ALCHEMISTS, EPICS, AND HEROES: THE RHETORICAL CONSTRUCTION OF THE SEVENTEENTH CENTURY EXPERIMENTAL PHILOSOPHER

BY

JENNIFER O'MEARA

B.A., University of Michigan-Dearborn, 1997
M.A., University of Illinois at Urbana-Champaign, 1999

DISSERTATION

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in English
in the Graduate College of the
University of Illinois at Urbana-Champaign, 2007

Urbana, Illinois

Doctoral Committee:

Professor Carol Neely, Co-Chair
Professor Robert Markley, Co-Chair
Assistant Professor Zachary Lesser
Professor Jonathan Smith, University of Michigan-Dearborn

Abstract

This dissertation contributes to the cultural study of the history of science by examining the rhetorical construction of seventeenth century natural philosophy and natural philosophers in a literary context. I offer as the heart of my study an original interpretation of Thomas Sprat's *History of the Royal Society* as a prose epic. The way in which Sprat incorporates epic tropes such as the *in medias res* opening, the invocation and re-invocations of his muse, the epic journey and quest, the divine intervention in the human world, and the epic flashback reveals that the *History* actively participates not only in the seventeenth century revision of the epic genre, but also in the reshaping of seventeenth century English cultural values. The chapters surrounding my reading of the *History* illustrate two very different rhetorical strategies that were used to explain and legitimize the character of the new experimentalist. The first strategy attempted to use comparisons and contrasts between the experimentalist and the alchemist. This strategy was ultimately unsuccessful in that it could yield for the experimental philosophers a cultural reputation that was only as variable and as unstable as that of the alchemist himself. The second and ultimately successful rhetorical strategy drew parallels between the experimentalist and the epic hero in terms of their growth and prowess, masculine asexuality, and distinctive linguistic style, and between the experimental and the heroic quest in terms of its command over physical space, communal nature, battle against foes,

and specialized weaponry. These parallels, combined with careful discussion of the experimentalist's relationship to the divine, effectively constructed the seventeenth century experimental philosopher as the quintessential English national hero. My methodology of situating close readings of specific textual passages in their broader cultural context reflects my concerted effort to historicize rather than to theorize about the texts, an effort undertaken to give readers an understanding not only of the 'heroic' rhetorical and ideological construction of seventeenth century experimental philosophy and experimental philosophers, but also an appreciation for how these constructions drew upon and helped solidify the cultural values of mid-seventeenth century England.

To Mom and Dad

Acknowledgments

I send a heartfelt thank you to my 'final' committee members, Carol Neely, Bob Markley, Zack Lesser, and Jonathan Smith, for helping to straighten out the mess left behind by numerous former committee members. Thanks also to my family and friends for their constant love and support. I would not have finished this project without the encouragement of Mom and Dad, and the playful ribbing of Derek and Jackie Rose. This 'Ph.Duh.' is for you.

Table of Contents

Chapter 1: Introduction to Alchemists, Epics, and Heroes

In the early seventeenth century, Galileo Galilei made a series of historically significant observations about the heavens and the natural world. Perhaps the most famous – and certainly the most infamous – of these observations allowed Galileo to conclude that the Sun and not the Earth was the center of the Universe. Galileo's efforts to account for and explain this conclusion resulted in condemnation and imprisonment.

In the late seventeenth century, Edmond Halley likewise made a series of historically significant observations about the heavens and the natural world. The most famous of these observations allowed Halley to predict accurately the path and periodicity of the comet that now bears his name. For his contribution to the budding science of astronomy, Halley was widely recognized as one of the leading thinkers of his day.

~ ~ ~ ~ ~

The markedly different cultural receptions of Galileo and Halley are of course due to the complex interplay of the social, philosophical, political, and religious forces of their respective times and places. Galileo undertook his studies and published his controversial papers essentially from the epicenter of

the Catholic Church. Church officials were unwilling to allow anyone to pose a challenge to the Church's power and authority – let alone someone from their own backyard. It would perhaps indeed have been more surprising had Galileo *not* been summoned to the Holy Office. The cultural situation for Halley in England, on the other hand, was quite different. Unlike with Catholicism, there was no publicly overt conflict between Anglicanism and new 'science.' Political and religious authorities did not need to censure Halley because Halley posed no real threat to their power or control.

In as much as they are true, however, such general characterizations of seventeenth century Italian and English culture cannot fully explain the difference between the treatments of Galileo and Halley. Maurice A. Finocchiaro, for example, describes Galileo as a "master of wit and sarcasm," a man who had "a penchant for controversy" (10). These qualities alone may well have inspired some of the virulence with which the Inquisition went after Galileo. Halley, on the other hand, was warmly respected for his geniality and frankness. He also, however, was denied the Savilian Professorship of Astronomy at Oxford "almost certainly," according to Allan Chapman, for his unorthodox religious views (176). Again, we must look beyond general characterizations if we hope to gain a deeper understanding of why these events unfolded as they did.

This text is the result of my efforts to go beyond the general – the result of my search for something specific that might help explain why a man who studied the natural world in the early seventeenth century would be condemned and a man who studied the natural world in the late seventeenth century would be

celebrated. I began with the hypothesis that perhaps something had occurred in the mid-seventeenth century to facilitate this change. As is turns out, several things did indeed happen in the mid-seventeenth century that profoundly changed the way that men who studied the natural world were perceived and accepted. One of these things was the founding of the Royal Society of London.

The works of scholars such as Michael Hunter, Steven Shapin, and Peter Dear have greatly increased our understanding of the complex processes of institutionalization undergone by the Royal Society after its foundation in 1660. We know that this foundation created not only a new institution in the mid-seventeenth century cultural landscape, but also a new identity – that of the natural philosopher, also known as the experimental philosopher, or, more simply, the experimentalist. In the years immediately following this establishment, Royal Society advocates and apologists took up the task of fashioning the cultural identity of this new experimentalist. I use the term "fashioning" in the specific sense defined by Stephen Greenblatt, to mean their manipulation of "the cultural system of meanings that creates specific individuals by governing the passage from abstract potential to concrete historical embodiment" (3-4). In short, my text here examines how Society advocates and apologists rhetorically fashioned the identity of the experimentalist so that he could shed his reputation as an object of suspicion and derision, could withstand the satirical attacks by contemporary writers such as Samuel Butler and Thomas Shadwell, and could ultimately become the cause for cultural admiration and celebration.

My work can be generally characterized as belonging to the cultural study of science.[1] Like many – and, indeed, perhaps the majority – of my fellow cultural critics of science, I simply cannot assent to the idea that there was such a thing as the monolithic Scientific Revolution. Robert Boyle's famous air pump experiments teach us that nothing can remain vital in a vacuum. Even the most lively of ideas must exist in a larger cultural context.

If it is indeed impossible to identify the Scientific Revolution, I began to wonder what had made us think that it had occurred in the first place. The answer, of course, is complicated. One piece of it is the subject of my analysis: we inherited the notion that there was a Scientific Revolution during the mid-seventeenth century from the mid-seventeenth century 'scientists' themselves.[2] They *told* the world that a revolution was occurring – rhetorically constructed the notions that vast and fundamental changes in methodology and worldview were taking place.

My focus of my study here is both the literal meanings and the larger implications of what was said by advocates and apologists for mid-seventeenth century experimental philosophy. The actual words, phrases, and linguistic constructions that were used by Society advocates and apologists are, of course, fundamentally significant to their arguments as a whole. I also believe, however, that the full impact of those arguments for experimental philosophy and the

[1] Any study could, of course, be termed a "cultural" study – particularly when one considers that all studies are generated from, described with, and limited by language. I define as a "cultural study of science" one that seeks to situate and understand any of the various fields of 'science' in the larger political, religious, social, and intellectual milieus of their time.

[2] I will wherever possible avoid using the anachronistic terms 'science' and 'scientists' to refer to the experimental philosophy and the experimental philosophers of the Seventeenth Century.

experimental philosophers can only be grasped when their words, phrases, and linguistic constructions are understood in their larger mid-seventeenth-century cultural context. This belief puts me in very good critical company. Many scholars have studied both the language and the rhetoric that was used to describe and defend the Royal Society and its experimental philosophy. I consider my work here to be in dialogue with the work of four of these critics in particular: Brian Vickers, Peter Dear, Robert Markley, and Alvin Snider.

In "Analogy versus Identity," Brian Vickers explains the key linguistic differences between 'occult' pursuits, such as alchemy, and the 'scientific' tradition, which includes mid-seventeenth century experimental philosophy. He identifies as the fundamental difference between these two spheres of activity their oppositional treatments of words and analogies. "In the scientific tradition," Vickers asserts, "a clear distinction is made between words and things and between literal and metaphorical language. The occult tradition does not recognize this distinction: words are treated as if they are equivalent to things and can be substituted for them" (95). And if, indeed, the power with which the occult tradition invests words themselves is problematic to the experimental tradition, even more so are the powers bestowed upon the analogies that are made using them. Analogies for the occult tradition, Vickers continues, are "modes of conceiving relationships in the universe that reify, rigidify, and ultimately come to dominate thought" – quite contrary to their use in the 'scientific' tradition, in which they serve as "explanatory devices subordinate to argument and proof, or heuristic tools to make models that can be tested,

corrected, and abandoned if necessary" (95). Occult traditions such as alchemy simply invested too much power in words and language to coexist with experimental philosophy.

This issue of language, however, was certainly not the only matter over which alchemy and the new experimental philosophy were at odds. In his "Reassessment" article, Vickers describes the Royal Society as involved in two main "campaigns": one against alchemy, and the other against the radicals and nonconformists of the English Civil War period (45). Vickers points to both groups' imaginative languages and fundamental 'Enthusiastic' worldviews as reasons for the conflict. By positioning experimental philosophy in opposition to Enthusiasm, Sprat in his *History of the Royal Society* rhetorically reinforces the connection forged earlier by Robert Boyle between the Royal Society and the Anglican Church – between the experimental philosophers and a conservative respect for proper authority and order. In addition to being loaded with significant cultural implications that helped to shape the social, political, and religious identity of the experimental philosopher, this connection also helped to shape the intellectual and emotional identity of the experimental philosopher. When one is ruled by enthusiasm, Vickers explains, "the ideals of clarity, reason, and objective knowledge perceptible to the senses are said to have been overthrown by obscurity, irrationality, and perverse personal inspiration" (52). The experimental philosopher, on the other hand, is portrayed as immune to these and other

enthusiastic vices because he[3] is both physically and philosophically opposed to Enthusiasm.

At least part of the experimental philosophers' intellectual opposition to Enthusiasm rested in their changed notion of authority. As Peter Dear explains in "*Totius in verba*," the Royal Society rejected ancient authority in favor of experience. Significantly, this new experimental authority was formally grounded in rhetoric. According to Dear, "the Royal Society's empiricism was rooted in the authority of the individual reporter as the actor in a well-defined, particular experience" (157). The reporting of this experience in many ways drew its validity from its literary form: "rather than being a generalized statement of how some aspect of the world *behaves*, it was instead a report of how, in one instance, the world had *behaved*" (152, italics his). Failure to report experimental results in the proper format was – and, indeed, still is – to invite skepticism as to the validity of those results.

The single most important insight that I take from Dear is an awareness of the importance of rhetoric in seventeenth century experimental philosophy. Dear states this point most forcefully with his assertion that "the style of science espoused by the Royal Society was more important than the substance of that science" (159). As I believe that what was meant or implied by advocates and apologists for the Royal Society was equally important as what was actually said by them, so too do I believe that how advocates and apologists crafted their

[3] I use the pronoun "he" to refer to experimental philosophers throughout, as it is an unfortunate historical reality that women were excluded from the Royal Society. For the sake of uniformity, I also use "he" and "mankind" to refer to humanity in general, hoping that readers will grant me the broader understanding of both terms.

arguments for the Royal Society was equally important as the substance of the arguments themselves. Perhaps my most fundamental position in the pages that follow is that an understanding of both the specific rhetorical forms and the broader cultural significance of seventeenth-century discourse about experimental philosophy is essential to understanding the ultimate meaning and impact of that discourse.

Many excellent examples of how the discourse about experimental philosophy is intertwined with its larger cultural context are to be found in the work of Robert Markley. Markley explains in *Fallen Languages*, for example, that

> Boyle's rhetorical practice in his experimental essays is not, and is not intended to be, conceptually self-sufficient; it is part of an undifferentiated discourse that conflates the languages of Baconian experimentation, of Renaissance moral reflection, of upper-class apologetics, of latitudinarian theology, of Calvinistic distrust of the physical world, of masculinist constructions of nature, and of ideological moderation in the decades following the Civil War and Commonwealth. (220)

To read Robert Boyle's experimental essays only for their experimental content, then, is to miss the full impact of Boyle's texts – texts that simultaneously both inform and are informed by social, religious, and political ideals. One must recognize the interplay between Boyle's experimentalism and these ideals in order to understand the cultural position of experimental philosophy in mid-seventeenth century England.

Markley also calls attention not only to how certain experimental notions were culturally loaded, but also to how those notions were rhetorically useful to the experimental philosophy and its proponents. For experimental philosophy, for example, Markley asserts that concept of objectivity acted as the guarantor of "the disinterested pursuit of truth," served as the "conceptual weapon" that "subsume[d] disagreement within the experimental community," and performed as an adjunct to "the production of informed assent." Objectivity, he notes, also provided a "useful defense against the perceived enemies" of experimentalism by enabling the experimental philosophers "to portray themselves as having transcended political controversies and sectarian squabbling" (99). We can, of course, see the notion of objectivity as not only explaining these experimental ideals, but also rhetorically constructing them as well. As Markley asserts that physico-theological texts that he studies "construct the 'facts' of theology, science, and history rather than unproblematically reflect 'evidence,' 'facts,' or 'ideas'" (17), so too do I believe that the texts discussed in the pages that follow actively construct rather than passively explain the ideals and values of the seventeenth century experimental philosophers.

The particular section of Markley's text that is most immediately pertinent to my own argument emerges from the discussion of the experimental philosopher's simultaneous yet contradictory views of the natural world. Markley explains that one of the fundamental beliefs of the experimental philosopher was that "the physical universe is both unproblematic evidence of God's wisdom and an irrevocably fallen realm of sin and delusion" (123). The latter of these beliefs

is especially significant, as for the seventeenth century experimental philosophers, "the corruption of the material world is necessary to their self-perception as pious men overcoming their crises of faith in order to overcome the Devil" (128). Markley asserts that by studying the natural world, experimental philosophers "seek to redeem it," adding that "they are not only its students but its saviors, translating a fallen nature into an ongoing demonstration of God's power and benevolence" (128). This portrayal is in turn important because it ultimately leads to the "heroicizing of the natural philosopher" and puts natural philosophy on the verge of "claiming for itself the status of an epic" (128-29). Indeed, Markley goes on to characterize Isaac Newton's *Principia* and a number of Robert Boyle's works as "the epics of the new scientific ideology" (129).

This linking of experimentalism and epic leads finally to the work of Alvin Snider. In *Origin and Authority*, Snider discusses both experimentalism and epic, but his discussions occur in separate chapters. Snider's text can be seen as most directly influencing my own, however, when those discussions are read in relation to one another. If, indeed, epic was "an originary and authoritative genre" (14), and if it provided "a means for the members of a community to consolidate and articulate their collective experiences" (105), it stands to reason that using epic tropes and conventions to describe and discuss the Royal Society and its new experimental philosophers could have been an extremely effective way not only to construct the authority of the experimentalists, but also to establish the origins of the new experimental philosophy as firmly rooted in English cultural and national pride. This, I argue, is exactly the rhetorical strategy

adopted by many of the seventeenth century apologists and advocates who wrote on behalf of experimental philosophers, experimental philosophy, and the Royal Society.

I am of course aware of the fact that this argument is not an entirely new one. The point that the experimentalists were portrayed as heroes has become almost commonplace, and thanks to the work of scholars like Michael Hunter, William T. Lynch, Steven Shapin, and Shapin and Simon Schaffer, we have a relatively solid understanding of just how carefully constructed and negotiated the Royal Society's heroic reputation was. The particular contribution that I make to this growing body of cultural studies is to situate the heroic discourse surrounding experimental philosophy and the new experimental philosophers in its specific literary context. I argue that it is the rhetorical adoption and adaptation of the tropes and conventions of the literary epic that ultimately allows Royal Society advocates and apologists to construct and communicate their claims for the social, religious, and political importance of experimental philosophy and the experimental philosophers to the English nation.

My argument is simultaneously grounded in English literary and cultural history. We know, for example, that English writers and literary critics in the mid-seventeenth century were reassessing the qualities of the classical epic – redefining its characteristics and stretching its boundaries so that the epic genre itself could become more reflective of the aesthetics and values of contemporary English culture. William Davenant began his landmark *Preface to Gondibert* (1650) with a nautical metaphor, in many ways reminiscent of the famous

frontispiece of Francis Bacon's *Instauratio Magna* (1620), that called for English writers to 'go beyond' Homer in the same way that Bacon's frontispiece had encouraged mankind to sail past the Pillars of Hercules. The metaphor reveals that the time was ripe for the modification and expansion of the epic literary genre.

Certainly part of this modification was to realign the epic with seventeenth century English cultural values. A number of the heroic character traits that were celebrated in the classical epic were simply not valorized in seventeenth century England. Englishmen who had lived through the tumult and turbulence of the civil war period, for example, had understandably grown weary of warfare and leery of those who tended to settle disagreements with violent rather than peaceful methods. The pagan and in some cases divinely-descended hero of the classical epic also needed to be appropriately Christianized, and his proper respect for divine authority needed to be confirmed in light of contemporary religious beliefs. It was only with modifications such as these that the epic genre could truly be made to speak both for and to the mid-seventeenth century English audience.

I offer as the heart of my study an original interpretation of Thomas Sprat's *History of the Royal Society*. Situating the *History* in this literary context of changing and expanding notions of what could or should qualify as 'epic' ultimately allows us to read Sprat's text as itself an epic, or, less ambitiously, as a text that effectively utilizes the conventions of the epic genre to construct its nationalist argument. Either reading highlights Sprat as one of the English

writers who actively participated in the seventeenth century re-imagining of the epic genre's potential. Either reading also highlights Sprat as one of the writers who actively participated in the reflecting and reshaping of seventeenth century English cultural values. In this respect, Sprat's *History* is a work not only of rhetoric, but also of ideology. Although I in the pages the follow most often refer to Sprat's 'rhetoric,' do keep in mind that that this rhetoric has powerful ideological underpinnings in that it is intended to engage the existing religious, civil, and political power structures in seventeenth century English culture.

The chapters surrounding my reading of the *History* examine two very different rhetorical strategies that were employed by Royal Society advocates and apologists in their attempts to explain and legitimize the character of the new experimentalist. The first and ultimately unsuccessful strategy attempted to use comparisons and contrasts between alchemists and experimentalists to introduce the experimentalist into English culture. The second and ultimately successful strategy alternatively constructed the character of the experimentalist using tropes and conventions that were typically associated with the epic hero but that had been appropriately modified to reflect contemporary English cultural values. The three chapters in sequence illustrate how fundamentally dependent on rhetorical and ideological constructions the mid-seventeenth century cultural reputations of the Royal Society, experimental philosophy, and experimental philosophers actually were.

I have throughout the course of my research tried to combine two very different methodological approaches to the works that I have studied – one

focusing on the details and close reading of specific textual passages, and the other tending to the broader issues and implications of the texts at hand. While admittedly maddening on occasion, this hybrid methodology has served me well in that it has focused my efforts on historicizing texts and issues rather than theorizing about them. My hope is that readers will take away from my project an understanding not only of the 'heroic' rhetorical and ideological constructions of seventeenth century experimental philosophy and experimental philosophers, but also an appreciation for how those constructions specifically both drew upon and solidified the cultural values of mid-seventeenth century England.

