Heinrich Paetsch until 1952.[1494] Focusing now on atomic warfare, the journal did not appear substantially different, encouraging West Germans to create communities of defense that sounded quite similar to the ideal collectives of the *Reichsluftschutzbund*. Futile atomic warfare drills like "duck and cover" revealed that atomic and chemical warfare created the same sense of protective futility that, according to experts, required mass psychological comfort. As such, nations around the world began to consider the possibility of creating an all-encompassing civil defense.[1495] If nothing else, nuclear protection experts argued that civil defense measures provided people with a sense of prepared security. Similar rhetoric, reminiscent of the earlier German gas specialists, led to the subsequent translation of the interwar works of Erich Hampe, who became an international figure in civil defense during the 1950s.

The American use of napalm similarly concerned the many West Germans who protested nuclear armament and the Vietnam War. Utilizing their own national memory of World War II fire bombings, these protestors pointed to the unique cruelty of incendiary chemicals.[1496] Indeed, over the next four decades, nuclear weapons, napalm, and nuclear power served as some of the central political foci for lingering German concerns over atmospheric destruction. However, in 1990, a more tangible connection to the chemical past was unearthed. When a geophysicist

[1494] Ziviler Luftschutz, 16 (1), 1952.
[1495] Edward M. Geist, Armageddon Insurance: Civil Defense in the United States and Soviet Union, 1945-1991, 154.
[1496] In 2019, the famous Vietnam War photo of "the napalm girl" won the Dresden peace prize. Kim Phuc Phan Thi, a victim of napalm bombing, became a symbol of the horrors of napalm after her image was published by a Vietnamese-American war photographer. The direct successors of napalm are the Mark 77 bomb and white phosphorous munitions. The use of incendiary bombs against civilian targets was outlawed in the 1980 United Nations Convention on Certain Conventional Weapons Protocol III. However, the United States has reserved the right to use incendiary weapons against military targets located in close proximity to civilians. Such weapons were dropped on Baghdad during the Iraq War, although the U.S. military claims that only military targets were killed.

surveyed an area of the Elbe River in the industrial part of Hamburg, he found large magnetic anomalies. This led to the discovery of two large barges that had been sunk by Hugo Stoltzenberg during the interwar removal of chemical weapons. These barges contained compromised barrels of phosgene and mustard gas, which had been slowly seeping into the river over the past sixty years or so.[1497] This led to careful surveys of all previous Stoltzenberg chemical sites, the chemical remediation of the soil, and the restriction of fishing in certain sections of the Baltic Sea.[1498] Overall, in the wake of the Second World War, many Germans became increasingly aware and skeptical of toxic chemicals and airborne inhalants, or what the sociologist Soraya Boudia has usefully termed the "residues" of industrial chemistry.[1499] Certainly, few pondered or questioned the chemistry behind the scenes of countless industries (like pharmaceuticals), but the days of a broad consensus on chemistry's naturally assumed progress were finished.[1500] Over the first half of the twentieth century, chemical weapons had proved to many that their potential destruction of both human bodies and the environment outweighed the chemical benefits. This awakened a new awareness of the chemically constructed environment and its many threats in Germany and around the world. Indeed, total war and its aftermath revealed the limits of humanity in manipulating its natural environment according to its wants. Environmental historian Linda Nash has written, "In the decades after World War II, it

[1497] Sinking drums in the North Sea, Baltic Sea, or Atlantic Ocean had long been the accepted means of chemical weapons disposal for Germany, Great Britain, France, and the United States. Simone Müller, "Cut holes and sink 'em": chemical weapons disposal and cold war history as a history of risk," 270.
[1498] Benjamin C. Garret, "Hugo Stoltzenberg and Chemical Weapons Proliferation," 23. A German engineer firm has identified a total 200 areas in Germany that may still be affected by chemical weapons production.
[1499] Soraya Boudia, et. al., "Residues: Rethinking Chemical Environments", 165.
[1500] The assumed benefits of chemistry are well illustrated in the 1940 film *Dr. Ehrlich's Magic Bullet,* directed by William Dieterle. In the film, Doctor Paul Ehrlich develops chemicals that can be injected directly into a patient's blood stream in order to combat various infectious diseases. Fighting against the doubts of other doctors, Ehrlich is depicted as a pioneer in antibiotic chemotherapy and his "magic bullets" are expressed as a gift to mankind.