Rather than beginning with an overview of the more successful attempts to define and explain experimental philosophy and the experimental philosopher, I begin instead with a chapter that examines one specific rhetorical strategy that was ultimately unsuccessful in this definition and explanation. This strategy involved using a series of comparisons and contrasts between alchemy and experimental philosophy, and between the alchemists and the experimentalists. In theory, this differential approach had the potential for success because both alchemy and the alchemists were widely familiar in mid-seventeenth century England. Advocates and apologists could refer to what the English public already knew about alchemy and the alchemists in their efforts to establish the nature of the new experimentalism and the character of the new experimentalist.

In reality, however, this comparative rhetorical strategy was a failure. While they were familiar in mid-seventeenth-century England, neither alchemy nor the alchemists had a single or a stable cultural meaning. Opinions of

alchemy, for example, ranged from solemn respect for it as a spiritual pursuit to downright contempt for it as a mere cheat. The alchemists likewise were viewed in a variety of conflicting ways – seen as both conservative and radical in politics, interpreted as both supportive of and in opposition to religion, and portrayed as both complex and one-dimensional in literature. These multiple and contradictory meanings created too many rhetorical variables for Royal Society advocates and apologists to control: virtually every comparison or contrast that they made between the experimentalists and the alchemists could be either deliberately contested or accidentally misunderstood.

This comparative strategy was additionally complicated by the fact that many members of the Royal Society were openly sympathetic to alchemy. The studies by J. Buchanan-Brown, K. Theodore Hoppen, and Donald R. Dickson show that a wide variety of Society fellows had alchemical interests. The two most prominent of these Fellows were of course Robert Boyle and Isaac Newton. Lawrence M. Principe has been instrumental in bringing Boyle's alchemical studies into critical focus, as have Betty Jo Teeter Dobbs and Richard S. Westfall for Newton's alchemical studies. Boyle's belief in transmutation was grounded in corpuscular philosophy, the theory of matter that he explains in *The Origine of Formes and Qualities.* We know that this text was also important to Newton, as it arguably influenced the conceptual worldview that he articulated in the *Principia.*

It was precisely because so many Fellows had interests in alchemy that Royal Society advocates and apologists both needed and failed to differentiate the experimentalists from the alchemists. Thomas Sprat's *History of the Royal*

Society was considered by many to be the institution's 'official' publication. Sprat's carefully qualified acknowledgement that there were benefits to be gained from a certain type of alchemist was thus rhetorically problematic in that it could seem to support the allegations leveled against the Royal Society by Henry Stubbe, the Society's most outspoken critic. In *Campanella Revived*, Stubbe ultimately exploits Sprat's alchemical sympathies to link the Society to the political chaos and social upheaval of England's recent past, and thereby blurs the distinctions that advocates and apologists were attempting to make between experimentalists and alchemists. Boyle's own efforts in *The Sceptical Chymist* to distinguish the language of the experimentalists from that of the alchemists had likewise been unsuccessful – a failure that undoubtedly contributed not only to the success of critics like Stubbe, but also to the success of satirists like Thomas Shadwell, whose play *The Virtuoso* ridicules nearly every aspect of experimental philosophy.

A number of other texts also contributed to the difficulty of distinguishing the experimentalists from the alchemists. Joseph Glanvill was one of the more prominent and prolific Royal Society apologists, and his *Plus Ultra* is often considered to be a supplement to Sprat's *History*. Glanvill's explanation of how the Royal Society has improved the art of chemistry, however, hinges on an alchemical image that metaphorically likens the experimentalists to alchemists. *Novum Organum,* the text in which Francis Bacon explains the inductive method championed by the experimentalists, acknowledges that the alchemists have made useful discoveries despite their haphazard experimental methods. And

Boyle's confirmation in *Certaine Physiological Essays* that experimental accidents and failures do indeed lead to valuable discoveries implies that the methods employed by the experimentalists may well have been more haphazard than was generally admitted. These rhetorical difficulties, combined with the historical reality that alchemy had multiple and contradictory meanings in mid-seventeenth century English culture, ultimately yielded a portrait of the experimentalist that was too hedged and qualified to be truly effective in defining and explaining his character.

This failure made it clear that advocates and apologists needed to compare the new experimentalist to a figure whose cultural meaning and significance was far more stable. The failure perhaps also made it clear that a definitive statement from the Royal Society itself would be helpful in the rhetorical effort to establish the nature of the new experimental philosophy and the character of the new experimentalist. I believe that it was due at least in part to these considerations that Thomas Sprat was commissioned in the early 1660s to write the *History of the Royal Society* – a text that, despite its potentially problematic acknowledgement of the alchemists, does indeed successfully define the character of the experimentalist.

Chapter three analyzes the rhetorical strategy employed by Sprat in the *History* to establish and legitimize the cultural identities of the new experimentalism and the new experimentalists. I here offer an original interpretation of the *History* as a prose epic, focusing particularly on how Sprat adopts and adapts the tropes and conventions of the literary epic in an effort to

explain the historical development, current benefit, and future potential of the Royal Society. My analysis can be situated intellectually among the work of critics like Michael Hunter, Steven Shapin, and Robert Markley who have already noted the heroic and nationalist elements of seventeenth century natural philosophy.

The *History* appeared at a time when the English public would have been ripe to recognize and understand the significance of Sprat's rhetorical strategy. John Dryden's *Annus Mirabilis* and John Milton's *Paradise Lost* were both published in 1667, the same years as the *History*, and both would arguably have encouraged readers to see the epic elements in Sprat's text. Although Milton was at the time a political outcast and therefore inverts many of the values traditionally associated with the epic, *Paradise Lost* employs many epic tropes, particularly in terms of structure. The initial proposition of subject, articulation of rhetorical purpose, *in medias res* beginning, temporal flashback, invocation and reinvocation of a muse, intervention of the divine in the human world, epic catalog, and theme of journey all appear in Milton's text. The fact that Milton employed these rhetorical tropes implies that seventeenth century readers were familiar with them and would likely have recognized them in Sprat's text as well.

The situation is similar with *Annus Mirabilis*. Dryden specifically avoids labeling *Annus Mirabilis* an epic and utilizing epic structural tropes. His poem on the whole, however, absolutely embodies the spirit of the classical epic. Sprat shares with Dryden not only the overall prophetic vision of England as the leader in international politics and commerce poised to inherit the natural and material

world, but also the specific views that London has been strengthened by the fire and plague, and that England will achieve intellectual and international mastery through the technological advances and practical inventions of the Royal Society. Readers of the *History*, like those of *Annus Mirabilis*, would undoubtedly have recognized this epic spirit.

The incorporation of epic conventions into the *History* ultimately allows Sprat to graft the cultural and national significance of the epic subject onto his own. The nationalism inherent in the epic tradition enables him to portray the Royal Society as the quintessential English institution of the post-civil war period: it represents the past glory, the present dominance, and the future triumph of the English nation. Redemption plays a significant role in this future triumph. As Milton ends *Paradise Lost* with the promise of the spiritual redemption of mankind, Sprat ends the *History* with the promise of the intellectual and material redemption of the English. Sprat in this way links faith in and the fate of the Royal Society with faith in and the fate of the English nation as a whole.

Sprat's rhetorical strategy did indeed successfully establish the status and significance of the Royal Society in mid-seventeenth century England. The strength of his approach, it should be noted, comes not only from the fact that it was rooted in a well-known and culturally stable literary tradition, but also from the fact that it incorporates and unites many of the other successful rhetorical strategies that were employed by Royal Society advocates and apologists. Some commentators, for example, urged support for the Society on the grounds that its pursuits would strengthen the English nation. Other commentators

defended the Society against charges that experimental philosophy as a whole was fundamentally opposed to religion. The comprehensiveness of the epic genre, however, allows Sprat to combine and glorify both of these arguments: because experimental philosophy offers the best method by which to learn about God's natural world, God will bless the Royal Society and through it grant the English nation redemption and prosperity.

Chapter four extends my discussion of the interplay between natural philosophy and the literary epic by examining the ways in which Sprat and his contemporaries adopt and adapt the conventions and tropes associated with the epic hero to define and explain the character of the new experimentalist. As I have noted, many critics have already commented on the heroicization of the experimental philosopher. My focus in this chapter, then, is not to echo the argument that the experimentalists were heroicized, but rather to illustrate how the experimentalists were heroicized – to illustrate that Royal Society advocates and apologists emphasized the character traits of the experimentalists that corresponded to the character traits of the epic hero that had been modified to reflect seventeenth century cultural values.

Like the rhetorical strategy employed by Sprat, the portrayal of the experimentalist as epic hero also incorporates a number of other successful rhetorical strategies that were used to establish the character of the experimental philosopher. Perhaps the most successful of these strategies, as discussed at length by Shapin and others, was the portrayal of the experimentalist as a gentleman. In the hands of Royal Society advocates and apologists, for

example, gentlemanly qualities such as civility, intellect, and religious devotion are transformed into the fundamental character qualities of the seventeenth century epic hero. This rhetorical strategy simultaneously constructs and confirms the experimental philosopher as that hero.

Advocates and apologists portrayed the experimentalists as having three specific character traits in common with the epic hero. The first is his early growth and prowess, achieved in an intellectual and emotional rather than a physical sense. We see this early maturity in Boyle's autobiographical "Account of Philaretus During His Minority" – a text of particular rhetorical significance given the fact, affirmed by Shapin, that Boyle was instrumental in establishing the identity of the experimental philosopher. "Philaretus" also reveals Boyle's embodiment of the second trait shared by the experimentalist and the epic hero: masculine asexuality. The experimentalist's distance from women and femininity was intended to affirm both his emotional and physical self-control, and his commitment to truth and knowledge. Abraham Cowley's "To the Royal Society," published as a prefatory piece to the *History*, not only portrays natural philosophy as a male pursuit, but also characterizes the linguistic style of the experimentalist as masculine as well. A distinctive linguistic style is the third trait that the experimentalist and the epic hero have in common. While the hero's style is poetic and violent, the experimentalist's style is unadorned and rational. This linguistic style, illustrated by Glanvill's revisions of *Plus Ultra*, endows the experimentalist with the authority and the power to capitalize on what Shapin calls the 'literary technology' of virtual witnessing.

Advocates and apologists also portrayed the experimental craft as similar to the heroic quest in four respects: its command over physical space, its communal nature, its battle against foes, and its specialized weaponry. Drawing on the spirit symbolized by the ship sailing through the Pillars of Hercules on the title page of Bacon's *Instauratio Magna*, both Glanvill and Edmond Halley celebrate that mankind is no longer constrained by intellectual or physical boundaries. Glanvill's "To the Royal Society" looks forward to the benefit and fame that the Royal Society will bring both to London and to England, whereas Halley's "On This Mathematico-Physical Work" memorializes Isaac Newton and his specific contributions to the experimental quest. Neither Newton nor any of the other experimentalists achieved his success alone, however, as the experimental quest was fundamentally a communal endeavor. The Royal Society and its *Philosophical Transactions* facilitated the advance and spread of new knowledge, and men like Robert Hooke worked tirelessly to record the observations, catalog the findings, fine-tune the experiments, and document the results that laid the foundations for their success.

Whereas the epic hero is in large part measured by his success in physical combat, the experimentalist is measured by his intellectual success in the battle against ignorance and the (con)quest to discover Nature's hidden secrets. Cowley not only likens the intellectual feats of the Royal Society to the physical feats of Hercules, but also uses military language and imagery to describe the experimentalists' conquest of Nature. Because it is portrayed by Cowley, Sprat, and many other advocates and apologists as a sexual one, this

conquest of Nature, as noted by critics like Carolyn Merchant, rhetorically emphasizes the raw power, control, and mastery that the experimentalists claimed to have over nature. The ultimate source of this mastery was the experimentalist's weapon, or the inductive method. Both this method and the knowledge derived from it were invested with a great deal of symbolic and functional power. In "A Brief Account of the new Sect of Latitude-Men," for example, Simon Patrick uses the language of combat and weaponry to argue that experimental knowledge will allow the religious community to defend religion against its detractors and enemies.

Tracts like Patrick's "Brief Account" were useful in helping to establish the relationship of the experimentalist to religion – a relationship that advocates and apologists needed to define clearly. Whereas the epic hero came from divine parentage, the experimentalists were instead portrayed as having three interrelated relationships to the divine. The first of these is between experimental philosophy and the divine. The *History* portrays the study of nature as an important component of spiritual religion and thereby emphasizes that experimental philosophy is in no way contrary to religion. The experimentalists themselves were likewise portrayed as having a harmonious relationship to the divine. Steven Shapin and Simon Schaffer note the rhetorical construction of the experimentalists as clergymen and of the experimentalist as a 'priest of nature.' Boyle's *Excellency of Theology Compar'd with Natural Philosophy* argues that the intellectual rigor of the experimentalists can be fruitfully applied to scriptural and theological studies, and Sprat argues that the study of nature brings the

experimentalists closer to God as they increase their knowledge and understanding of His natural world. In addition to the experimentalists as a group, certain individual experimentalists were also portrayed as having special relationships to the divine. We see these relationships not only in texts like Boyle's "Philaretus" and Halley's "Mathematico-Physical Work" that heroicize Boyle and Newton, but also in later texts like Alexander Pope's epitaph "Intended for Sir Isaac Newton," James Thomson's "To the Memory of Sir Isaac Newton," and Richard Glover's "Poem on Sir Isaac Newton" that likewise border on the deification of Newton.

The heroic transformation of the experimentalist did not occur immediately, of course, and the reputation of the experimentalist did indeed suffer its share of pitfalls and setbacks on his march through time. I consider it nonetheless important to study how the experimental philosopher was heroicized through the rhetorical adoption and adaptation of epic tropes and conventions because such studies ultimately further our knowledge not only of experimental philosophy itself, but also of the broader mid-seventeenth century English culture out of which experimental philosophy grew. The texts that I examine throughout my study here offer important historical insight into how literature – a pursuit today too often considered as antithetical to 'science' – was used to justify the existence of the experimentalist, the Royal Society, and experimental philosophy as a whole. Indeed, if readers take from my text only this single insight, I will consider my work here to be a success.

~ ~ ~ ~ ~

I have wherever possible preserved the original capitalization, italics, and spelling of the material I have quoted. I alone accept responsibility for any and all errors that may appear in the text that follows.

Chapter 2: Experimentalists and Alchemists

When the Royal Society was founded in 1660, experimental philosophy and experimental philosophers were officially introduced into English culture. The task then fell to Society advocates and apologists to educate the English public not only as to what this philosophy was and who these philosophers were, but also as to why and how these new philosophical and experimental endeavors would benefit the English nation. Scholars interested in the cultural study of the Royal Society rightly interpret this task as a fundamentally ideological and hence rhetorical one. Their studies collectively illustrate that Society advocates and apologists successfully used a variety of rhetorical strategies to create the cultural persona of the experimental philosopher.

One strategy, for example, used the metaphor of the two books to situate experimental philosophy in the religious realm. This popular metaphor likened the book of Nature to the book of Scriptures, and thereby portrayed God's natural world as an equally important object of study as was God's written word. This metaphor functioned rhetorically to legitimize experimental philosophy by, as Robert Markley explains, "minimizing the epistemological problems of scientific investigation by justifying natural philosophy as a means to a theological end" (42). The metaphor likewise legitimized the role of the experimental philosopher as well: these men could be seen as the 'priests of Nature' who were capable of reading God's natural work and revealing its messages to mankind as a whole.

This metaphor thus constructs the experimental philosopher as a figure capable of teaching man about himself, the natural world, and his rightful place in that world.

Another successful rhetorical strategy employed by Society advocates and apologists situated experimental philosophers in the social realm. This strategy emphasized the status of the experimental philosopher as an English gentleman, and thereby served to graft the positive traits associated with gentility onto the character of the experimentalist. Certainly one of the more significant of these traits was truthfulness: Steven Shapin asserts that "the social practices mobilized around the recognition of truthfulness, the injunction to truth-telling, and the interpretations of why gentlemen were, and ought to be, truthful were central to the very notions of both honor and gentility" (67). In effectively mapping gentlemanly notions such as inherent truthfulness onto the character of the new experimentalist, advocates and apologists constructed the experimental philosopher as a reliable, respectful, and respectable cultural figure.

Still another successful rhetorical strategy situated the Royal Society and its experimental philosophers in the political realm. This strategy highlighted the commitment of natural philosophy to values such as the peaceful resolution of dispute, and thereby portrayed experimental philosophy as a viable model for civic reform. As the tempestuous Civil War period came to a close, the English actively sought to foster the peace that had been shattered. Because it focused on intellect rather than passion, and on agreement rather than dissent, experimental philosophy could serve, as William T. Lynch puts it, as "the

exemplar for enforcing orderly discourse in Restoration society" (177). By portraying the experimental philosopher as a living embodiment of experimental philosophy's dedication to peace and learning, then, advocates and apologists for the Royal Society constructed the experimentalist as the English civic ideal.

Rather than rehearsing these successful strategies, however, my chapter instead examines one particular rhetorical strategy that ultimately failed to justify the place of either experimental philosophy or experimental philosophers in mid-seventeenth century English culture. This strategy attempted to define and explain the new experimentalism and the new experimentalists through an extended series of comparisons and contrasts to alchemy and alchemists. Alchemy resonated throughout the political, religious, and literary realms, and the alchemist was a well-known cultural figure during this time. This ubiquity created an excellent rhetorical opportunity for Royal Society advocates and apologists. Because their contemporaries were already aware of alchemy and alchemists, advocates and apologists could draw similarities and highlight differences between alchemy and alchemists and experimental philosophy and experimental philosophers in their efforts to introduce and establish the latter in English culture.

This strategy proved to be more difficult than anticipated, however. While cultural references to alchemy and the alchemists may themselves have been ubiquitous, the uses and interpretations of those references varied wildly. What to one Englishman was a solemn and deeply spiritual pursuit was to another a pernicious deception, and to another merely a laughable waste of time. In reality,

alchemy and alchemists had such contentious cultural reputations in mid-seventeenth century England that nearly every comparison or contrast made to them by Society advocates and apologists could be either deliberately misinterpreted or accidentally misunderstood. The attempt to establish and legitimize the cultural reputations of experimental philosophy and the figure of the experimental philosopher by comparing and contrasting them to alchemy and the alchemists was thus inevitably a failure.

Further complicating the attempts in particular to differentiate experimentalists from alchemists was the historical fact that many members of the Royal Society had a respect and appreciation for alchemy. Alchemical matters were discussed among Society fellows, alchemical works were held by the Royal Society library, and papers on alchemically relevant topics were published in the *Philosophical Transactions*. We know that alchemical ideas and notions helped shape the experimental theories of Robert Boyle and Isaac Newton, the two most prominent Society fellows of the seventeenth century. And while the developing rhetorical conventions of experimentalism itself forced the two to obliterate the references to the hermetic roots of their theories, the contemporaries of Boyle and Newton were indeed aware of the influence that alchemy had on those theories.

Given the number of experimentalists that had alchemical sympathies, it is arguably no surprise that Royal Society advocates and apologists were unable to differentiate experimentalists from alchemists. Their unsuccessful rhetorical attempts fall into five general categories that I describe as the who, what, where,

why, and how of the experimentalist: who he is, what he does, where (and with whom) he works, why he undertakes his studies, and how he will achieve his goals. In order to establish the experimentalist as a valuable member of English culture, advocates and apologists needed to explain clearly and unambiguously each of these character elements. Their ultimate inability to define any one of these character traits with clarity and precision, however, ultimately illustrated the need for advocates and apologists to employ an entirely different rhetorical strategy in order to legitimize experimental philosophy and the experimental philosopher in mid-seventeenth English culture.

Arguably the greatest factor that made it difficult for advocates and apologists to contrast alchemists and experimentalists was that alchemy itself had no single or unequivocal meaning in the mid-seventeenth century. Alchemy, alchemists, and alchemical ideas all surfaced in complex and contradictory ways in English politics, religion, and literature. Some scholars, for example, have claimed that alchemy had radical associations during the Interregnum. Keith Thomas asserts that "the radical sects set out to revive all the occult sciences" (375) and that "alchemy was closely linked with religious enthusiasm" (270). Christopher Hill likewise notes that "alchemy / chemistry, and especially chemical medicine, had radical associations" and that "chemistry became almost equated with radical theology" (290) during that tempestuous period.[4] Advocates and apologists at the Restoration therefore attempted to distance the Royal Society from alchemy and its radical associations: Michael Heyd recognizes in Thomas

[4] For more recent discussion of the relationship between chemistry and mid-century radicalism, see Malcolm Oster's "Millenarianism and the New Science" and "Virtue, Providence, and Political Neutralism."

Sprat's *History of the Royal Society* a conscious effort "to portray the new experimental philosophy as an effective 'antidote' to enthusiasm" (423).

These efforts, however, were not entirely successful, as other scholars note. Heyd explains that "in the eyes of its critics, the experimental practice of the new science was easily confused with the empirical tendencies of the alchemists or the quack doctors" (431), and J. V. Golinski discusses at length how the Phosphorus demonstrations even in the 1670s still "put at risk the public image of the natural philosopher, who became liable to be confused with a conjurer, showman, or wondermonger" (24). Such confusions, of course, are precisely what Royal Society advocates and apologists were attempting to deter.

Given alchemy's radical associations, Hill's assertion that the iatrochemists and alchemists "found themselves spurned by official scientific bodies" (295) indeed seemingly makes a good deal of sense. Because England itself was eager to put the radicalism of the Civil War period behind it, it likewise makes sense to expect that alchemy would have been forced deeply underground following the Restoration. This is not the case, however. Rather than being spurned or driven underground, alchemy in many ways actually became legitimized by the scientific and political institutions of the mid-1660s.

J. Andrew Mendelsohn's 1992 reassessment of the political associations that alchemy had between 1649 and 1665 contains two key points. The first is that during the Civil War period, both radicals and royalists alike "could read into chymistry what they wanted to find there and could use its code for disparate purposes" (42). This point challenges the belief that alchemy necessarily (and

only) had radical associations, and effectively refocuses alchemical ideas and philosophies as rhetorical tools that could be used for differing political purposes. The second point is that for a time after 1660, there were open ties between the monarchy and alchemy. Nicaise Le Fèvre served as apothecary-in-ordinary to Charles II upon the Restoration; citing both this evidence that "when the king returned after the Revolution, he thus returned with an alchemist" (30), and the fact that both the court and government supported the Society of Chymical Physitians (66), Mendelsohn challenges the previous critical belief that alchemy was chased underground after 1660. Further corroborating the point that alchemy was both popular and visible during this time is that "between 1650 and 1680, more alchemical books were published in England than before or since" (72).

In addition to its contradictory reputations in the political realm, alchemy was also seen in the mid-seventeenth century as a pursuit that could either foster or oppose religion and spirituality. The quack doctors who sold chemical remedies with false promises of health and the fraudulent alchemists who swindled money and valuables with false promises of wealth were indeed far from pious or devout. One of the primary goals of alchemy could also be seen as being at odds with religious beliefs. The Elixir of Life was a medicinal potion much sought after and believed by alchemists to have the power not only to restore its takers to perfect health, but also to make them immortal. This Elixir was problematic to critics of alchemy for two reasons. First, a common mid-seventeenth century belief was that sickness and poor health was a punishment

from God: supporters of monarchy and Charles I, for example, often pointed to John Milton's blindness as a divine punishment for his sinful republicanism, a charge that Milton explicitly notes in the *Second Defense* (1654) with his assertion that "my enemies boast that this affliction is only a retribution for the transgressions of my pen" (825). A second religious belief – and an even more fundamental one than the first – was that death was a punishment from God for mankind's original sin. In the face of these beliefs, either the alchemical pursuit of the Elixir of Life or the actual Elixir itself could be considered an hubristic attempt to challenge or subvert God's authority.

On the other hand, however, alchemy could also be seen as a deeply spiritual pursuit. Thomas explains that the esoteric alchemists "thought of themselves as pursuing an exacting spiritual discipline, rather than a crude quest for gold," and that for them "the transmutation of metals was secondary to the main aim, which was the spiritual transformation of the adept" (269). Stanton J. Linden further explains that these alchemists "set forth the religious and ethical implications" of their art by

> devising or reaffirming the intricate systems of correspondence and analogy between chemical processes and interactions occurring within their alembics and spiritual transformations taking place within their own hearts and souls. In each case the desired end was purification and perfection: the attainment of the philosopher's stone or the moral and spiritual regeneration of a believer whose

soul, through God's grace, has been fitted for salvation. ("Alchemy" 103)

For the spiritual alchemists, the world of man was analogous to the world of nature. As man had been debased by the Fall, so too had 'base' metals been degenerated from gold. As man could be redeemed and his initial spark of divinity be rekindled though a process of spiritual regeneration, so too could base metals be restored to their original state of purity through a process of material transmutation.

Significantly, the esoteric alchemists were not the only ones to see this spirituality in their craft. Robert M. Schuler illustrates that "the material process of alchemy as relating to spiritual regeneration" was recognized in differing ways by various religious groups (317), as during the early to mid-1660s, "moderate Anglicans, orthodox Calvinists, and radical Puritans alike could find in alchemy something to harmonize with their very different religious beliefs and experiences" (294). It was, then, not only the alchemists but also a wide range of mid-seventeenth century Englishmen who saw alchemy as a meaningful adjunct to religion.

Alchemy in seventeenth century English literature was also subject to widely contradictory portrayals. Linden explains that alchemy had since the Middle Ages been viewed as "little more than a crude form of deception" and that alchemists themselves had been "universally known as cheats and impostors" (*Darke Hierogliphicks* 63). This image is perhaps nowhere more vividly reflected than in Ben Jonson's *Alchemist*, which, although first performed in 1610, was

among the first plays staged when English theaters reopened in 1660. Jonson's fraudulent alchemist, aptly named Subtle, is portrayed as a duplicitous mastermind, and alchemy itself, in the words of one of Subtle's dupes Surly, is depicted as "a pretty kind of game, / Somewhat like tricks o'the cards, to cheat a man / With charming" (2.3.180-82). Satirical works like the *Alchemist* did indeed help shape the public perception of alchemy as synonymous with scandal and infamy.

This portrayal is different, however, in the poetry of John Donne and George Herbert, which often utilizes alchemy as a rich and complex metaphor. Linden describes both Donne and Herbert as understanding the "full range of denotations, connotations, and associational nuances" of alchemy and as recognizing its "potential in meeting the intellectual, spiritual, and imagistic demands of the new metaphysical poetry" (155). In "Easter," for example, Herbert uses an alchemical metaphor to celebrate the spiritual regeneration that will take place at the resurrection, when the Lord will transmute mortal "dust" into spiritual "gold" (5-6). Herbert likewise portrays conscientiously living for God as the agent of transmutation in "The Elixir": this, he says, "is the famous stone / That turneth all to gold" (21-22). Because the spiritual and emotional touch of God purifies and perfects all whom are touched by it, God is in this poem both the "famous stone" and the Elixir of Life. These poems illustrate Herbert's solemn use of alchemical imagery to symbolize the transformative power of religion.

Donne's use of alchemical imagery is both wider and more complex than Herbert's. He does indeed employ negative or satirical references to alchemy, such as in "Love's Alchemy," where he characterizes the ability to find happiness in love as an "imposture" similar to an alchemist's fruitless search for "the elixir" (6-7). He also, however, utilizes alchemical imagery like Herbert to depict positive transformations, such as in the "First Anniversary," where Elizabeth Drury is described as having been able to "purify / All, by a true religious alchemy" (181-82). What particularly distinguishes Donne's use of alchemy, though, is the complexity with which he deftly employs its language and imagery. "A Nocturnal upon S. Lucy's Day," for example, is underpinned by an awareness of the potential for positive alchemical transformation. Donne, however, then inverts these images to convey his feelings of profound emptiness at the loss of a loved one: his speaker explains that "I am every dead thing, / In whom love wrought new alchemy" (12-13); that "I, by love's limbeck, am the grave / of All, that's nothing" (21-22); and that "I am by her death (which word wrongs her) / Of the first nothing, the elixir grown" (28-29). Only when one understands the positive transformation that love could have wrought in the speaker – the positive transformation that could have been expressed with these same alchemical images – does the depth of the speaker's emptiness become clear. Alchemy in this way serves for Donne as a serious and solemn poetic metaphor.

Alchemy in mid-seventeenth century England could thus be understood or interpreted in a variety of contradictory ways: radical or conservative in politics, in opposition or as an adjunct to religion, as a one-dimensional satire or a complex

metaphor in literature. The fact that neither alchemy nor the alchemists had a single or a stable cultural meaning created an inherent difficulty for Royal Society advocates and apologists. Their comparative rhetorical strategy could only yield for experimental philosophy and the experimental philosophers a cultural reputation that was as variable and as unstable as that of alchemy and the alchemists themselves.

Given the fact that alchemy historically has been portrayed as antithetical to the new experimental philosophy, we might perhaps expect the reputation of alchemy and the alchemists to fare relatively poorly among the experimentalists. In actuality, however, it is clear that many Royal Society fellows had an active interest in alchemical pursuits. Cultural studies of mid-seventeenth century experimental philosophy have revealed not only the extent of alchemical interest among some of the more prominent experimental philosophers – Boyle and Newton among them – but also the ways in which these philosophers translated ideas and concepts taken from their alchemical studies into what we today know as their modern 'scientific' ideas. Indeed, far from being scowled at and disappearing into a fanciful past, alchemy appears to have had a powerful influence among mid-seventeenth century experimentalists.

There are many noteworthy connections between alchemy and the Royal Society. The institution itself, for example, was modeled after Salomon's House in Francis Bacon's *New Atlantis*, a text that is sometimes read as having hermetic or alchemical undertones.[5] J. Buchanan-Brown indicates that the

[5] One of the more (in)famous of these readings appears in chapter nine of Frances Yates *Rosicrucian Enlightenment*, which argues at one point that John Heydon in 1662 read Bacon's

Society had a number of alchemical tracts in its library, noting in particular that the volume of Roger Bacon's donated to the Society by John Aubrey "seems to have been prized for Bacon's alchemical writing" (174). The fact that Thomas Henshaw's "Some Observations and Experiments Upon May-Dew" was published in the first volume of the *Philosophical Transactions* is significant because, as K. Theodore Hoppen explains, "may-dew had long been an important constituent of Hermetic recipes in the fields of both iatrochemistry and alchemy itself" (246).[6] From the correspondence between Henshaw and Robert Paston cited by Donald R. Dickson, it is evident that alchemical matters were indeed discussed at the Royal Society.

That these discussions occurred is no surprise given the number of Society fellows who were interested in alchemy and Hermeticism. Buchanan-Brown explains that John Aubrey's *Miscellanies* "are avowedly a 'collection of Hermetick Philosophie'" and asserts that "even in mathematics where [Aubrey] seems at his most 'modern' and scientific one might perhaps detect a trace of hermeticism" (185). Dickson says of Henshaw that it is "quite clear that he was a

---

New Atlantis as "practically the same as the Rosicrucian manifesto" the *Fama* (128). I personally find Yates' *Rosicrucian Enlightenment* noteworthy because it was among the first to posit hermetic and alchemical philosophy as worthy of serious intellectual inquiry. Many critics, however, would disagree. Brian Vickers reviews the list of critics who do not think highly of the text – a list that includes P. F. Corbin, C. H. Josten, Charles Webster, and A. J. Turner. Vickers' own assessment of Yates' text is in many ways a damning one. He asserts that Yates has "suppressed her critical faculties" and that "normal processes of evaluating evidence have been temporarily suspended" (304), that "the reader who approaches her book as a serious historical study will be bothered by the amount of sheer speculation in it" (301), and that "if the findings and methodology of that book came to be accepted or used as models for imitation the results could be disastrous" (316). These very serious problems notwithstanding, however, I nonetheless do believe that Yates' stated purpose for the text was fulfilled in that it did "take this whole subject out of the range of uncritical and vaguely 'occultist' studies, and make of it a legitimate, and most important, field for research" (xiii).

[6] For further discussion of Henshaw's experiments, see Alan B. H. Taylor's "An Episode With May Dew."

practising alchemist" (58), noting also that Henshaw and Robert Plot were "privately pursuing a line of inquiry that originated in the alchemy of Paracelsus" and that Henshaw "publicly pursued similar lines of inquiry at meeting of the Royal Society" (63). And Hoppen notes that Plot, Edmund Dickenson, Theodor Kerckring, and Christopher Adolphus Balduin – all of whom "had already, or were soon to develop, strong inclinations for and personal involvement in the world of Hermetic alchemy" – were admitted to the Society in the late 1670s (257).[7]

One of the most comprehensive studies of the Royal Society Fellows who had Hermetic and alchemical interests is that by Hoppen. Among the Fellows discussed by Hoppen are Elias Ashmole, Sir Robert Moray, John Winthrop, Sir Kenelm Digby, and Le Fèvre. The publications of Ashmole were and still are "among the most important Hermetic collections produced in seventeenth-century England" (243). Moray married Hermetic interests and chemistry, and was a patron of the Rosicrucian and "prolific Hermeticist" Thomas Vaughan (247-48). Winthrop combined "Hermetic alchemical preoccupations with a pursuit of practical research in metallurgy, mining, and chemical manufacture" (251). Digby just prior to joining the Royal Society had "scoured France, Germany, and Scandinavia in search of the universal remedy or alkahest of the alchemists" (252).[8] And Le Fèvre "firmly believed in the possibility of the 'Great Work' and was anxious to further the eventual realization of the age-old quest for potable gold" (254).

---

[7] For further discussion of Plot's interests in alchemy, see F. Sherwood Taylor's "Alchemical Papers of Dr. Robert Plot."

[8] For further discussion of Digby's alchemy, see Parts I, II, and III of Betty Jo Dobbs' "Studies in the Natural Philosophy of Sir Kenelm Digby." For a discussion of Digby's alchemy as it relates to religion, see Bruce Janacek's "Catholic Natural Philosophy."

Two of the most historically prominent Royal Society fellows who had serious and active interests in alchemy are Boyle and Newton. The work of Lawrence M. Principe has been instrumental in bringing to light the extent and depth of Boyle's alchemical studies.[9] In "Boyle's Alchemical Pursuits," for example, Principe asserts that Boyle had a "long-term interest, activity and belief in traditional alchemy"; that "Boyle's works and papers teem with alchemical references, theories, practices and processes"; and that "alchemy occupied an enormous portion of Boyle's time and experimental activity" (91). We now know that Boyle's alchemical interests were fundamental rather than merely tangential to his experimental endeavors. As rightly stated by William R. Newman, "Boyle knew and absorbed the material theory of alchemy to such a degree that it forms a seamless part of his own work" (107). The worldview of the man that posterity has dubbed 'The Father of Modern Chemistry' was, in reality, a fundamentally alchemical one.

The most well-known material theory of alchemy, for example, was transmutation. Boyle's belief in transmutation was grounded in corpuscular philosophy, the theory of matter that he explained in *The Origine of Formes and Qualities* (1666). According to this theory, all matter was formed of building-block particles called corpuscles. The *Origine*, as put by Marie Boas Hall, emphasized that it was "the size, shape and motion of the lesser corpuscles and of any larger corpuscles that they composed that determined the properties of physical bodies"

[9] For further discussion of Boyle's alchemy, see Principe's *Aspiring Adept.* Also noteworthy are Principe's "Newly Discovered Boyle Documents" and "The Alchemies of Robert Boyle and Isaac Newton," and Michael Hunter's "Alchemy, Magic, and Moralism."

(118). It was ultimately the idea that these corpuscles could be rearranged that supported the theory of transmutation. Louis Trenchard More explains that

> All the different qualities of bodies are assumed to be merely different geometric patterns of aggregations of identical corpuscles, and every chemical analysis, or synthesis, is thus only a mechanical rearrangement of one pattern into another. If so, was it to be doubted that a chemist, with his planning mind and manipulative skill, could discover a chain of actions by which he would rearrange the pattern which was, for example, lead, into the pattern which is gold? (69)

There was, indeed, nothing to dissuade Boyle from thinking that such a rearrangement was possible: he himself affirms in Experiment VII of the *Origine* that "I could not see any impossibility in the Nature of the Thing, that one kind of Metal should be transmuted into another" (350). The theory of transmutation was entirely consistent with Boyle's corpuscular philosophy and his overall understanding of Nature.

It was shortly after he read Boyle's *Origine* in 1667 or 1668, according to Betty Jo Teeter Dobbs, that Newton began "to acquire and copy various circulating alchemical manuscripts" (*Foundations* 191). He during that time also began the series of chemical experiments that are documented in his laboratory notebooks. As with Boyle, Newton's alchemical interests were fundamental to his experimental work. Dobbs explains that "alchemical modes of thought"

ultimately "rest at the very heart of the great Newtonian system" (*Foundations* 196).[10]

Newton would ultimately, however, revise his published work so that these modes of thought were not explicit. The first edition of the *Principia*, for example, contained the statement that "any body can be transformed into another, of whatever kind, and all the intermediate degrees of qualities can be induced in it" (qtd. in Dobbs, "Newton's Alchemy" 514). Despite the fact that Newton, according to Dobbs, "maintained to the end his belief in the inertial homogeneity and transformability of matter" ("Newton's Alchemy" 514), this passage alluding to transmutation does not appear in subsequent editions of the text. Richard Westfall likewise argues that "peculiarly Hermetic notions fostered the crucial development" of Newton's thought ("Newton" 185) and that we can see this influence particularly in Newton's concept of force.[11] It is indeed significant, as noted by Westfall, that "the cry of occult qualities greeted the publication of the *Principia*" ("Newton" 194). This reaction not only confirms that Newton, like Boyle, was profoundly influenced by alchemical ideas and theories, but also reveals that Newton's contemporaries recognized the Hermetic influences that Newton would later strip from his more 'scientifically mature' articulations.

It is thus clear that many experimental philosophers in the mid-seventeenth century valued alchemical ideas and benefited from alchemical studies. This esteem for alchemy may therefore appear to be at odds with the

---

[10] For further discussion of Newton's alchemy, see Dobbs' *Janus Face of Genius*, P. M. Rattansi's "Newton's Alchemical Studies," and Principe's "Alchemies of Robert Boyle and Isaac Newton."

[11] For further discussion of the relationship between Newton's alchemy and his concept of force, see Westfall's *Force in Newton's Physics*.

attempts by Royal Society advocates and apologists to distinguish the experimentalists from alchemists: if alchemy was indeed such a worthy pursuit, it would perhaps have made more sense to associate rather than differentiate the experimentalists and alchemists. Advocates and apologists were well aware, however, that alchemists did not have an entirely favorable cultural reputation, and hence probably feared that associating the experimentalists with alchemists would ultimately do more harm than good. As it turns out, though, their attempts to differentiate the experimentalists from alchemists also did more harm than good by in many ways complicating rather than clarifying the relationship between the two.