became increasingly clear that human beings were not simply agents of environmental change; they were also objects of that change."[1501]

These brief examples of post-war German chemical concerns are again meant to remind us that the story of German chemical weapons between 1915 and 1945 sits within a much larger historical context that continues up to the present day. Since World War II, chemical weapons have been used in numerous contexts, with the obvious example being Middle Eastern military conflicts. As recently as May 2019, the President of Syria, Bashar al-Assad, likely used chlorine gas against his own people. As this case illustrates, chemical weapons are still, like in the German historical study, most frequently used to terrorize and pacify the defenseless. Interestingly, the *Süddeutsche Zeitung* has recently found that a German chemical wholesaler, Brenntag AG, sold the chemicals necessary to produce Syrian sarin gas in 2014. Some of these chemicals have been traced back to a Belgium-based BASF factory. Similar stories of German chemical company involvement in the Middle East have arisen over the past forty years, especially during the conflict between Iran and Iraq. Between 1978 and 1981, German firms helped to build Iraq's chemical weapons facilities as part of what was called Project 922.[1502] Several firms sent 1,027 tons of the chemicals required to produce mustard gas, Sarin, Tabun, and tear gas. These weapons were likely used against Iranian soldiers over the course of the Iran-Iraq War.

Of course, chemical weapons are not only used in military conflicts and tear gas remains one of the predominant methods of crowd control throughout the world.[1503] While non-lethal in

[1501] Linda Nash, Inescapable Ecologies: A History of Environment, Disease, and Knowledge, 7. ; Simo Laakkonen, Richard Tucker and Timo Vuorisalo, eds, The Long Shadows, 324.
[1502] Pol O. Dochartaigh, Germans and Jews Since The Holocaust, 184.
[1503] See: Anna Feigenbaum, Tear Gas: From the Battlefields of World War I to the Streets of Today (London: Verson, 2017).

small doses, tear gas has been known to suffocate people who are exposed to large amounts in a confined space. Still more have died in the moment of panic that tear gas can elicit from crowds. The example of tear gas points to the ways in which the definition of chemical weapons remains fuzzy and malleable. Environmental pollutants and industrial poisons often appear little different from traditionally-defined chemical weapons.[1504] This should remind us that since the Chemical Revolution, forays into pharmaceuticals, fertilizers, plastics, and other chemically synthesized products are immediately adjacent to the history of chemical weapons. Thus, the atmospheric threats of a much broader and older "chemical modernity" are ever-present in contemporary life. From terrorist plots like the 1995 Tokyo subway Sarin attack to carbon dioxide emissions and cigarette smoke, the composition of the air we breathe continually and perhaps increasingly occupies our minds. Don DeLillo's well-known 1985 novel *White Noise* makes clear this perennially modern theme. When the small college town of Blacksmith is affected by what is termed the "airborne toxic event," the townspeople in DeLillo's novel are forced to come to terms with the modern synthetic chemicals that regularly pass their notice. The novel's narrator states that:

> Soon there was a smell of acrid matter...A sharp and bitter stink filled the air, overpowering the odor of smoke and charred stone. It changed the mood of the people on the sidewalk...Whatever caused the odor, I sensed that it made people feel betrayed. An ancient, spacious and terrible drama was being compromised by something unnatural, some small and nasty intrusion...The odor drove us away but beneath it and far worse was the sense that death came two ways, sometimes at once, and how death entered your mouth and nose, how death smelled, could somehow make a difference to your soul.[1505]

[1504] Throughout the Cold War, the U.K. and the United States attempted to create weapons that intentionally blurred the distinction between environmental pollutant and chemical/biological weapon. For instance, in Britain's offensive against communist Malaysian insurgents, the British military tested chemicals that could destroy crops and starve the enemy. Jacob Darwin Hamblin, *Arming Mother Nature,* 67.
[1505] Don DeLillo, *White Noise,* 240.