One of the ways that Royal Society advocates and apologists attempted to explain the character of the new experimentalist was to define his temperament and his purpose in relation to those of the alchemist. As I have discussed, however, the reputation of the alchemist himself in mid-seventeenth century England was both variable and unstable – a historical reality that from the outset undermined the very foundation of the comparative rhetorical strategy. In order to be successful, advocates and apologists would have to differentiate between the various types of alchemists, explain the value in the pursuits of the 'good' sort of alchemist, and then align the experimentalist with this 'good' alchemist, all while simultaneously neither confusing those who might have been disposed to follow their explanation nor being misunderstood by those who would have disagreed in principle that there could be anything of merit in any alchemist at all.

This was, indeed, too tall of a task even for the accomplished rhetoric of Boyle and Sprat.

The rhetorical success of Sprat's *History of the Royal Society* will be discussed at length in the next chapter. Noteworthy here, however, is Sprat's unsuccessful attempt to establish a rhetorically unassailable difference between the experimentalists and the alchemists. Section XVII of Part I of the *History* is entitled "The Chymists." This short section of the text can be used to illustrate how even a seemingly innocuous acknowledgment of the benefits of alchemy could be turned against the experimentalists.

Sprat begins by dividing the chymists into "three rancks: Such, as look after the knowledge of Nature in general: Such, as seek out, and prepare Medicines: and such, as search after riches, by Transmutations, and the great *Elixir*" (37).[12] He then notes that chymists of the first two ranks have been notably successful in, among other things, "shewing the admirable powers of Nature," asserting that it is "from their labors" that "the true *Philosophy* is like to receive the noblest Improvements" (37). These chymists, of course, are the ones with whom the experimentalist has the most in common: both endeavor to study the natural world, and both seek to improve the lot of mankind as a result of those studies. They share a sober disposition, a rational temperament, and a sincere commitment to learning. It is significant, however, that Sprat does not make this sort of explicit comparison. He merely acknowledges the potential of these chymists before launching into his attack against the chymists of the third rank.

[12] All italics and capital letters in passages quoted from the *History* are Sprat's own.

Sprat characterizes this unsavory rank of chymists as both single-minded and emotionally undisciplined. He declares that

> in the chase of the *Philosopher's Stone*, they are so earnest, that they are scarce capable of any other thoughts: so that if an Experiment lye never so little our of their rode, it is free from their discovery: as I have heard of some creatures in *Africk*, which still going a violent pace straight on, and not being able to turn themselves, can never get any prey, but what they meet just in their way. This secret they prosecute so impetuously, that they believe they see some footsteps of it, in every line of *Moses*, *Solomon*, or *Virgil*. The truth is, they are downright *Enthusiasts* about it. And seeing we cast *Enthusiasm* out of *Divinity* it self, we shall hardly sure be perswaded, to admit it into Philosophy. (37-38)

This passage is rhetorically significant not only because it establishes an adversarial relationship between the experimentalist and this sort of alchemist, but also because it supports a number of Sprat's key arguments for experimental philosophy as a whole. It does, for example, effectively differentiate this third type of alchemist from those of the first two ranks. Indeed, whereas those of the first two ranks have the potential to contribute to philosophical learning, the alchemists of this rank make no contribution at all. The forceful repudiation of their character and their purpose is certainly meant to confirm that the experimentalists of the Royal Society are not only unlike, but are also entirely unsympathetic to such alchemists.

One particularly objectionable characteristic of this sort of alchemist is his fundamental lack of emotional discipline. The fact that Sprat brands this rank of alchemists as "downright *Enthusiasts*" is highly significant: Heyd reminds us that during this period, the term 'enthusiasts' had "connotations of opposition to established institutions and traditional professions" (423). Enthusiasm itself, of course, was also often identified as the root cause of the cultural dissention and upheaval of the Civil War period. For Sprat to separate the experimentalists from these 'enthusiastic' alchemists and to support the exclusion of 'enthusiasm' from Philosophy, then, serves as a powerful rhetorical affirmation that both the experimental philosopher and the new experimental philosophy were, are, and will remain untainted by the irresponsible and undisciplined zeal that ruled the revolutionaries during the Interregnum.

In addition to thus having the potential to stabilize English culture by quelling uncontrolled passion and zeal, the experimentalist is also portrayed as having the potential to improve and advance the English nation. Unlike the unsavory alchemist who so single-mindedly seeks the Philosopher's Stone that he is "scarce capable of any other thoughts," the experimentalist remains open-minded on his quest for knowledge – an attribute that will enable him to discover not only the knowledge that he actively seeks, but also the knowledge that presents itself to him along the way. Sprat's comparison of these alchemists to "some creatures in *Africk*" may seem a bit bizarre; when one thinks of the Great Chain of Being, however, the comparison makes more sense. Sprat uses it to emphasize not only his explicit point that these alchemists are ruled by passion

and emotion, but also his implicit point that the experimentalists, who are governed instead by right reason and intellect, are superior to – and one might even say more 'godly' than – this third rank of alchemists.

This comparison can also be seen as functioning on an imperial level as well. Given that Sprat could have likened these alchemists to any creatures at all, it may well be significant that he chooses to liken them to creatures in Africa. From this perspective, Sprat's comparison not only places the experimentalist above the alchemist, but also places the English above the African, and thereby both replicates and reinforces the feelings of national superiority that the English adopted as they came increasingly into contact with new worlds.

It is significant, however, that even this apparently successful multi-layered treatment of alchemy and the alchemists was able to protect neither the *History* nor the Royal Society from attack. One of the more persistent and outspoken critics of the Society, for example, was Henry Stubbe. In *Campanella Revived*, a text ominously subtitled "An Enquiry into the History of the Royal Society, whether the Virtuosi There Do Not Pursue the Projects of Campanella for the Reducing England unto Popery," Stubbe in one single passage effectively unravels Sprat's careful rhetoric.

Stubbe writes as a defender of the Royal College of Physicians, a cultural institution that saw the upstart Royal Society as a threat to its own reputation and authority. In the preface to *Campanella Revived*, he takes particular advantage of Sprat's acknowledgment of alchemy's contribution to medicine to discount and challenge the Royal Society.

> *At first* they *would have incorporated the* Colledge of Physicians *into* their Society: *but that the* prudent *and* grave *did decline*: *then they promoted the* Anti-Colledge *of* Pseudo-Chymists, *encouraging* Odowde *and his* ignorant Adherents *in opposition to the* Physicians: *and this is not more* notorious *to the world, than it is also that those* objections *with which* M.N. *and other* Quacksalvers *amuse the* Age *were suggested unto them by the* Virtuosi, *and derived their repute* from them.[13]

Stubbe attacks the Royal Society on three levels. He begins by claiming that the Society wanted at its outset to incorporate the College, but that this incorporation was blocked by the "prudent and grave" College members. This claim both portrays the College as a legitimate and authoritative institution with which the Society initially wished to associate, and implies that the members of the College have a certain measure of judgment and dignity that is presumably absent in the new experimentalists. The implication is rhetorically calculated to call into question the true character of the Society fellows.

Stubbe next asserts that this rebuff led the Royal Society to turn against the College of Physicians and promote the "Anti-Colledge *of* Pseudo-Chymists." This "Anti-College" is identified by Heyd as the "Noble Society for the Advancement of Hermetick Physick," a society of chymical physicians that was "established as the plague was beginning to spread in London" and "claimed to provide an alternative type of medicine to that of the College of Physicians" (427); "Odowde" is identified by P. M. Rattansi as Thomas O'Dowde, a Groom in

[13] All italics and capital letters are Stubbe's own.

the King's Privy Chamber who "had apparently been licensed as physician by the Archbishop of Canterbury" ("Helmontian-Galenist" 15, n65). Stubbe with these references characterizes the Society's acknowledgment of the "Pseudo-Chymists" as a deliberate attempt to subvert the rightful authority of the College of Physicians. He thus not only explicitly links the Society to the alchemists who seek chemical remedies, but also implicitly links the Society to the radicals and revolutionaries of England's not-so-distant past.

Stubbe concludes by cementing the link between the Royal Society and the most notorious sort of alchemists. Heyd identifies "M.N." as Marchamont Needham, a "prominent journalist and physician who was also involved in the Society of Chymical Physitians" (428). Likening Needham and his 'chemical physicians' to the "*other* Quacksalvers" of the day allows Stubbe in turn to link the Royal Society fellows with precisely that rank of alchemists from whom Sprat was attempting to distinguish the experimentalists. In this single passage – this single sentence, even – Stubbe rhetorically undoes Sprat's careful distinctions and associations between the experimentalists and the three different ranks of alchemists, effectively lumping the alchemists, the experimentalists, and the Royal Society into one ignominious group.

It is, however, to Sprat's credit that it takes a worthy opponent like Stubbe to dismantle his rhetorical finery. The same can unfortunately not be said for Boyle, whose rhetoric in *The Sceptical Chymist* can be interpreted as actually dismantling itself. Antonio Clericuzio notes that Boyle's text was "widely known, often quoted, though very seldom properly understood" (84). I suggest that one

possible barrier to such an understanding could well rest in the fact Boyle blurs the distinction between the alchemists and the experimentalists even as he is in the course of making it.

The use and philosophy of language was one of the more important ways that the experimentalists distinguished themselves from the alchemists. The language of the alchemists was well known to be deliberately ambiguous and enigmatic, designed to keep secret or sacred knowledge from falling into the hands of the unqualified or uninitiated. The language of the experimentalists, on the other hand, was much more clear and precise, intended to facilitate the spread of knowledge not only throughout the experimental community, but throughout the general cultural community as well. There was thus for the experimentalists much more at stake in their language than mere words: the experimental language that one employed ultimately symbolized his trust in or the mistrust of his fellow man, and his intention to work for himself alone or for the good of all mankind.

Issues of language play an important part in *The Sceptical Chymist.* Clericuzio explains that Boyle there "made a firm distinction between the communication techniques of chemistry and those of alchemy," and ultimately asserted that "an obscure and allusive style was not appropriate in natural philosophy" (82-83). Boyle's text can therefore be seen on one level as a critique of alchemical language from the perspective of experimental philosophy, and thus as another rhetorical attempt to differentiate the new experimentalist from the arcane practices of the alchemists.

We know that Boyle himself was very interested in alchemy, and it is significant that he does not keep this interest a secret from his readers. Boyle proclaims in his Introductory Preface, for example, that he is "far from being an enemy to the chymist's art"; that he distinguishes "betwixt those chymists that are either cheats, or but laborants, and the true adepti"; and that he would "both willingly and thankfully be instructed" by the true adepti "especially concerning the nature and generation of metals" (8-9). Boyle also there states his purpose for writing the text, explaining that

> one of the chief designes of this sceptical discourse was, not so much to discredit chymistry, as to give an occasion and a kind of necessity to the more knowing artists to lay aside a little of their over-great reservedness, and either explicate or prove the chymical theory better than ordinary chymists have done, or by enriching us with some of their nobler secrets to evince that their art is able to make amends even for the deficiencies of their theory. (8-9)

Note that Boyle's ultimate plea here is for communication. He writes not to discredit alchemy, but rather to encourage alchemical adepts to share their knowledge with the experimentalists.

This plea is echoed in the opening pages of the text proper. Speaking here of his skeptical protagonist Carneades, Boyle explains the hope that

> by having thus drawn the chymists' doctrine out of their dark and smokie laboratories, and both brought it into the open light, and shewn the weakness of their proofs, that have hitherto been wont to

> be brought for it, either judicious men shall henceforth be allowed calmly and after due information to disbelieve it, or those abler chymists, that are zealous for the reputation of it, will be obliged to speak plainer than hitherto has been done, and maintain it by better experiments and arguments that those Carneades hath examined. (6)

Again, the purpose of revealing the inaccuracies and inconsistencies of the proofs offered by the alchemists is to oblige the alchemical adepts to "speak plainer" about their doctrine – to abandon their traditionally ambiguous and enigmatic language and explain their doctrine in the clearer and more precise language of the new experimentalism. The description "dark and smokie" applies equally well to the alchemists' language as it does to their laboratories. Only when the adepts communicate clearly and precisely can knowledge truly be gained from them.

Despite the fact that Boyle indeed puts a great deal of effort into clearly articulating his rhetorical premise and purpose, readers of the *Sceptical Chymist* could have nonetheless become confused by the text in a number ways. Boyle does, for example, identify three different types of alchemists in his Preface. He does not, however, make any attempt to define those types by offering some sort of explanation as to what kind of actions or beliefs might typify each of those categories. His assumption is that readers will naturally recognize and understand the distinctions he is making. We know, however, that public opinion and knowledge of both alchemy and alchemists were both confused and

contradictory. If the text ended up in the hands of a reader who either did not understand or simply did not believe Boyle's distinction, the text as a whole would have been undercut – reduced from a carefully negotiated plea to a mere exercise in rhetorical hairsplitting.

Even if a reader did accept Boyle's alchemical distinctions and understand his rhetorical purpose, however, I would argue that the potential for confusion or misunderstanding still exists. Boyle's ultimate wish, remember, is for the adepts to "speak plainer than hitherto has been done." It is certainly a fair expectation, then, for Carneades himself to speak in the plain and readily intelligible language of experimentalism. At one point in the text, for example, Carneades describes one of his experiments in support of the argument that substances separated from bodies were not necessarily pre-existent as a principle or element in that body. His description is as follows:

> At the time newly mentioned, I caused my gardiner (being by urgent occasions hindered from being present myself) to dig out a convenient quantity of good earth, and dry it well in an oven, to weigh it, to put it in an earthen pot almost level with the surface of the ground, and to set in it a selected seed he had before received from me, for that purpose, of squash, which is an Indian kind of pompion, that growes apace; this seed I ordered him to water only with rain or spring water. I did not (when my occasions permitted me to visit it) without delight behold how fast it grew, though unseasonably sown; but the hastning winter hindered it from

> attaining anything neer its due and wonted magnitude; (for I found the same autumn, in my garden, some of those plants, by measure, as big about as my middle) and made me order the having it taken up; which about the middle of October was carefully done by the same gardiner, who a while after sent me this account of it: 'I have weighed the pompion with the stalk and leaves, all which weighed three pound wanting a quarter; then I took the earth, baked it as formerly, and found it just as much as I did at first, which made me think I had not dried it sufficiently: then I put it into the oven twice more, after the bread was drawn, and weighed it the second time, but found it shrink little or nothing.' (65)

What is important here is not necessarily what the gardener does or how he does it, but rather how Carneades describes the experiment. His language is clear and direct, and the description as a whole would likely have been readily understandable to most readers. This passage thus serves as a good example of the straightforward linguistic and rhetorical style advocated by the new experimentalists.

Elsewhere in the *Sceptical Chymist*, however, Carneades actually sounds more enigmatic. Carneades cites the following experiment, for example, to illustrate that the separation of elements in a body may be achieved by means other than fire:

> Having then purposely for trial's sake digested eight ounces of good and well powdered antimony with twelve ounces of oil of vitriol

> in a well stopt glass vessel for about six or seven weeks; and having caused the mass (grown hard and brittle) to be distilled in a retort placed in sand, with a strong fire; we found the antimony to be so opened, or altered by the *menstruum* wherewith it had been digested, that whereas crude antimony, forced up by the fire, arises only in flowers, our antimony thus handled afforded us partly in the receiver, and partly in the neck and at the top of the retort, about an ounce of sulphur, yellow and brittle like common brimstone, and of so sulphureous a smell, that upon the unluting the vessels it infected the room with a scarce supportable stink. (45)

The language that Carneades uses to describe this experiment is notably different from the language he used to describe the first. There is likely nothing about the first experiment with which a general reader would be unfamiliar: squash, pumpkins, and earthen pots were common objects, and the processes of planting, weighing, and drying were widely known. This second experiment, however, would likely have sounded much more foreign to a general reader. Despite the fact that the procedure itself seems relatively straightforward and easy to follow, the average seventeenth century Englishman would not necessarily have known what powdered antimony, oil of vitriol, or sulfur were, or what either a retort or a menstruum was. He may also not have been familiar with the processes of incorporation, digestion, or distillation. Thus, even the language of Boyle's skeptical chemist Carneades occasionally sounds strange and mysterious.

The implication is that the language used by Carneades – and, indeed, by any of the new experimentalists who spoke of substances or processes that were not generally familiar in seventeenth century culture as a whole – could potentially sound just as unintelligible to the average Englishman as did the alchemists. This circumstance was problematic not only because it appeared to support the allegations made by critics like Stubbe, but also because it provided near-devastating ammunition for satirists like Thomas Shadwell.

Claude Lloyd asserts that "of all of the '*Wits* and *Railleurs*' from Butler and Marvell to Swift and Addison, probably none launched a more effective attack upon the Royal Society than did Thomas Shadwell in *The Virtuoso*" (472). The play is indeed a cutting satire on all things experimental. Shadwell's virtuoso Sir Nicholas Gimcrack hates the water but, because he contents himself with "the speculative part of swimming," can swim "most exquisitely" on land (II.ii.84, 79). His simultaneous transfusion of the blood of a spaniel into a bulldog was so successful that, quite literally, "the spaniel became a bulldog and the bulldog a spaniel" (II.ii.27-28). His knowledge of spiders is so extensive that he once tamed one named Nick (III.iii.73), and he keeps a vault of hermetically sealed bottles of country air so that he can partake whenever he wishes (IV.iii.264-66). Gimcrack is also, of course, well versed in experimental language, which is yet another target of Shadwell's satire. Gimcrack explains, for example, that the madmen into whom he transfused sheep's blood "suffer'd not under the operation, but they were cacochymious and had depraved viscera" (II.ii.216-17). This explanation is immediately deflated, however, when Snarl barks "Pish! I do

not know what you mean by your damn'd cacochymious canting, but they died, in sadness. Prithee make haste with your canting and lying, and let's go to dinner, or you shall quack by yourself" (II.ii.219-22). The language, the interests, and the activities of the experimentalists are thus all targets of Shadwell's satire.

Note that the word "quack" in the passage above works in conjunction with Snarl's description of Gimcrack as a "mountebank" that occurs only lines earlier (II.ii.205), and also with Gimcrack's ultimate resolve at the end of the play to "find out the philosopher's stone" (V.vi.131). Whereas Stubbe links experimentalists to alchemists in order to portray the experimentalists as a threat, Shadwell links his virtuoso to alchemists in order to portray the experimentalists as ridiculous. Linkages such as these, combined with the fact that the experimentalists could themselves sound very much like alchemists to the average Englishman, certainly contributed to the difficulties encountered by Royal Society advocates and apologists in their rhetorical attempts to establish the character of the new experimentalist by defining him in relation to the alchemist.

As with their attempts to distinguish the experimentalist from the alchemist in terms of his temperament and language, advocates and apologists for the new experimentalists also had trouble distinguishing the two in terms of their community, their goals, and their methods. Many of the differences that were articulated between the two actually dissolve when they are examined from a broader cultural perspective. The recognition of this dissolution thus ultimately highlights the fact that the character of the mid-seventeenth century English experimental philosopher was fundamentally a rhetorical creation.

One of the more commonly known characteristics of the alchemists, for example, is that they were essentially solitary figures. Whether true adepts or fraudulent quacks, alchemists usually worked alone or with a single assistant in the pursuit of their goals: the quacks kept their remedies a secret from others so as to capitalize on them financially, and the adepts safeguarded their knowledge so as to prevent it from falling into the hands of the spiritually uninitiated. Advocates and apologists contrasted the experimental philosophers to these private and untrusting alchemists by portraying the experimentalists as members of an open experimental community. William Eamon affirms that it was with "the establishment of the Royal Society" that "the principle of science as public knowledge gained institutional endorsement" (352). New insights and information were to be shared freely among members of the experimental community. Society Secretary Henry Oldenburg facilitated the communication between an impressively wide array of experimentalists both in England and abroad, and the *Philosophical Transactions* helped spread new knowledge throughout the experimental community. Peter Dear notes further that the Royal Society was a symbol of "*cooperative* natural philosophy" (146, italics his). Experimentalists learned both with and from one another, and considered themselves as companions rather than competitors in the quest for knowledge.

The experimentalists were also portrayed as willing to learn from novices or amateurs. Unlike the alchemists who shielded their knowledge and methods from the public, the Royal Society actually fostered the public's interest in natural philosophy and the experimental process. Believing that Francis Bacon's

inductive methodology, if employed correctly, could enable anyone to conduct meaningful investigations into nature, the new experimentalists openly welcomed the engagement and correspondence of both the national and the international community at large.

In reality, however, we know that the Society was not as egalitarian as it portrayed itself to be. While anybody could in theory be elected a Fellow, that was actually not quite the case. We know that the Society was, as Dear puts it, "very conscious of its social position" (156), and that it both courted and actively recruited men of social prominence and financial means. We must also admit that the Society may have deliberately excluded men of lower social or financial status. The case of tradesman Joseph Moxon is illustrative. Despite his close association with a number of early Fellows, Moxon himself was not elected Fellow until 1678 – and even then was elected only with dispute, as four votes were cast against him. Graham Jagger documents that "the first and indeed only occurrence of negative voting" happened at that November 1678 meeting, and interprets the votes cast against Moxon as the Fellows "using their new-found power of expression in the secret ballot to register their disinclination to elect a mere tradesman to their ranks" (200).

The Royal Society may also not have been as cosmopolitan as it portrayed itself to be. While it prided itself on having friends and Fellows in England, on the Continent, and even from the New World,[14] the Society was at its core a fundamentally English institution that considered its experimentalists to

[14] For further discussion of the Fellows in the New World, see Raymond Phineas Stearns' "Colonial Fellows of the Royal Society of London, 1661-1788."

be the standard against which all other experimentalists should be judged. Christiaan Huygens, for example, had established the principle of anomalous suspension with his own air pump in Holland in late 1661 and early 1662. Despite Huygens' appropriate use of experimental procedure and the replication of his experimental results, Boyle and his fellow English experimentalists would not initially accept anomalous suspension as a matter of fact. Steven Shapin and Simon Schaffer state that "in March and April 1663 it became clear that unless the phenomenon could be produced in England with one of the two pumps available, then no one in England would accept the claims Huygens had made, or his competence in working the pump" (249). Despite the fact that it was portrayed as an international community, the Royal Society did not necessarily accept the claims of foreign experimentalists.

Thus, its dealings with both Huygens and Moxon illustrate that the Royal Society was neither as cosmopolitan nor as egalitarian as it was portrayed to be. To the average Englishman of no particular social distinction, the experimental community could indeed look very much like a closed club of initiates. From this perspective, the experimentalists would not necessarily have appeared to be that different from the alchemists: they communicated in their own language to their fellow experimental 'adepts,' and were highly wary as to whom they would allow into their fold. The Society could thus have resembled an elitist club to those experimentalists working outside of its immediate geographical and socio-political boundaries.

Also potentially problematic were the rhetorical attempts by advocates and apologists to distinguish the goals of the experimentalists from those of the alchemists. Alchemists, for example, were commonly known to have two main objectives: the chemical preparation of the Elixir of Life, and the chemical preparation of the Philosopher's Stone. Royal Society advocates and apologists, on the other hand, wanted to portray the experimental philosophers as able to use their own chemical investigations to achieve much broader goals – as able to develop inventions and technologies that would not only benefit mankind in general, but that would also foster the power, prestige, and social morality of the English nation in particular. As with so many other efforts, however, this rhetorical attempt to distinguish the experimentalists from the alchemists also backfired.

Joseph Glanvill, for example, was such a prominent apologist for the Royal Society that his *Plus Ultra* was often considered a supplement to Sprat's official *History.* Early in his text, Glanvill makes this distinction between the chemistry of the experimentalists and that of the alchemists:

> I confess, Sir, that among the *Aegyptians* and *Arabians*, the *Paracelsians*, and some other *Moderns*, *Chymistry* was very *phantastick*, *unintelligible*, and *delusive*; and the *boasts*, *vanity*, and *canting* of those *Spagyrists*, brought a *scandal* upon the *Art*, and exposed it to *suspicion* and *contempt:* but its late *Cultivatours*, and particularly the ROYAL SOCIETY, have refin'd it from its *dross*, and made it *honest*, *sober*, and *intelligible*; an excellent *Interpreter* to

> *Philosophy*, and *help* to *common Life*. For *they* have laid aside the *Chrysopoietick*, and *delusory Designs* and *vain Transmutations*, the *Rosie-crucian Vapours*, *Magical Charms*, and *superstitious Suggestions*, and form'd it into an *Instrument* to know the *depths* and *efficacies* of *Nature*. This, Sir, is no small advantage that we have above the *old Philosophers* of the *Notional way*.[15] (12)

Glanvill does indeed distinguish the two brands of chemistry, and he is careful to add that sober experimental chemical inquiries will greatly assist the experimentalists in achieving their goals of both the philosophical inquiry into nature and the improvement of the lot of mankind. The metaphor that Glanvill uses to make this distinction, however, is not only an alchemical one: it is an alchemical one that figures the Royal Society experimentalists as alchemists who have themselves "refin'd" chemistry from its "*dross.*" Although perhaps an effective one for differentiating the base and imperfect chemistry of the alchemists from the more pure and precise chemistry of the experimentalists, Glanvill's metaphor undercuts the distinction between experimentalists and alchemists by actually encouraging the association of the two.

Whereas Glanvill's metaphor failed because it does not take this distinction far enough, other rhetorical attempts to distinguish the goals of the experimentalists from those of the alchemists failed, ironically, because they took the distinction of experimentalists from alchemists too far. Alchemists were often portrayed, for example, as exclusively focused on one particular goal. Sprat in the *History*, remember, had characterized 'bad' alchemists as so single-minded

[15] All italics and capital letters are Glanvill's own.

that they were "scarce capable of any other thoughts." Society advocates and apologists, on the other hand, emphasized that the experimentalists wanted to learn about every aspect of nature. Literally everything in the universe was their potential object of study: the worlds through the telescope, the world they lived in, and the worlds through the microscope were all to be examined in new ways and from new perspectives. The extraordinary and the mundane were scrutinized with equal diligence. The experimental philosophers thoughtfully questioned, enthusiastically discussed, and conscientiously published their observations on nearly every conceivable topic.

Friends and fellows of the Royal Society saw this activity as both useful and progressive. Critics of the Society, however, saw it as downright ridiculous. Even the King himself, whose authority and reputation the Society drew upon to help establish its own, found humor at the experimentalists' expense: Samuel Pepys records in his 01 Feb 1664 diary entry that Charles II "mightily laughed" at the experimentalists "for spending time only in weighing of ayre, and doing nothing else since they sat" (33). The Royal Society and the experimentalists were targeted in a series of satires – including the high profile literary ones by Shadwell and Samuel Butler – that ridiculed their thought processes, experiments, and publications. These satires were often devastating because they exploited and caricatured the fact that the experimentalists would study literally anything and everything.

Caricatures such as these were in many ways detrimental to the cultural reputation of the experimentalist. By depicting the experimentalists as more

worthy of ridicule than respect, satirists directly challenged the portrayals by advocates and apologists of the experimentalists as sober and serious inquirers into nature. They also, of course, gave opponents of the new experimental philosophy ammunition with which to launch their own attacks against the Society. Noteworthy in this context is that fact these depictions could also have blurred the distinction between the experimentalists and the alchemists. Alchemists were a perennial focus of caricature and satire in English literature, and to those Englishmen who considered alchemy a laughable waste of time, experimental philosophy may well have seemed little different. It would perhaps have been easy to see the attempt to weigh air as equally ridiculous as – if, indeed, not more ridiculous than – the attempt to transmute metals.

For friends and fellows of the Royal Society, however, there was a significant difference between the experimentalists and the alchemists not only in terms of their goals, but also in terms of their methods. Because it was widely known that alchemists also engaged in experiments, the methods and results of the experimentalists needed to be distinguished from those of the alchemists. Advocates and apologists made this distinction by implicitly contrasting the controlled experimental methodology of the experimentalists with the more haphazard methodology of the alchemists and asserting that the experimentalists were better able to understand and explain their experimental results than were the alchemists. While they may indeed be effective from a rhetorical standpoint, these points of contrast are not necessarily supported by historical reality.

The characterization of the alchemists' method as accidental, for example, had been articulated by Bacon in *Novum Organum*. Bacon in Aphorism 73 acknowledges that "it is true that alchemists have some achievements from their labours," but quickly notes that these achievements "came by chance, incidentally, or by some variation of experiments, such as mechanics are accustomed to make, and not from any art of theory" (83). Bacon echoes this sentiment later in Aphorism 85, where he explains more metaphorically that

> it is not to be denied, of course, that alchemists have discovered a good many things, and given useful inventions to mankind. But they are like the fable of the old man who bequeathed to his sons some gold buried in his vineyard, pretending he did not know the exact spot. They then fell to work with might and main to dig up the vineyard and found no gold, but the vintage was made more plentiful by that working of the ground. (95)

Implicit in these explicit descriptions of the alchemists' progress as inadvertent or accidental is the comparative assertion that the experimentalists' progress will be both intentional and purposeful. The theory and the art of both Bacon's inductive method and experimental philosophy were to yield new knowledge and insights by guiding the process of experimental investigations. Whereas the alchemists have stumbled accidentally into their achievements, the experimentalists are much better equipped methodologically to improve the lot of mankind.

The experimentalists were also portrayed as much better equipped than the alchemists to advance the understanding of nature as well. In the *Sceptical*

Chymist, Carneades asserts that there is a "great difference betwixt the being able to make experiments, and the being able to give a philosophical account of them" (117). While from Carneades' perspective it is possible that the alchemists do understand the results of their investigations, the reality is that the alchemists either do or can not explain their results in such a way that allows others to benefit from their knowledge. The alchemists are thus cast here as mechanics merely able to conduct experiments. The experimentalists, on the other hand, are portrayed as not only able to design and conduct fruitful experiments, but also as able to understand and explain the results of those experiments for the benefit of all.

As with so many of the other attempts to distinguish the experimentalists from the alchemists, these attempts can likewise be seen as problematic. While the investigative process and methodology employed by the experimentalists may indeed have been less accidental than those used by the alchemists, Boyle's *Certain Physiological Essays*, for example, confirms that the experimentalists' processes were more accidental and haphazard than they were portrayed to be, explaining that "in Philosophical Trials, those unexpected accidents that defeat our endeavours do sometimes cast us upon new discoveries" that are "of much greater advantage than the wonted and expected successe of the attempted Experiment would have proved to us." Given his comment that the many circumstances that can cause an experiment to miscarry "can hardly be discours'd of in an accurate Method, (which their nature will scarce admit of)" (67), we can perhaps conclude that the rhetorical form of the

public presentation or formal publication creates the impression that the experimental process is relatively straightforward by presenting that process as a linear rather than a discursive one.

The claim that the experimentalists had a better understanding of experimental results than did the alchemists can also arguably be called into question. Our modern 'scientific' perspective tends to focus on the progress that the experimentalists made. It is important to keep in mind, however, that in the mid-seventeenth century, the experimentalists often had to convince people that they were making any progress at all. One advantage that the experimentalists did have over the alchemists, though, was a language that enabled them to sound as if they were making progress – as if they were advancing the state of knowledge in such a way that would improve the lot of mankind. In much the same way that the rhetoric of the formal publication or public presentation had the power to create the impression that their experimental methodology was straightforward and precise, I believe that the language of the new experimentalists was likewise able to give the impression that they understood exactly what they were doing and how they were doing it. Thus, as Dear argues, the assertions that the experimentalists had a significantly better experimental process and a substantially better understanding of their experimental results can well be interpreted as more a function of rhetoric than reality.

The attempt by Royal Society advocates and apologists to establish the character and legitimacy of experimental philosophy and the experimental philosophers by comparing and contrasting them to alchemy and the alchemists

was thus, ultimately, a failure. I believe that a fundamental cause of this failure is the fact that the reputations of alchemy and the alchemists were themselves highly unstable and contentious in mid-seventeenth century English culture. This chapter has highlighted a number of the rhetorical difficulties of that were encountered in the attempt to construct solid reputations for the new experimental philosophy and the new experimental philosophers on the shifting foundations of the cultural reputations of alchemy and the alchemists.

In short, the cultural reputation both of alchemists and of alchemy itself was not even stable enough to allow advocates and apologists to establish the basic facts surrounding the experimentalists and the new experimentalism, let alone to enable them to endow the experimentalists and the new experimentalism with their desired cultural stature and dignity. Clearly a different rhetorical strategy was needed – one that rested on a more stable cultural foundation and would therefore not subject either experimental philosophy or the experimental philosophers to potentially damaging misunderstandings or misinterpretations. I believe that it was at least partially in response to this need that Sprat's *History of the Royal Society* was written.

Chapter 3: Epic, Nationalism, and the *History of the Royal Society*

When the Royal Society was founded in 1660, it certainly was not a foregone conclusion either that experimental philosophy would become a valued pursuit in or that the experimental philosopher would become a valued member of late-seventeenth century English culture. The depiction of the Royal Society as an institution destined to lead the national advance of England and the portrayal of the experimentalist as the humble yet dignified champion of that national advance were fundamentally rhetorical constructions that, at the time, were highly contested by opponents of the new experimental philosophy. I noted at the outset of the previous chapter three particular rhetorical strategies that were successfully employed by Royal Society advocates and apologists in their attempts to establish experimental philosophy and the experimental philosopher in the mid-seventeenth century religious, social, and political realms. Both in this and in my next chapter, I will examine what was arguably the most successful rhetorical strategy: the strategy that utilized aspects of the literary epic.

To associate seventeenth century experimental philosophy with the epic is, indeed, nothing novel in and of itself. The fact that the Royal Society and the new experimentalists were often portrayed in heroic terms is routinely noted in the work of prominent scholars such as Michael Hunter and Steven Shapin, and Robert Markley in particular describes Isaac Newton's *Principia* along with a number of Robert Boyle's works as "epics of the new scientific ideology" (129).

The specific contribution that I wish to make to this body of literature is to offer a literary interpretation of Thomas Sprat's *History of the Royal Society* – if not as a prose epic itself, then certainly as a text that effectively utilizes the hallmarks of the epic genre to achieve its ideological and rhetorical purpose. This interpretation allows us not only to contextualize the narrative moments that seem a bit out of place in the *History*, but also helps us to realize the ultimate claim that Sprat is making for the Royal Society and its experimental philosophers. The rhetorical adoption and adaptation of epic tropes and conventions enables Sprat to map the cultural significance of the epic subject onto the Society itself, and thereby craft his argument that the Royal Society is the quintessential institution of English national identity and that its experimental philosophers are English national heroes.

In *Origin and Authority*, Alvin Snider confirms that epic is the perfect genre with which to make this claim. He notes that the epic generically implies a "type of primitive nationalism" (100), a point that affirms that Sprat's rhetorical form itself supports his nationalist argument. Snider also notes that the epic generically "provides a means for the members of a community to consolidate and articulate their collective experiences" (105). The *History*, I believe, is actually designed to speak for and to two different communities – the experimental community, and the English national community. The more technical-oriented areas of the text are arguably geared toward the existing and the potential members of the experimental community, whereas the non-

technical areas of the text are geared toward Sprat's wider and more general English audience.

This mid-seventeenth century audience would certainly have been familiar with the classical epic genre, for Snider affirms that its market at that time "showed no signs of diminishing" (95). Although they were indeed highly respectful of this classical epic tradition that they had inherited from Homer and Virgil, writers and critics during this time were beginning to wrestle with the genre to see how they could stretch and modify it so as to make it relevant to their own historical time and place. H. T. Swedenberg's *Theory of the Epic in England 1650-1800* chronicles the change and development of the epic genre that took place throughout this period. While he concludes that there was generally "a unanimity of opinion on the fundamental principles of epic structure" (58), Swedenberg illustrates that there was fertile discussion and debate among literary critics as to what properly belonged in that epic structure.

One of the most important contributors to this discussion and debate was William Davenant, whose *Preface* to *Gondibert* (1650) Swedenberg describes as a "landmark" in epic theory (43). Particularly relevant to my analysis in this chapter is the lengthy nautical metaphor with which Davenant begins his *Preface*:

> But first give me leave (remembring with what difficulty the world can shew any Heroick Poem, that in a perfect glasse of Nature gives us a familiar and easy view of our selves) to take notice of those quarrells, which the Living have with the Dead: and I will (according as all times have apply'd their reverence) begin with

> *Homer*, who though he seemes to me standing upon the Poets famous hill, like the eminent Sea-marke, by which they have in former ages steer'd; and though he ought not to be remov'd from that eminence, least Posterity should presumptuously mistake their course; yet some (sharply observing how his successors have proceeded no farther than a perfection of imitating him) say, that as Sea-markes are cheefly usefull to Coasters, and serve not those who have the ambition of Discoverers, that love to sayle in untry'd Seas; so he hath rather prov'd a Guide for those, whose satisfy'd witt will not venture beyond the track of others, then to them, who affect a new and remote way of thinking; who esteem it a deficiency and meanesse of minde, to stay and depend upon the authority of example.[16] (3)

What I find particularly interesting about Davenant's nautical metaphor is how it resonates with the image of the ship sailing through the Pillars of Hercules that had appeared on the title page of Francis Bacon's *Instauratio Magna* (1620) thirty years earlier.[17] Homer in Davenant's passage functions as a literary Pillar of Hercules in that he marks the 'known' boundaries of the epic genre. Those who have a "new and remote way of thinking" and wish to introduce innovation to the genre must proceed past the achievement of Homer in the same way that "Discoverers" wishing to explore the unknown world must pass the Pillars of Hercules to "sayle in untry'd Seas." Davenant's passage thus ultimately

[16] All italics and capital letters in this passage are Davenant's own.
[17] I discuss Bacon's image and its heroic associations in Chapter Four.

translates the pioneering spirit often associated with natural philosophy into the realm of literature, and thereby portrays the mid-seventeenth century as an exciting time in which the current intellectual boundaries of the epic genre will be stretched and surpassed.

We now know that the stretching of these boundaries ultimately led to the demise of the classical epic. Writers throughout the seventeenth century modified the epic genre to bring it more in line with the cultural and aesthetic values of the period – modifications, as explained by David Quint in *Epic and Empire* – that resulted in "the deformation of epic in the direction of the romance genre from which it had traditionally differentiated itself" (309). What results is a body of 'heroic' literature that hybridizes in various proportions the emotional, political, and structural elements of romance and epic.

It is in this hybridized literary context that I situate Sprat's *History of the Royal Society.* The *History* was published in 1667, the same year as two other famous English heroic epics – John Milton's *Paradise Lost* and John Dryden's *Annus Mirabilis.* In his *English Epic and Its Background*, E. M. W. Tillyard describes the *History* as "a work that shows better than any I know something of the temper that must have animated any authentic epic in the first few years of the Restoration" (458). While he concludes that "Sprat could have had no doubt in his mind that the time was propitious for a patriotic epic," Tillyard then claims that it is Dryden's *Annus Mirabilis* that "reads almost like an answer to Sprat's implicit challenge" (464). I argue that we should not read Sprat as issuing a

challenge for someone else to write such a text, however, for Sprat's own *History* can perhaps be seen as that patriotic epic.