Projecting towards the future, the perceptive difference between industrially produced chemicals and the so-called "natural" environment seems increasingly important. In a moment of increased concern for large-scale environmental/biological processes like climate change and global pandemics, the invisible toxins of the modern world appear progressively threatening.[1506] With imminent danger looming in the minds of many contemporaries, this project asks us to carefully consider the possibility or impossibility (or at least the large implications) of technological protection from our often-manmade atmospheric dangers. If we take seriously the idea that technologies always exist within webs of human intention, then chemical and biological threats are part of a much larger concern that cannot be solved by techno-fixes like gas mask distribution. Indeed, anthropogenic change invites us to re-write the history of the twentieth century with an eye towards the way in which the atmosphere has become the battleground in a newly pressing "struggle for existence." Even the German soldier's experience with the chemical weapons of the First World War makes this clear. Elucidating the importance of this historical experience for contemporary concerns, Historian Dorothee Brantz writes:

> During World War I the interrelationship of weaponry and the environment reached an unprecedented level in the sense that innovations in military technology, particularly heavy artillery and poison gas, led to a type of destruction that no longer focused exclusively on the killing of soldiers but instead aimed at the indiscriminate and total annihilation of everything. It was modern technology that made possible the mass slaughters that characterize twentieth-century warfare.[1507]

[1506] To realize the increased scholarly concern for environmental degradation, one can simply look to the explosion of historical literature on the subject, including three collected volumes since 2013. See: Soraya Boudia and Nathalie Jas, *Toxicants, Health and Regulation since 1945* (London: Pickering & Chatto, 2013) ; Soraya Boudia and Nathalie Jas, eds., *Powerless Science? Science and Politics in a Toxic World* (New York: Berghahn, 2014) ; James Rodger Fleming and Ann Johnson, eds., *Toxic Airs: Body, Place, Planet in Historical Perspective* (Pittsburgh: University of Pittsburgh Press, 2014) ; Scott Christianson, *Fatal Airs: The Deadly History and Apocalyptic Future of Lethal Gases That Threaten Our World* (Santa Barbara: Praeger, 2010) ; Edmund Russell, *War and Nature: Fighting Humans and Insects with Chemicals from World War I to Silent Spring* (Cambridge: Cambridge University Press, 2001) ; Frederick Rowe Davis, *Banned: A History of Pesticides and the Science of Toxicology* (New Haven: Yale University Press, 2014)

[1507] Dorothee Brantz, "Environments of Death: Trench Warfare on the Western Front, 1914-1918," in *War and the Environment,* 81.

The study at hand is an important corollary to Brantz's claims since, in this specific historical case, the often-ephemeral poison gases were not the only technologies that created a world in which both atmo-terrorism and systematic genocide was achieved. If we begin to employ Bruno Latour's Actor-Network theory to examine the development of chemical weapons, then we realize the innumerable connections between weapons of human annihilation and all other facets of the modern world.[1508] Uncovering the totality of this web would certainly be an unending task that may only dilute focus on the topic at hand. However, by extending our gaze down one central branch of entwined technological development—that of the gas mask—the way in which chemical weapons were intimately connected to more than just the search for human destruction becomes evident. Part of a value-laden technological order, the gas mask demanded the necessary acknowledgement and implicit acceptance of a modernity filled with poison gas while also generating an entire specialized field of gas protection. Gas masks simultaneously encouraged the development of more deadly and insidious chemical weapons and a vast array of protective devices. Gas suits, gas blankets, and gas shelters further attempted to encapsulate and seal off human beings, protecting them from the world that they had all, in one way or another, helped to create.

Interestingly, the uncanniness of the gas mask often seems to reveal the device's hidden intentions to us. DeLillo's novel again makes this apparent during the "airborne toxic event:"

> German shepherds still patrolled the town, accompanied by men in Mylex suits. We welcomed the dogs, got used to them, fed and petted them, but did not adjust well to the sight of costumed men with padded boots, hoses attached to their masks. We associated these outfits with the source of our trouble and fear.[1509]

[1508] Bruno Latour, Reassembling the Social, 46.
[1509] Don DeLillo, *White Noise*, 173.