My reading of the *History of the Royal Society* focuses on the ways in which Sprat adopts and adapts to his rhetorical purpose many of the tropes and conventions associated with the literary epic. Sprat's fundamental purpose is to explain the Royal Society to his readers in a way that both deters criticism and encourages support for the new institution. I argue that Sprat achieves this purpose by employing the rhetorical conventions of the literary epic throughout the *History* to cast the Royal Society as a culturally honorable English institution that will both strengthen the English nation and enable it to fulfill its destiny as an economic and political world leader. Recognizing the adoption and adaptation of these epic elements not only helps us to understand the rhetoric of Sprat's text, but also to understand the overall argument made in the text as well.

Thomas Sprat had attended Wadham College at Oxford University. Charles Edward Mallet explains that Dorothy Wadham, widow of College founder Nicholas Wadham, "laid great stress on education." Scholars at Wadham were required to write "at least mediocre" Latin verses, and undergraduates attended lectures on Greek and Latin authors three times a week (258-59). The Statutes of Wadham recalled those of Corpus Christi College (257), which so highly valued classical learning that its Statutes describe the Professors of Greek and Latin as those "to whose teaching the busy bees of the whole University might swarm" (22). Given this educational pedigree, it is arguably safe to assume that Sprat was well versed in all genres of classical literature, including the epic.

Sprat received his B.A. in 1654 and his M.A. in 1657, and during his attendance at Wadham became a protégé of John Wilkins, then Warden of the College.

Wilkins proposed Sprat for election to the Royal Society in April of 1663, and Sprat was admitted as a Fellow later that same month. Many critics note that Sprat was elected to the Society to write the *History*, but only Michael Hunter emphasizes that "Sprat was a self-conscious writer, brought in to serve a specific literary function" (*Establishing* 50). Sprat began writing the text in 1663. He apparently was making good progress on the *History* when his composition was interrupted by three specific events. Sprat stopped first to issue a response to the erroneous and injurious analysis of England in Samuel Sorbière's *Relation d'un voyage en Angleterre* (1664) by publishing his *Observations on Monsieur de Sorbier's Voyage into England* in 1665, a tract he explains that he had to write in order to preserve the integrity of both the *History* and of the Royal Society itself (5). He was hindered later that same year by an outbreak of the plague, and was further delayed in 1666 by the great fire of London. The text was finally finished and published in the summer of 1667.

The *History* was immediately subjected to criticism. Henry Stubbe was arguably the most outspoken of Sprat's contemporary critics. James R. Jacob explains that "bad historical press" is largely responsible for the misinterpretation of Stubbe as "a conservative defender of the established church, the monarchy and Scholastic learning" (1) – a view that fails to account for Stubbe's radical religious, political, and social beliefs.[18] While his appropriation of conservative-

[18] Among the many salient points that Jacob makes in his reassessment of Stubbe's character and career is that Stubbe's attacks against the Royal Society, "far from representing a

sounding arguments may thus be more a matter of rhetoric than of principle, the historical reality is that Stubbe's attacks, as described by Jacob, "probably constitute the most sustained and vociferous polemical challenge that the Society ever faced" (1). [19]

In addition to weathering criticism from those who opposed experimental philosophy, the *History* also faced criticism from those who supported the Royal Society and its experimental program as well. The Society's own secretary Henry Oldenburg, for example, was ultimately so dissatisfied with the work's lack of experimental substance that he urged Joseph Glanvill to publish *Plus Ultra* (1668) as an official supplement to the text. I interpret this dissatisfaction as an outgrowth of Oldenburg's desire for the *History* to address the experimental community more decisively. Sprat's imagined audience, however, was a far broader one, and it is in many ways to this more general English audience that the *History* is rhetorically designed to appeal.

It is indeed Sprat's appeal to this broader audience that scholars have primarily noted. Jackson I. Cope and Harold Whitmore Jones, for example, characterize Sprat as "writing as an apologist rather than as a scientist" (xxi), and K. Theodore Hoppen describes Sprat as "more anxious to defend the society against its critics than to provide detailed reflexions upon its complex nature" (2).

---

conservative reaction to the new philosophy, as the standard interpretation would have it," instead "represent yet another deployment of his civil religion, this time against the alliance being forged during the early Restoration between the Royal Society and latitudinarian Anglican Christianity" (3). This point allows us not only to make better sense of the suggestive subtitle of Stubbe's *Campanella Revived*, which is "An Enquiry into the History of the Royal Society, whether the Virtuosi There Do Not Pursue the Projects of Campanella for the Reducing England unto Popery," but also to see the rhetorical motivation for the *Campanella* tract as perhaps more anti-Royal Society than it is genuinely pro-Royal College of Physicians.

[19] Harold Whitmore Jones surveys the published arguments both for and against experimental philosophy in "Mid-Seventeenth Science: Some Polemics."

The text itself is likewise typically situated in the social rather than the 'scientific' realm. While Margery Purver sees the *History* as a comprehensive and authoritative account of the Society's "origin, policy, and business" (19), Charles Webster challenges this view as a "questionable thesis" ("Origins" 108). Most critics are perhaps more in agreement with the assessments of Sir Henry Lyons, who asserts that the *History* "was not so much an account of its doings as an explanation of the need for the Society's existence" (vii), and Michael Hunter, who characterizes Sprat's text as "an apologia for a heterogeneous body widely regarded with suspicion," its ultimate purpose "to placate potential critics" (*Establishing* 61).

This rhetorical purpose affected both the form and the substance of the *History*. P. B. Wood, for example, explains that because the fellows needed "an apologetic outlining the congruence between the aspirations and activities of the Society and the search for stability and prosperity in the Restoration," Sprat's "recounting of the true history of the Society was relatively unimportant – if not completely so" (5). Webster and Marie Boas Hall are among the critics who have also questioned Sprat's facts: Webster, for example, describes Sprat's genealogy of the Society as "a severe distortion" (*Great Instauration* 93), and Hall even claims that Sprat "appears to write from hearsay" (12). My own belief is that the historical inaccuracies of the text are particularly valuable from a rhetorical perspective in that they constitute Sprat's effort to construct a history of the Society that is more ideologically meaningful than a recitation of the factually accurate history of the Society may perhaps have been. Hunter acknowledges

the significance of the *History* as a whole as a "summation of polemical attempts to define the role of science in the atmosphere of the mid seventeenth century" (*Science and Society* 29), and Richard Foster Jones notes that it is important "not only in its being the most elaborate and comprehensive defence of the Society and experimental philosophy in this century, but more especially in its constituting an official statement on the matter" (222).

I find two specific interpretations of the *History* to be particularly relevant to my own work. The first is Wood's "Methodology and Apologetics," which argues that Sprat's description of the methodology used by the experimentalists served "an apologetic function which fulfilled the institutional needs of the newly founded Society" (21). As with his genealogy of the early Society, Sprat's explanation of the new experimental methods were crafted to suit his larger rhetorical purpose: Wood explains that through "a combination of subtle misrepresentation and selective exposition, Sprat portrayed a method which would further the aims of social and ecclesiastical stability and material prosperity," all of which were "essential for the Royal Society since its continued existence depended upon the creation of a social basis for the institutionalized pursuit of natural philosophy" (1). From Wood's perspective, one can only understand the *History* when one recognizes "the institutional needs which it fulfilled" (1).

Another notable interpretation of the *History* is offered by William T. Lynch, who examines the rhetoric of Sprat's text to adduce the work's political agenda. Situating the founding of the Society amid the turbulence of the mid-1660s, Lynch argues that Sprat's primary aim was "to demonstrate that the Royal

Society was not just another private, sectarian body pulling apart the body politic, but a model for a representative and moderate English institution" (159). Sprat's rhetorical challenge was to situate the Society in the tenuous political milieu of the Restoration: Lynch explains that Sprat "tried simultanėously to hold up the Royal Society as a model for all to follow and to assure existing interests that it was not a threat to them" (161). From Lynch's perspective, one can understand the *History* only when one recognizes "its place among competing efforts to define and imagine what the English nation could and should be" (161).

What I find noteworthy about these two interpretations is not only their awareness of the larger cultural significance of Sprat's rhetoric, but also their focus on how the rhetorical purpose of the *History* affected the substance of the text – how Sprat had to subordinate philosophical concerns to rhetorical ones. As of yet, however, there has been no sustained critical study of how the rhetorical purpose of the *History* helped shape its form. Cope and Jones do note that Sprat probably looked to Paul Péllisson-Fontanier's *Relation Contenant l'Histoire de l'Académie Françoise* (1653) as a structural model for the historical sections of the text (xv), and Brian Vickers points to Bacon's *Advancement of Learning* (1605) as another potential source for its structure (3). Neither Cope and Jones nor Vickers, though, explores the overall cultural significance of the structural form of the text.

Reading *The History of the Royal Society* as a literary epic, on the other hand, highlights not only the overall cultural significance of the text's argument, but also the detailed interplay between the text's literary purpose and its narrative

form. Sprat needed to explain what the Royal Society was and how it could achieve its purpose; to describe who the experimental philosophers were and what they stood for; and to justify why the public at large should support the Society, its proponents, and its endeavors. Vickers has acknowledged a literary dimension to Sprat's text, describing it as "written in straightforward English prose, but with a free use of rhetoric, both of figures (various forms of parallelism) and tropes (especially metaphor)" (3). It is precisely this literary dimension of the *History* that I would like to explore, both revealing the text's epic characteristics and explaining how the use of those characteristics ultimately allows Sprat to fulfill his rhetorical purpose.

The *History of the Royal Society* is divided into three formal parts. In his Advertisement to the Reader, Sprat explains that the first part "*wholly Treats of the state of the* Ancient Philosophy," the second part describes the Royal Society's "*Undertaking*," and the third part "*chiefly contains a Defence and Recommendation of* Experimental Knowledge *in General.*"[20] The degree to which Sprat's composition was monitored had at one point been the subject of some critical discussion. Purver argued that "Sprat was closely guided, and his work scrutinized by a wide range of persons – prominent Fellows and numerous committees set up by the Royal Society Council for that purpose" (10). Webster, on the other hand, asserted that the evidence cited by Purver not only "scarcely justifies" her conclusion, but also "does not provide information to justify the inference that the committee was concerned with the whole of Sprat's text" (111). Scholars today perhaps tend to agree with Hunter's assessment that Sprat's

[20] All italics and capital letters in passages quoted from the *History* are Sprat's own.

composition was more closely monitored in some parts of the text than in others: whereas a "special solicitude" was shown "regarding the exact content of the scientific and constitutional sections of Sprat's book," he sees a "relative lack of evidence of supervision of the part of the work in which Sprat dealt with the broader implications of the new science" (*Establishing* 54).

The scientific and constitutional sections of the text to which Hunter refers are located in Part Two. Sprat in these sections describes various factual and procedural aspects of the Society, such as its member qualifications, its methods of inquiry, its direction of experiments, its manner of discourse, and its way of registering new observations (61-119). He also recounts what Charles II has given and granted the Society (134-43), provides an abstract of the Society's statutes (144-48), and includes a sampling of papers that have already been produced by Society members (158-309). These sections of the text are indeed relatively straightforward in terms of subject and form.

Far more interesting for my purposes, however, are the sections of the *History* where Sprat's writing was less supervised, because Sprat was there most fully able to incorporate the conventions and characteristics of the literary epic into the text. Sprat's seventeenth-century English audience would have recognized as 'epic' those traits specifically deriving from the classical literary epic: according to Kenneth Borris, the "sixteenth- and seventeenth-century writings that we can now most readily consider heroic in kind or mode according to the norms of that period feature a substantial selection of elements associated

with Homeric or Virgilian epic" (90). Borris' lengthy list of these epic elements is as follows:

> the *in medias res* opening; initial proposition of subject and invocation; further invocations within the narrative; encyclopedic scope; high style, involving epic formulas and epic similes; celebration of an expanding culture; heightened, illustrious characters, and delineation of a heroic model; analysis of their ancestry, involving some divine antecedents; inclusion of significant names, with some interpretation; historical context, at least putatively; catalogues; banquets, councils, and games; wars, sieges, and individual combats, with illustrious military campaigns or feats of arms; topics of love, friendship, passion and reason, death, mortality, mourning, fame, glory, honour, civility, hospitality, and civic responsibility; ekphrasis; dreams, prophets, and poets; and supernatural machinery, including oracles, prophecies, sacrifices, libations, heroic descent to the underworld, appeals to spirits or divinities, and interventions by them. (90-91)

Sprat's *History* incorporates nearly every one of these epic elements – either directly or indirectly, explicitly or implicitly – into its narrative structure. It is on the recognition of these epic elements that my interpretation of the *History* as a seventeenth century epic rests.

A number of these epic elements are immediately evident in Sprat's Prefatory Remarks, which begin in high epic style by announcing both the subject and the purpose of the text:

> I Shall here present to the World, an Account of the *First Institution* of the *Royal Society*; and of the *Progress*, which they have already made: in hope, that this Learned and Inquisitive Age, will either think their Indeavours, worthy of its *Assistance*; or else will be thereby provok'd, to attempt some *greater Enterprise* (if any such can be found out) for the Benefit of humane life, by the Advancement of *Real Knowledge*. (1-2)

While admittedly neither as poetic nor as memorable as Milton's famous first lines, there are several noteworthy rhetorical similarities between the two epic beginnings. In keeping with classical convention, both narratives begin *in medias res*. Milton writes after the Fall but before the Redemption of mankind; Sprat writes after the institution but before the general cultural approval and support of the Royal Society. Sprat is, indeed, writing precisely to foster this approval, for he knows that not all of his readers are Society supporters.

Both narratives also make an initial proposition of their subject. Milton writes "Of Man's First Disobedience, and the Fruit / Of that Forbidden Tree, whose mortal taste / Brought Death into the World, and all our woe, / With the loss of *Eden*, till one greater Man / Restore us, and regain the blissful Seat" (1.1-5).[21] Sprat writes "an Account of the *First Institution* of the *Royal Society*; and of the *Progress*, which they have already made." While not as obviously so as

[21] All italics and capital letters in passages quoted from *Paradise Lost* are Milton's own.

Milton's, Sprat's subject is indeed both relevant and important to all of mankind. His parenthetical phrase is rhetorically calculated to imply that there is no "*greater Enterprise*" than the Royal Society and its endeavors to benefit humanity. In this respect, Sprat constructs his subject as a likewise honorable and glorious one.

The texts of Milton and Sprat can also be seen as analogous in that they both expressly articulate their rhetorical purposes. Milton writes to "justify the ways of God to men" (1.26); Sprat writes to convince his "Learned and Inquisitive Age" to see the Society's endeavors as "worthy of its *Assistance*." We know, however, that one of Sprat's even more basic rhetorical purposes was to explain what the Society was and why it was important. Jones in an interesting verbal parallel describes this purpose as Sprat's "justifying the Society to the public" (271). In both cases, the authors explain to their contemporary audiences what events in the past have led to mankind's current state of affairs, and what events in the future can be expected to unfold.

Another epic characteristic shared by the texts is the invocation and reinvocation of a muse to assist the author in his weighty undertaking. To aid him in his "advent'rous Song" of "Things unattempted yet in Prose or Rhyme," Milton invokes the "Heav'nly Muse" Urania (1.13, 16, 6) at three different times. Milton is careful to explain in his Book Seven reinvocation, however, that this muse is a Christian and not a pagan one (7.1-12). This Christianizing of the classical muse is one of the ways that Milton adapts the conventions associated with the classical epic to suit his own rhetorical purpose.

Sprat can likewise be interpreted as invoking his muse three different times in the *History*, and as adapting this convention to suit his own rhetorical purpose as well. Sprat here makes his initial invocation:

> Although therefore, I come to the performance of this work, with much less *deliberation*, and *ability*, then the *weightiness* of it requires: yet, I trust, that the *Greatness* of the *Design* it self, on which I am to speak, and *zeal* which I have for the *Honour* of our *Nation*, which have been the chief reasons, that have mov'd me to this confidence of writing, will serve to make something for my Excuse. (2)

Like many epic writers, Sprat feels inadequate in the shadow of the task before him. Rather than calling upon a divine entity to assist him with the "*deliberation*" and "*ability*" that his undertaking requires, however, Sprat turns for inspiration to his enthusiasm for the Society and to his zeal for the English nation. By casting his combined passion for the Society and for the English nation in the role of epic muse, Sprat implicitly shows his immediate audience that they do not need to look outside themselves for inspiration to achieve the seemingly impossible: Englishmen need only put their belief in the advancements of the Royal Society and their trust in the English nation in order to find the strength and support they need to succeed in any endeavor.

Even more important, however, is the explicit argument that Sprat makes by casting his passion for the Society and the English nation as his epic muse. Shortly after his initial invocation, Sprat begins to forge the connection between

the Society and the nation that will ultimately become the foundation of the text's nationalist argument:

> For what greater matter can any man desire, about which to employ his thoughts, then the Beginnings of an *Illustrious Company*, which has already laid such excellent Foundations of so much good to Mankind? Or, what can be more delightful for an *Englishman* to consider, then that notwithstanding all the late miseries of his Country; it has been able in a short time so well to recover it self: as not onely to attain to the perfection of its *former* Civility, and Learning, but also to set on foot, a *new* way of improvements of Arts, as *Great* and as *Beneficial* (to say no more) as any the wittiest or the happiest Age has ever invented?" (2-3)

Sprat's rhetorical questions function both implicitly and explicitly. Implicitly, they challenge the critics of experimental philosophy who believe that the Royal Society will contribute little, if anything, to the benefit of mankind. Explicitly, of course, the questions assure readers that they should indeed take pride not only in the fact that England has recovered from the "late miseries" of the civil war period, but also in the fact that it has brought the Royal Society into being. Note that Sprat's second question constructs pride for the Society as a natural component or extension of pride for the nation as a whole. Sprat throughout the text increasingly casts the Society as representative and reflective of post-Reformation England, and ultimately as the symbol of English national spirit.

If we accept national pride to be Sprat's epic muse, we can interpret a passage from the beginning of Part Two of the text as Sprat's first reinvocation. Sprat could certainly have signaled his movement from Part One into Part Two with a simple page break, new heading, or marginal notation. The fact that he instead utilizes this lengthy passage to signal that movement arguably indicates that he intended the passage to function rhetorically as more than a mere transition:

> I come now to the Second Period of my Narration: wherein I promis'd, to give an account of what they did, till they were publickly own'd, incourag'd, and confirm'd by Royal Favor. And I trust, that I shall here produce many things, which will prove their attempts to be worthy of all Mens incouragement: though what was perform'd in this interval, may be rather styl'd the *Temporary Scaffold* about the building, then the *Frame itself*. But in my entrance upon this Part, being come to the top of the Hill, I begin to tremble, and to apprehend the greatness of my Subject. For I perceive that I have led my Readers Minds on, by so long, and so confident a Speech, to expect some wonderful Model, which shall far exceed all the former, that I have acknowledg'd to have been imperfect. Now, though this were really so, as I believe it is; yet I question, how it will look, after it has been disfigur'd by my unskilful hands. But the danger of this ought to have deterr'd me in the beginning. It is now too late to look back; and I can only apply my self to that *good*

> *Nature*, which a *Great Man* has observ'd to be so peculiar to our *Nation*, that there is scarce an expression to signifie it, in any other Language. To this I must flye for succor, and most affectionately intreat my Countrymen, that they would interpret my failings to be onely errors of obedience to some, whose commands, or desires, I could not resist: and that they would take the measure of the *Royal Society*, not so much from my lame description of it; as from the honor, and reputation, of many of those Men, of whom it is composed. (60-61)

This passage serves several key rhetorical functions. On its most basic level, it allows Sprat to express his shortcomings as a writer, acknowledging that he with his "unskilful" hands will be unable to do the Society justice. Note, however, that Sprat again does not call upon an outside force for assistance. He instead makes a plea to the natural character of the English people – a plea to that "*good Nature* . . . so peculiar to our *Nation*" – that will allow his readers to perceive the true measure of the Society despite his inability to express it. It is in this respect the perception, judgment, and understanding of his English reader that Sprat here invokes.

The passage also allows Sprat to heroicize the Society and its fellows. Sprat characterizes the Society's many accomplishments, for example, as only a small part of what it will ultimately accomplish – as the "*Temporary Scaffold*" rather than the "*Frame itself.*" If indeed, the logic goes, it was able to do great things in the past, there may well be no limit to what the Society can achieve in

the future now that it has been "publickly own'd, incourag'd, and confirm'd by Royal Favor." Note, too, that Sprat turns the awareness of his shortcomings as a writer to his rhetorical purpose as well. The very structure of his request for readers to measure the Society by its fellows rather than by his "lame description" focuses the reader's attention squarely on the "honor" and "reputation" of the new experimentalists.

The most significant sentence in the entire passage, however, is the one that at first glance seems the most bizarre and out of place: "But in my entrance upon this Part, being come to the top of the Hill, I begin to tremble, and to apprehend the greatness of my Subject." This highly visual image of Sprat having ascended a hill and pausing to apprehend the sight before him would perhaps have resonated with his contemporary audience in a number of ways. The image is on one hand similar to that employed by Milton in Book 11, where Michael leads Adam to the top of the highest hill in Paradise to "behold / Th' effects" wrought by original sin (11.423-24). The image, however, is on the other hand very different from Milton's in that Sprat sees not a "sight / Of terror, foul and ugly to behold" (11.463-64), but rather vision of the "greatness" of the Royal Society's promise and potential. In this respect, then, the image is more closely reminiscent of the Biblical image of Moses viewing the Promised Land from atop Mount Pisgah.

The image also, however, echoes one from a work that was intimately associated with the *History* – Abraham Cowley's "To the Royal Society," which

was published as an introductory poem to the *History*. Cowley too employs this image, but alters it so that Francis Bacon becomes the visionary[22]:

> Bacon, like Moses, led us forth at last;
> The barren wilderness he passed,
> Did on the very border stand
> Of the blest promised land,
> And from the mountain's top of his exalted wit,
> Saw it himself, and showed us it. (st. 5)

While Bacon and Moses were both only able to view their promised lands from afar, however, Cowley portrays the Royal Society as the "great champions" that will "get" and "subdue" these lands:

> From you, great champions, we expect to get
> These spacious countries but discovered yet;
> Countries where yet instead of nature we
> Her images and idols worshipped see.
> These large and wealthy regions to subdue,
> Though learning has whole armies at command,
> Quartered about in every land,
> A better troop she ne'er together drew. (st.6)

Whereas Cowley portrays Bacon as the Moses figure looking down on the lands that that the Royal Society will ultimately enable England to enter and possess, Sprat portrays himself as the Moses figure looking down upon the "greatness" of

[22] See Achsah Guibbory's "Imitation and Originality" for a discussion of Bacon's influence on Cowley.

the Royal Society. Cowley's image indeed reflects Sprat's larger argument as to the national and international power that the Royal Society will bestow on the English nation. Sprat's image of the Royal Society as the promised land, however, is significant not only because it constructs the Royal Society itself as a noble and divine institution, but also because it constructs England, by virtue of its nurturing and cultivation of the Royal Society, as on the cusp of possessing the promised land. Having survived the plague, the fire, the Dutch Wars, and the civil war period, England is now ready, both metaphorically and literally, to inherit the natural and the material world.

One final aspect to note about Sprat's second invocation is its introduction of the idea of an epic journey or quest. Allusions to this epic convention surface a number of times throughout the text, as Sprat variously portrays the reader, the Royal Society, the English people, and the English nation itself as all being on particular journeys of their own. In the second invocation, Sprat portrays the process of writing the *History* as a journey as well, admitting that he has "led [his] Readers Minds on, by so long, and so confident a Speech, to expect some wonderful Model" of the Society. If the process of writing is indeed viewed as a journey, it is significant from an epic standpoint that this journey was interrupted by two natural calamities. Sprat explains in Part Two that

> thus far I was come in my intended *work*, when my *hand* was stop'd, and my *mind* disturb'd from writing, by the two greatest disasters, that ever befel our *Nation*, the *fatal Infection*, which

> overspread the City of *London* in Sixty five; and the *dreadful firing* of the City it self, in the year insuing. (120)

Particularly important is the fact that Sprat refers to the 1665 outbreak of the plague and the 1666 Great Fire of London as "scourges of mankind" (120). His description of these events as "scourges" perhaps suggests that we interpret the disasters as the result of divine intervention in the human world – yet another epic trope that Sprat incorporates into his text.

Rather than a cause for lamentation, however, these disasters ultimately become a source of national pride for Sprat. Although he does "*bewail*" the "*desolation*" left by them, Sprat says that he must "*admire*" the "*magnanimity*, wherewith the English Nation did support the mischiefs" (120). This admiration in turn leads to national pride, which he invokes here in his third invocation as enabling him to return to his composition:

> From this *observation* my mind begins to take comfort, and to presage, that as this *terrible Disease*, and *Conflagration* were not able to darken the honour of our *Princes Armes*; so they will not hinder the many noble *Arts*, which the *English* have begun under his *Reign* on the strength of these hopes, and incouragements, I will now return to my former thoughts, and to the finishing of my interrupted *design*. (122)

Contemporary readers of the *History* would certainly have known that Sprat was not the only writer who had taken pride in the way that the England recovered

from these disasters. Dryden conveys this same pride and optimism in the final section of *Annus Mirabilis*:

> The utmost malice of their Stars is past,
>
> And two dire Comets which have scourg'd the Town,
>
> In their own Plague and Fire have breath'd their last,
>
> Or, dimly, in their sinking sockets frown.
>
> Now frequent Trines the happier lights among,
>
> And high-rais'd *Jove* from his dark prison freed:
>
> (Those weights took off that on his Planet hung)
>
> Will gloriously the new laid work succeed.
>
> Me-thinks already, from this Chymick flame,
>
> I see a City of more precious mold:
>
> Rich as the Town, which gives the *Indies* name,
>
> With Silver pav'd, and all divine with Gold.[23] (st. 291-93)

Dryden here likewise refers to the plague and fire as scourges, and conveys an optimistic vision of the future of England as well. Note also that his image of London's resurrection is an alchemical one: as fire was said to transmute lead into gold, the "Chymick flame" of the fire and the plague has symbolically transmuted London into a "more precious mold." As the texts of Sprat and Dryden are infused with a sense of national pride, so too does that pride derive from the anticipation of economic and material advance.

The *History* and *Annus Mirabilis* end with the same prophetic vision of England as master over the natural and the economic world. Both texts also

[23] All italics and capital letters in passages quoted from *Annus Mirabilis* are Dryden's own.

anticipate that this mastery will be achieved through the many technological advances and practical inventions to be developed by the experimentalists. But whereas Dryden places the Society, according to Helen M. Burke, "firmly in the context of technological development" (310), Sprat portrays the Society in the context of national development – portrays it as integral to the development of the English nation. This portrayal is most explicit in Sprat's discussion of the early history of the Royal Society. It is important to recognize that Sprat's discussion of this history goes far beyond providing his readers with mere facts. Remember that there has been some debate as to whether the history he recounts is even accurate – and if, indeed, it is not accurate, that arguably makes what Sprat does say all the more significant from a rhetorical standpoint.

Certainly one thing to note is that the way in which Sprat recounts the early history of the Society enables him simultaneously to retell – and in doing so, to reconstruct in epic fashion – the recent history of the English nation. This allows Sprat not only to draw on, but also to construct the nationalism of his readers. Herbert Grabes, for example, asserts that "there is now a broad consensus that national identity is an invention in terms of a collective creation determined by a multitude of historical factors" (ix). One of those factors is certainly memory. David Cressy explains that

> long before the modern period, as early as the sixteenth century, English governments made calculated use of national memory for dynastic, political, religious, and cultural purposes. And by the seventeenth century, when politics and religion became

> dangerously fraught and fractured, much of England's political discourse, including the discourse of opposition and contest, revolved around the interpretation, celebration, and control of remembered historical events. England's past became an issue in England's present to a degree unknown elsewhere in early modern Christendom. (61)

The *History* does indeed make a "calculated use of national memory" for its own rhetorical purpose. Sprat's retelling of the events of England's recent past not only celebrates the Royal Society, but also constructs the Society as an English institution with intense cultural and political significance.

The retelling of the Society's early history occurs in Part Two of the text. Because it recounts events that occurred chronologically before the events that are discussed in Part One of the narrative, this discussion can be seen as a flashback. Sprat begins his discussion of the "*first occasions*" of the Society by asserting that

> it may seem perhaps, that in passing through the first of these, I go too far back, and treat of things, that may appear to be of too private, and Domestick concernment, to be spoken in this publick way. But if this *Enterprise*, which is now so well establish'd, shall be hereafter advantageous to Mankind (as I make no scruple for foretel, that it will) it is but just, that future times should hear the *names*, of its first *Promoters*: That they may be able to render

> particular thanks to them, who first conceiv'd it in their minds, and practis'd some little draught of it long ago. (52-53)

Given that readers of a text entitled *The History of the Royal Society* would likely expect to learn who first promoted the institution, Sprat's overt justification of this discussion is a bit puzzling. One potential explanation for this justification is that it allows Sprat rhetorically to call attention to the discussion as a flashback, and therefore to emphasize this epic characteristic of the text. It also allows Sprat to suggest remembrance of the Society's founders, and to assert yet again that the Society will be a great advantage to mankind.

According to the *History*, the foundations for the Society were ultimately laid in John Wilkins' lodging at Wadham College sometime during the 1650s. Sprat explains that it was

> some space after the end of the Civil Wars at *Oxford*, in *Dr. Wilkins* his [sic] Lodgings, in *Wadham College*, which was then the place of Resort for Vertuous, and Learned Men, that the first meetings were made, which laid the foundation of all this that follow'd. The *University* had, at that time, many Members of its own, who had begun a *free way* of reasoning; and was also frequented by some *Gentlemen*, of Philosophical Minds, whom the misfortunes of the Kingdom, and the security and ease of a retirement among Gown-men, had drawn hither. (53)

Note here that Sprat does not give the specific year in which these first meetings took place. The omission, I believe, can not have been an accident: what rather

is more likely is that the exact year that these meetings began is less important to Sprat's overall rhetorical purpose than the fact that the meetings began after the civil war era. The portrayal of the University as having been peopled with virtuous and learned men seeking to escape the "misfortunes of the Kingdom" constructs Oxford, which had itself been a Royalist stronghold during the 1640s, as a safe haven from the outside world.

Speaking here of those "*Gentlemen* of Philosophical Minds," Sprat says that

> their first purpose was no more, then onely the satisfaction of breathing a freer air, and of conversing in quiet one with another, without being ingag'd in the passions, and madness of that dismal Age. And from the Institution of that *Assembly*, it had been enough, if no other advantage had come, but this: That by this means there was a race of yong Men, provided, against the next Age, whose minds receiving from them, their first Impressions of *sober* and *generous knowledge*, were invincibly arm'd against all the inchantments of *Enthusiasm.* (53)

Emphasizing their sobriety and distancing them from "passions" and "madness" was an effective and relatively common way for advocates and apologists to describe the intellectual and emotional character of Society members. The fact that Sprat here also distances the early members from "*Enthusiasm*," however, is significant because it specifically establishes the political character of the Society members. The term "Enthusiasm" and its various permutations were frequently

used during the civil war period as derogatory terms to characterize the motivations, actions, or fundamental natures of dissenters and radicals. To thus declare that the early Society members were "invincibly arm'd against all the inchantments of *Enthusiasm*," then, is a powerful way to affirm that these men were entirely divorced from the causes of the cultural upheavals during the civil war period.

This declaration likewise establishes the religious character of the experimentalists by implicitly linking them to the established Church of England. As will be discussed in my next chapter, Sprat goes to great lengths in the *History* to associate the Royal Society and its members to latitudinarianism, or liberal Anglicanism. This association helped construct the experimentalists as a God-fearing and morally upright member of the English religious community, and thereby allowed Sprat to undercut the critics of the Society who portrayed the experimentalists as hubristic promethean overreachers or, even worse, as atheists who elevated the material above the spiritual. Distancing Society members from "*Enthusiasm*" thus also enables Sprat to assure readers that experimental philosophers are indeed operating within appropriate theological and spiritual bounds.

Sprat also uses this distance to imply that Society members are against war and physical conflict. Whereas classical epic heroes were valorized for their physical strength, aggression, and combat, the experimentalists are valorized for their contemplation, civility, and peace – cultural values that the *History* ultimately

portrays as the appropriate and effective foundation for building and uniting the English nation. Sprat explains that

> for such a candid, and unpassionate company, as that was, and for such a gloomy season, what could have been a fitter Subject to pitch upon, then *Natural Philosophy?* To have been always tossing about some *Theological question*, would have been, to have made that their private diversion, the excess of which they themselves dislik'd in the publick: To have been eternally musing on *Civil business*, and the distresses of their Country, was too melancholy a reflexion: It was *Nature* alone, which could pleasantly entertain them, in that estate. The contemplation of that, draws our minds off from past, or present misfortunes, and makes them conquerers over things, in the greatest publick unhappiness: while the consideration of *Men*, and *humane affairs*, may affect us, with a thousand various disquiets; *that* never separates us into mortal Factions; *that* gives us room to differ, without animosity; and permits us, to raise contrary imaginations upon it, without any danger of a *Civil War.* (55-56)

Note here that natural philosophy is depicted as having the power to unite even those with fundamentally differing political or theological beliefs. Theological and political discussions are divisive and burden men "with a thousand various disquiets"; discussions of natural philosophy, however, can be pleasantly entertaining and can empower men to become "conquerers over things."

Perhaps even more important is the fact that disagreements over natural philosophy can be discussed "without animosity" and "without any danger of a *Civil War.*" This final point affirms that the code of conduct followed by the experimentalists could, and perhaps should, serve as a model for the appropriate civic behavior of all Englishmen.

It is significant that Sprat's characterization of the Royal Society as an institution that insulates its members from the political strife of the outside world is not without literary precedent. The House of Astragon in William Davenant's *Gondibert* (1651), for example, is such a haven for "Natures [sic] Friends" (II.v.15), as is the Prophet's College for "*Schollars, Doctors* and *Companions*" (259) in Cowley's *Davideis* (1656). How the civic virtues and values fostered by these institutions overlap with those of the Royal Society and its experimentalists will be discussed in chapter four. At this point, simply note that Sprat's depiction of the early history of the Society is yet another link between the *History* and the seventeenth century epic tradition.

In addition to thus offering his readers an example of appropriate civic behavior, Sprat also suggests that thinking about that nation's past or present "misfortunes" is both a stressful and an upsetting activity. To dwell on these misfortunes, now as then, is simply counterproductive: much better would be to focus on that which will foster peace and unity. In that he seems to advocate a collective forgiving and forgetting of England's recent past that is not unlike the one officially legislated by the Acts of Oblivion, Sprat can indeed here be seen as attempting to shape the collective national remembrance of England's recent

history by advising his audience to remember the good that resulted from the revolutionary period. After briefly mentioning the "miserable distractions" of 1658, Sprat says

> but, (to make hast through those dreadful revolutions, which cannot be beheld upon Paper, without horror; unless we remember, that they had this one happy effect, to open mens eies to look out for the true Remedy) upon this follow'd the King's Return; and that, wrought by such an admirable chain of events, that if we either regard the *easiness*, or *speed*, or *blessed issue* of the Work; it seems of it self to contain variety, and pleasure enough, to make recompence, for the whole Twenty years Melancholy, that had gone before. (58)

While he does admit that the past twenty years have been dreadful ones, Sprat affirms that the Restoration of Charles II more than makes up for their misery. The description of the Restoration as a "*blessed issue*" analogizes it to childbirth, and therefore casts the event as a natural and beautiful one that should be celebrated. The best course of action now, Sprat asserts, is for Englishmen to put the misery of the past behind them, and to focus on the happy rebirth of the King and of the English nation.

Sprat makes his ultimate ideological and rhetorical move when he then links the founding of the Royal Society to the "glorious Action" of this national rebirth. He explains that

> it shall suffice my purpose, that Philosophy had its share, in the benefits of that glorious Action: For the *Royal Society* had its beginnings in the wonderful pacifick year, 1660. So that, if any conjectures of good Fortune, from extraordinary Nativities, hold true; we may presage all happiness to this undertaking. And I shall here joyn my solemn wishes, that as it began in that time, when our Country was freed from confusion, and slavery: So it may, in its progress, redeem the minds of Men, from obscurity, uncertainty, and bondage. (58)

Note that Sprat here finally gives his readers a year with which to associate the Society's beginnings – "the wonderful pacifick year, 1660." This is the date that he wants readers to remember: that fortuitous year not only freed England from the miseries of war, but also cast a prophetic nativity of "happiness" and success to the Society in its quest to "redeem the minds of Men." Sprat ultimately hopes that his readers will not only identify the birth of the Society with the rebirth of the nation, but also associate the Society with the redemption of the nation as well. In the same way that Christ is championed in Book 12 of *Paradise Lost* as the spiritual redeemer of mankind after the Fall, the Society is in the *History* portrayed as the intellectual redeemer of mankind – and particularly of Englishmen – after the civil war period. It is with this characterization of the Royal Society as the preeminent national institution of the newly reborn and redeemed England that Sprat brings his epic flashback to a close.

One final noteworthy dimension of this flashback concerns the overall characterization of the civil war period. Sprat rhetorically focuses his readers' attention on England's future, but there is no denying that he recognizes the political strife, social instability, and religious conflict of the recent past as having been truly hellish. As such, I argue that we can interpret this phase of English history metaphorically as the nation's epic journey through the underworld. Although terrifying, the journey also was enlightening: Sprat asserts that it did "open mens eies" to the fact that the return of Charles II was the "true Remedy" to their woes. If one is willing to accept this metaphorical interpretation of the English past, the journey through the underworld can be seen as yet another epic convention that Sprat adopts and adapts in the *History*.

Sprat is equally concerned with establishing the Royal Society's relationship to the distant past as he is with establishing its relationship to the recent past. The rhetorical purpose of the entire first part of the *History,* for example, is to explain and defend the Society's relationship to the ancients in a way that supports his argument that the Society should replace the ancients as the legitimate authority on all issues relating to the study and interpretation of nature.[24] Sprat fundamentally grounds this argument in language: because corruption of language leads to corruption of knowledge, the Royal Society through its dedication to clear and precise language will lead men to a more clear and precise understanding of nature and the natural world.

Sprat explains, for example, that while it is just to "attribute the original of *Astronomy*, *Geometry*, *Government*, and many sorts of Manufactures, which we

[24] The critical standard on this relationship remains Richard Foster Jones' *Ancients and Moderns.*

now enjoy, to the *Assyrians*, the *Chaldeans*, and *Egyptians*," it is also necessary to recognize that

> from them proceeded the first *Corruption* of knowledge. It was the custom of their Wise men, to wrap up their Observations on Nature, and the Manners of Men, in the dark Shadows of *Hieroglyphicks*; and to conceal them, as sacred *Mysteries*, from the apprehensions of the vulgar. (5)

Note that the objection raised here is analogous to that which was raised against the alchemists. Knowledge concealed in "*Hieroglyphicks*" contributes nothing to the understanding of nature. Sprat objects also to the "Artifice" of the "Schole-men." Despite their "extraordinary strength of mind," "great quickness of imagination," "excellent" natural endowments, and "commendable" industry, these schoolmen

> lighted on a wrong part at first, and wanted matter to contrive: and so, like the *Indians*, onely express'd a wonderful Artifice, in the ordering of the same Feathers into a thousand varities of Figures. I will not insist long on the Barbarousness of their style: though that too might justly be censur'd. (15-16)

Sprat's point is that the obscure and redundant language of the past is not only primitive and barbaric, but also a hindrance to the Royal Society and to all seekers of truth and knowledge.