Regardless of such initial visceral resistance, humanity clearly always run the risk of giving in to its greater fears of toxic exposure and then treating technologies like gas masks as magical protective talismans.[1510] The daughter of DeLillo's central character reveals as much:

> Steffie was still wearing the protective mask...She was solemn about warnings, interpreted danger as a state too lacking in detail and precision to be confined to a certain time and place...In the meantime the mask, setting off her eyes, dramatized her sensitivity to episodes of stress and alarm. It seemed to bring her closer to the real concerns of the world, honed her in its wind.[1511]

The gas mask's "honing" of DeLillo's young character is certainly disconcerting. But such self-inflicted technological discipline pales in comparison to collective imposition. Large-scale civilian regulation was certainly the case in Nazi Germany where gas mask discipline and training was not an option. Indeed, the communal rituals and visions that surrounded poison gas in the Third Reich were essential components in the Nazi relationship to the technological. Reflecting on other examples of Nazi technoscience, historian Tiago Saraiva has argued that emblematic fascist political designs were both envisioned in, and enacted through, the cultivation of organic matter like cotton, rubber, coffee, and even swine.[1512] As this present study has shown, the Nazis did likewise at an even more intimate and microbiological level, attempting to cultivate volatile toxic gasses in the larger fascist collective. Like this study, Saraiva has further revealed the importance of a perceived national insecurity for such coercive fascist endeavors. In the philosopher Michel Foucault's vocabulary, such actions were deeply biopolitical in that they

[1510] In doing so, we also run the risk of forgetting that social and economic inequalities are made all the more existentially threatening through environmental degradation and technological armoring. The most at-risk people, according to traditional metrics of class, are also often the most exposed to deadly contaminants. See: Dorceta E. Taylor, *Toxic Communities: Environmental Racism, Industrial Pollution, and Residential Mobility* (New York: New York University Press, 2014) ; Noémi Tousignant, *Edges of Exposure: Toxicology and the Problem of Capacity in Postcolonial Senegal* (Durham: Duke University Press, 2018) ; Sara Ann Wylie, *Fractivism: Corporate Bodies and Chemical Bonds* (Durham: Duke University Press, 2018).
[1511] Don DeLillo, *White Noise*, 161.
[1512] Tiago Saravia, *Fascist Pigs*, 14.

attempted to "take control of life, to manage it."[1513] Indeed, Foucault also saw the Nazis as the ultimate historical example of a modern regime underpinned by the attempt at total state biopower.

By dramatizing the omnipresence of death and destruction, the Nazis were able to begin the regulation and governance of both life and death. Foucault writes:

> Risking one's life, being exposed to total destruction, was one of the principles inscribed in the basic duties of the obedient Nazi, and it was one of the essential objectives of Nazism's policies. It had to reach the point at which the entire population was exposed to death. Exposing the entire population to universal death was the only way it could truly constitute itself as a superior race and bring about its definitive regeneration once other races had been either exterminated or enslaved forever.[1514]

In coordination with widespread fear, this ideological construction encouraged many Germans to hand over decisions on life and death to the regime. In this same vein, the state's distribution of survival technologies like the gas mask, which still always allowed for sacrificial German death, was intimately tied to the controlled gassing of "inferior races."[1515] In many ways, Foucault's conception of state biopower built on the post-war technological reflections of Martin Heidegger and his students. For instance, reflecting on the technological and totalitarian rationality of Auschwitz, Herbert Marcuse wrote in his 1964 text *One-Dimensional Man* that the Nazi death camp was "the setting in which the great human achievements of science, medicine, technology take place; the effort to save and ameliorate life are the sole promise in the disaster."[1516]

Through the institutionalized and ritualized allocation of gas death, the Nazis redefined terms like "humanity" and "life." Under their partially realized schemas of state biopower, in

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[1513] Michel Foucault, "Society Must Be Defended" Lectures at the Collège de France, 1975-1976, 261-262.
[1514] Ibid, 259-260.
[1515] Michel Foucault, *The History of Sexuality vol. 1*, 149-150.
[1516] Herbert Marcuse, One-Dimensional Man: Studies in the Ideology of Advanced Industrial Society, 123, 247. Historian Michael Kater that stated that it was the "exclusive prerogative of [Nazi] physicians" to select Jews for the gas chambers. Indeed, such physicians became the arbiters of life and death at Auschwitz. Michael Kater, Doctors Under Hitler, 182.

their most extreme and violent form, human life under the gas mask was no longer spoken about in qualitative terms. Indeed, the dangers of genocide and total war encouraged a view of life (and death) as purely quantitative—the actual states of living and dead were all that truly mattered. In turn, this simplification of life turned human beings into objects of the technological state, ready to be reserved, reallocated, reconstituted, or destroyed.[1517]

Perhaps most troubling, Saraiva and Foucault have both made it clear that lesser regimes of technoscientific rationality are regularly implemented in ostensibly democratic political systems. The increasing desire to control risk in an increasingly dangerous modern world, the continued existence of which is predicated on protective technologies, seemingly demands such centralized control of life and death. Recognizing the biopower at work in Covid-19 measures, the philosopher Giorgio Agamben has expressed his fear of the growing tendency to use the state of exception as a normal paradigm for centralized governance, thus normalizing restrictions and suspensions of daily life.[1518] Undeniably, the biological threat of Covid-19 bears many resemblances to the chemical menace of the interwar world and it is likely the case that various people will be exposed to its risks at unequal levels predicated on entrance into the exclusionary protective communities that we create. Now, it has become manifestly apparent, that the atmosphere of Mother Earth is the new ground on which both real and imagined struggles for existence are waged. While Agamben has tread into the dangerous waters of science denial to refute the dangers of Covid-19, this study is less concerned with scientific fact or consensus, which may never actually be reached. The greater concern here, which the fifth chapter has

[1517] Using the language of Martin Heidegger, the German studies scholar Todd Presner has argued that the victims of the gas chambers became a "Bestand" or standing reserve for the directives of the technological imperative. Todd Presner, Mobile Modernity: Germans, Jews, Trains, 225. A similar logic also seemed to operate in the medical community. Sabine Hildebrandt, The Anatomy of Murder: Ethical Transgressions and Anatomical Science during the Third Reich, 303.

[1518] See: Giorgio Agamben, "**The Invention of an Epidemic" ; Slavoj Zizik, *Pandemic! Covid-19 Shakes the World* (New York: Polity Press, 2020)**

hopefully shown, is the curtailment of other possible responses to bio-atmospheric threat and the wholesale adherence to the often naïve solutions of technoscientific prevention/protection.[1519] Indeed, thinking of life in qualitative terms, Foucault championed the human freedom to accept and face death individually, without the kind of biopolitical structures that the Nazis attempted to create. For, in the technoscientific solution, there is always the danger of reaching what historian Thomas P. Hughes called the "technological moment," or the time at which a given technology becomes integral to the society that created or incorporated it.[1520] At this very point, the technology, and often its relational web of technologies, become exceedingly difficult to manage and/or control. Indeed, they are normalized in the structures of daily life, thus becoming constitutive of human subjectivity itself.

As this project has attempted to show, in the search for mental and physical security, we run into the constant danger of embracing the chemically and biologically dangerous world that we wish to pacify or decontaminate. Atmospheric anxiety and bio-chemical fear can distract us from the deep and interlocking connections between modern protective technologies and the man-made dangers that continually threaten the modern environment. Since the German interwar experience, such dangers, in the specific form of chemical weapons, have been most closely imitated in the Middle East. In several instances in which war between Israel and its Middle Eastern neighbors appeared imminent, the Israeli government has distributed gas masks to its citizens.[1521] Most notably, in 1991, all Israelis received a gas mask due to the potential threat of Saddam Hussein's chemical weapons arsenal. At the height of the Persian Gulf War, gas mask

[1519] It seems that protective answers never trouble the underlying structures that have created the risk in the first place. The German case, the chemical weapons industry was never seriously dismantled.
[1520] Sandra Chaney, "A Chemical Landscape Transformed: Bitterfeld, Germany since 1980," 141.
[1521] In the 1967 Six-Day War, Israel received 20,000 gas masks from West Germany. In his public appeal to provide the masks, the SPD deputy Adolf Arendy claimed that "We cannot be silent when the Israeli people is threatened with genocide." Carole Fink, West Germany and Israel: Foreign Relations, Domestic Politics, and the Cold War, 1965–1974, 55.

distribution centers passed out cardboard boxes with the supposedly necessary devices so that civilians could sit in designated air raid shelters with their masks affixed. While no one was ultimately killed by Iraq's chemical weapons during the war, numerous Israelis reported feeling dizzy or out-of-breath while wearing their gas mask. Tragically, at least seven people suffocated after donning the mask and failing to remove the protective cap on their filter.[1522] This should remind us that the greatest threat to our atmospheric health is not only the airborne toxins themselves, but also the ubiquitous form of technoscience that has helped to produce the biologically and chemically precarious world that we now inhabit.

[1522] D. Huminer et al, "Untoward effects of gas masks during the Persian Gulf War," 582.

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