This objection to obscure and redundant language certainly contributes to the experimental push for a clear and direct mode of expression that grew from

Francis Bacon's discussion of the Idols of the Marketplace in *Novum Organum* (1620).[25] It also, and perhaps more importantly, contributes to the nationalism of the *History* as well. According to Benedict Anderson, it was language combined with print that "laid that bases for national consciousnesses" (44). Texts make readers conscious of the fact that they are not alone – conscious of the fact that there are other readers to whom the text is also speaking. Anderson explains that, for readers, "these fellow-readers, to whom they were connected through print, formed, in their secular, particular, visible invisibility, the embryo of the nationally imagined community" (44). Sprat indeed encourages his readers throughout to envision themselves as part of a collective English audience.

Sprat also encourages his readers to take pride in their English character and in their English language. Sprat's admiration for the rhetorical style of Péllisson's *l'Histoire de l'Académie Françoise* (1653), for example, that it "is so masculinely, so chastly, and so unaffectedly done" (40), is often cited. Rarely cited, however, is the critique that immediately follows it:

> I have onely this to allege in my excuse; that as they undertook the advancement of the Elegance of Speech, so it became their *History*, to have some resemblance to their enterprize: Whereas the intention of ours, being not the Artifice of Words, but a bare knowledge of things; my fault may be esteem'd the less, that I have written of *Philosophers*, without any ornament of *Eloquence*. (40)

[25] See H. Fisch and H. W. Jones' "Bacon's Influence on Sprat's *History of the Royal Society*" for a discussion of the similarities between Sprat's text and the first volume of Bacon's *Advancement of Learning.*

Just as John Milton defends his stylistic choice to write *Paradise Lost* in "*English* Heroic Verse without Rime" (210), Sprat here defends the plain linguistic style of the *History*. Note that for both authors linguistic and stylistic choices are more than a matter of aesthetics: while Milton avoids rhyme because it is "no necessary Adjunct or true Ornament of Poem or good Verse, in longer Works especially, but the Invention of a barbarous Age, to set off wretched matter and lame Meter" (210), Sprat's unadorned language is a deliberate rhetorical reflection of the English dedication to knowledge and understanding. Sprat's simultaneous acknowledgement and critique of the French text is similar to his acknowledgement and critique of the ancients and the school-men: while all can be admired to some extent, each has a characteristic linguistic flaw – in the case of *l'Histoire*, an "Artifice of Words" – that must be avoided. The portrayal of these linguistic flaws as also representative of conceptual and moral problems strengthens Sprat's linkage of obscure, redundant, and fanciful language with various cultural or national others, and links clear, straightforward, and direct language with the English.

Only when one recognizes and understands Sprat's association of the English language with the English nation does the significance of his lengthy passage about the history of the English language become evident. Speaking here of the English language itself, Sprat asserts that

> till the time of *King Henry* the *Eighth*, there was scarce any man regarded it, but Chaucer; and nothing was written in it, which one would be willing to read twice, but some of his *Poetry*. But then it

began to raise it self a little, and to sound tolerably well. From that Age, down to the beginning or our late *Civil Wars*, it was still fashioning, and beautifying it self. In the Wars themselves (which is a time, wherein all Languages use, if ever, to increase by extraordinary degrees; for in such busie, and active times, there arise more new thoughts of men, which must be signifi'd, and varied by new expressions) then I say, it receiv'd many fantastical terms, which were introduc'd by our *Religious Sects*; and many outlandish phrases, which several *Writers*, and *Translators*, in that great hurry, brought in, and made free as they pleased, and with all it was inlarg'd by many sound, and necessary Forms, and Idioms, which it before wanted. And now, when mens minds are somewhat settled, their Passions allai'd, and the peace of our Country gives us the opportunity of such diversions: if some sober and judicious Man, would take the whole Mass of our Language into their hands, as they find it, and would set a mark on the ill Words; correct those, which are to be retain'd; admit, and establish the good; and make some emendations in the Accent, and Grammar: I dare pronounce, that our *Speech* would quickly arrive at as much plenty, as it is capable to receive; and at the greatest smoothness, which its derivation from the rough *German* will allow it. (42)

Note that Sprat here portrays the English language as having gone through the same tribulations as the English nation itself. Its development was halted during

the civil war period, when it was expanded with "fantastical terms" and "outlandish phrases" in a linguistic free-for-all that mirrored the cultural anarchy of the period. Sprat's desire to now have the "ill Words" struck out of the English language is analogous to his desire to erase the ill memories from the English past. Now that passions have settled and peace has been restored, it is time for the "sober" and "judicious" Englishmen to tend to their language and to their nation.

Part Three of the *History* enumerates the many ways that experimental philosophy and the Royal Society will contribute to this national improvement. From a rhetorical standpoint, it is important to keep in mind that many of the arguments offered by Sprat in favor of the Society and its experimental program may well have been dictated by the criticism of its antagonists. Sprat's overall claim in this part of the text is that

> the increase of *Experiments* will be so far from hurting, that it will be many waies advantageous, above other *Studies*, to the wonted Courses of *Education*; to the Principles, and instruction of the minds of Men in general; to the *Christian Religion*, to the Church of *England*; to all Manual *Trades*; to *Physic*; to the *Nobility*, and *Gentry*; and the Universal Interest of the whole *Kingdom*. (322-23)

The shape and content of this argument is in many ways designed to refute the claims and allegations of Society critics. Sections II-V of the text, for example, dispute the claims for the superiority of a traditional education in ancient knowledge and logic by arguing that experiments should be an integral part of an

Englishman's education (323-332). Sections VI-XII extend this point, countering those who question the necessity for this education by arguing that the pursuit of all knowledge and learning is both a worthy and a valuable pursuit for Englishmen (332-341). Sections XIV-XXIII refute allegations of atheism and heresy by arguing that experiments are not fundamentally antithetical to religion (345-378). Sections XXIV-XXIII challenge the claim that Royal Society endeavors will be of little or no benefit by arguing that experiments will effect great improvements in the manual arts (378-403).

The particular section that is most relevant to our purposes is the one that explicitly addresses the ways in which experiments and experimental philosophy will serve the interest of the English nation (403-430). Sprat begins a section entitled "Experiments advantageous to the Interest of our Nation" with the announcement that he will now "examin the Universal Interest of the *English Nation*, and consider what effect the *Works* of the *Royal Society* are like to have upon it, by what means their *Labors* may serve to encreas our advantages, and correct our imperfections" (419). Before embarking on this examination, however, Sprat pauses to make this comment on the English character:

> There are very many things in the *Natural Genius* of the *English*, which qualify them above any other for a *Governing Nation*. The scituation [sic] of our *Country* is most advantageous for *Command*: Its native productions are most serviceable for *strength* and *Empire*: The disposition of the people is bold in dangers, severe in Discipline, valiant in Arms, virtuous in Life, relenting to the afflicted,

> and merciful in Conquest. The unfortunat [sic] Divisions by which our *Force* has bin of late distracted, are but one or two *Ages* growth; the Vices to which we are subject are not natural to our *Soil*, but imported hither from forein *Countries*: The *English* Generosity, Fidelity, Magnanimity, Modesty, Integrity, they ow to themselves; their Luxury, their Debauchery, their Divisions, their Spiritual Schisms, they have receiv'd from abroad. (420)

As he had earlier associated linguistic flaws with cultural or national 'others,' Sprat here associates personal and political vice with the foreign – particularly with France and the Netherlands. He cites the "*Natural Genius of the English*" as inherently honorable on many levels, and sees this innate English character and temperament as having degenerated in the recent past by an influx of vices "imported" from abroad. In that it epitomizes these natural and honorable English values, the Royal Society both exemplifies and represents an idealized English national identity.

Even more significant than the fact that the Royal Society embodies this natural English virtue, however, is the fact that it can help to improve and foster English national virtue. This improvement, Sprat explains, will occur in four specific ways: the Royal Society will help England to "advance its Industry in peaceful *Arts*"; to "introduce the forein, of which our soil is capable"; to "obtain a union of mind, both in *Civil* and *Spiritual Matters*"; and to "preserve the ancient form of *Government*" (421). Much of the remainder of the *History* is dedicated to explaining how and why these improvements will be achieved.

Sprat asserts, for example, that the "first thing that ought to be improv'd in the *English Nation*, is their *Industry*." He then affirms that "the tru Method of increasing *Industry*, is by that cours which the *Royal Society* has begun in *Philosophy*, by *Works*, and *endeavors*" (421-22). A lengthy example of how industry directly benefits a nation then follows:

> This I will demonstrate by an *instance* which I have already alledg'd, and it is of the *Hollanders*: For we may fetch *examples* of *virtu* from our own Countrymen, but of *Industry* from them. At first they were as lazy as the worst of ours: their hands were unus'd to labor: their manner of life was much like that of the *Ancient Britains*: their Coasts lay desolat to the Sea, without Bancks, or Towns, or Ships, or harbors: and when the *Roman Emperor* gather'd Cockles there, perhaps there was little else worth gathering. But when by the number of their people they were forc'd to look abroad, to Trade, to Fish, to *labor* in *Mechanics*; they soon found the sweetness as well as the toyl of their *diligence*: their successes and riches still added new heat to their minds; and thus they have continued *improving*, till they have not only discrac'd but terrify'd their *Neighbors*, by their *Industry*. Nor will it suffice to tell us, that they ow this activity to the form of their *Government*. That supposition may presently be confuted by the Example of *France*, the most absolute *Monarchy* of *Christendome*. There it is apparent by the prodigious toyls of their people, both upon the Earth, and in

> their Shops, that *diligence* may thrive in a *Kingdom*, as well as in a *Common-Wealth*. (422-23)

Sprat's use of Holland and France, both of which were adversaries of the English, functions on two rhetorical levels. One level is intended to force readers of the *History* to acknowledge that England is lagging behind its neighbors – to see that action must be taken if England is to compete successfully in matters of international trade and commerce. It also implicitly challenges those who argue against the cultural changes both advocated and represented by the Royal Society.

Sprat's example also functions on a second level to assure readers that England will indeed become a leader in international politics and economics once the influence of the Royal Society takes hold. When Englishmen, like the Hollanders before them, finally abandon their laziness and commit themselves to labor, they too will find the "sweetness" of their diligence: they will build harbors, ships, towns, and banks; they will increase their skills in fishing, farming, and mining; they will gain the individual, community, national, and international "successes and riches" that improved industry offers. Sprat thus both implicitly and explicitly refutes those who argue that the Royal Society will have little, if any, benefit. Because it will build and foster diligence, productivity, and industry on the part of Englishmen, the Society will ultimately enable the English nation to participate more fully and more profitably in international commerce and trade.

The Society will also help Englishmen deal appropriately with foreign influence. One "fault" that Sprat sees in the English temperament is to have "an

inclination to every *Novelty*, and vanity of forein *Countries*, and a contempt of the good things of our own." This "wandring, and affected humor," he asserts, "*Experiments* will lessen, above all other *studies.*" A second "*imperfection*" that Sprat sees in the English is "a *narrowness of mind*, and a *pusillanimous confining* our thoughts to our selves, without regarding any thing that is forein, or believing that any of their *Arts*, or *Customs* may be preferr'd before our own." This imperfection, he explains, "will be cur'd by the effectual *Demonstrations* that the *Society* will give, of the benefit of a universal *Correspondence*, and *Communication*" (424). The experiments and demonstrations of the Royal Society will ultimately help correct the contradictory English tendencies both to underestimate and to overestimate the value of foreign things and ideas, will enable the English to incorporate useful or beneficial foreign technologies into their own culture, and will give Englishmen a more balanced perspective of their true intellectual and cultural standing.

Still a third English "mischief" that Sprat believes the Royal Society will correct is the "want of union of *Interests*, and *Affections*" which has of late "bin heighten'd by our *Civil differences*, and *Religious distractions.*" Sprat contends that in order to forge this national unity,

> the most effectual remedy to be us'd is, first to assemble about some *calm*, and *indifferent* things, especially *Experiments*. In them there can be no cause of mutual *Exasperations:* In them they may agree, or dissent without faction, or fierceness: and so from induring each others *company*, they may rise to a bearing of each

> others *opinions*; from thence to an exchange of good *Offices*; from thence to real *Friendship*: Till at last by such a Gentle and easy *Method*, our several *Interests* and *Sects* may come to suffer one another, with the same peaceableness as men of different *Trades* live one by another in the same *Street*. (426-27)

Because its very purpose is to create a consensus, the Royal Society will directly contribute to the development of English national unity. Indeed, Sprat specifically notes that the Society has already begun to forge this unity, as there "men of disagreeing parties, and ways of life, have forgotten to hate, and have met in the unanimous advancement of the same *Works*" (426-27). Its early success in bringing men of different factions together demonstrates that the Society can help England cast off its fractured past and move into the future as a strong and unified nation.

And finally, the Society will benefit the English nation by helping to "preserve the ancient form of *Government*" by encouraging obedience to the newly restored King. Sprat describes the "skill of *Nature*" as "the best præservative against disobedience" and declares that "*Experiments*" will check the "resistance of *lawful Authority*":

> To this *Experiments* will afford a certain cure; they will take away all pretence of idleness, by a constant cours of pleasant indeavors; they will employ men about profitable *Works*, as well as *delightful*; by the pleasure of their *Discoveries* they will wear off the

> roughness, and sweeten the humorous peevishness of mind, whereby many are sowr'd into *Rebellion*. (428)

Sprat's emphasis here is again on the fact that experiments will secure and strengthen the English nation by encouraging Englishmen to work with rather than against one another – a partnership, he reminds readers, that will be not only pleasurable but "profitable" as well. Because it has the potential to unify Englishmen in politics and the power to increase their individual financial and collective economic status, the Royal Society can ultimately lay the foundation on which the strength and future of the English nation will be built.

Sprat's explanation of these four particular ways that the Society will benefit England is certainly important on one level. Readers of the *History* would more than likely have expected such a discussion, and Sprat indeed gives them a number of specific reasons to offer their political and philosophical support to the new institution. The epic spirit of Sprat's argument, however, lies not in these literal claims, but perhaps rather in the more metaphorical of the text's passages. One significant passage already mentioned is that at the beginning of Part Two, where Sprat portrays himself as a Moses figure looking down upon the greatness of the Royal Society. Recall there that the image portrayed England as destined to enter and possess the promised land. Sprat's elsewhere portrays England as destined to reenter and repossess Eden itself, asserting that the Royal Society's "*Systeme* of *Natural Philosophy*" is the means through which

> the Beautiful Bosom of *Nature* will be Expos'd to our view: we shall enter into its *Garden*, and tast of its *Fruits*, and satisfy our selves

> with its *plenty*; insteed of Idle talking, and wandring, under its fruitless shadows; as the *Peripatetics* did in their first institution, and their Successors have done ever since. (327)

Sprat's sexualized image here is one of raw power. The Royal Society will expose, enter, taste, and satisfy itself with all of the knowledge to be found in the "Beautiful Bosom" of nature. The passage speaks metaphorically of the intellectual paradise of plenty to be gained. Because it serves a redemptive purpose, the Society will enable mankind to regain the paradise that was lost as a consequence of the Fall. This image also, however, also has an important literal and specifically English meaning as well: that the Royal Society has now made a material paradise of plenty available to Englishmen and to the English nation. Sprat's use of the plural pronouns "we" and "our" is rhetorically intended to inspire and inflame his English readers' collective sense of nation, national pride, and – perhaps most importantly – national destiny.

Hans Kohn explains that it was in the seventeenth century that the "tendencies of a nascent nationalism"

> filled the English people with a new sense that they, the common people of England, the chosen people, were the bearers of history and builders of destiny at a great turning point from which a new true Reformation was to start. (165)

Kohn further notes that "the new nationalism expressed itself in an identification of the English people with the Israel of the Old Testament" (166). Sprat makes this identification of the English with the Israelites in a number of passages in the

History. Arguably the most significant of these passages is the final paragraph of the text as a whole.

This passage in many ways summarizes Sprat's ultimate argument as to the promise and potential of the Royal Society. For Sprat, all that England needs to do to effect an epic change in the course of history – or this 'new true Reformation,' as described by Kohn – is to embrace the Royal Society and all that it symbolizes. He forecasts that

> if, (as I rather believe and præsage) our *Nation* shall lay hold of this opportunity, to deserve the applause of Mankind, the force of this *Example* will be irresistibly prævalent in all *Countries* round about us; the State of *Christendom* will soon obtain a new face; while this *Halcyon Knowledge* is breeding, all *Tempests* will cease: the oppositions and contentious wranglings of *Science* falsly so call'd, will soon vanish away: the peaceable calmness of mens *Judgments*, will have admirable influence on their *Manners*; the sincerity of their *Understandings* will appear in their *Actions*; their *Opinions* will be less violent and dogmatical, but more certain; they will only be *Gods* one to another, and not *Wolves*; the value of their *Arts* will be esteem'd by the *great things* they perform, and not by those they speak: While the old *Philosophy* could only at the best pretend to the Portion of *Nepthali*, *to give goodly words*, the New will have the Blessings of *Joseph* the younger and the belov'd Son; *It shall be like a fruitful Bough, even a fruitful Bough by a Well,*

> *whose Branches run over the wall: It shall have the blessings of Heven above, the blessings of the deep that lies under, the blessings of the breasts and of the womb*: While the Old could only bestow on us some barren Terms and Notions, the New shall impart to us the uses of all the *Creatures*, and shall inrich us with all the Benefits of *Fruitfulness* and *Plenty*. (437-38)

Drawing here closely on both the style and the substance of the prophecy regarding the twelve tribes of Israel that describes Joseph as "A fruitful bough by a well" whose "branches run over the wall" and who has the "blessings of heaven above," the "Blessings of the deep that lies beneath," and the "Blessings of the breasts and of the womb" (Gen. 22-26), Sprat looks ahead not only to the future of England, but also to the future of the entire world. Royal Society will enrich the English people and the English nation, and will ultimately establish England as the undisputed intellectual and political leader of the Christian world. As the metaphorical beneficiaries of the blessings of Joseph, the English people and the English nation will fulfill their destiny to lead all of mankind into a peaceful, fruitful, and plentiful future.

Sprat signals his conclusion to the *History* by announcing that "I have now at last brought my Reader, by a tedious compass, to the end of our Journey" (430). It is important to realize, however, that only journey truly coming to an end is Sprat's writing of the text itself. The many other epic quests to which Sprat refers throughout the text – that of the Royal Society, that of the English people, and that of the English nation – are still very much alive. So too is the quest of

the reader: he has now been educated by the *History*, and must decide how he will utilize his new knowledge and understanding. Certainly one thing Sprat hopes his reader will do is offer unqualified support to the new institution. To encourage this support, Sprat includes a list of nearly two hundred "eminent men of all Qualities" who have "ingag'd to bestow their labors" on the Society. The fact that Sprat himself refers to this list of eminent men as a "*Catalogue*" is highly significant (431), as the reference specifically draws attention to the final epic characteristic that he has incorporated into his text.

It is often said that advocates and apologists for the new experimental philosophy disapproved of highly stylized or literary modes of expression. Sprat himself is often cited as evidence of this disapproval. He claims, for example, that among the members of the Royal Society, there has been

> a constant Resolution, to reject all the amplifications, digressions, and swellings of style: to return back to the primitive purity, and shortness, when men deliver'd so many *things*, almost in an equal number of *words*. They have exacted from all their members, a close, naked, natural way of speaking; positive expressions; clearness; a native easiness: bringing all things as near the Mathematical plainness, as they can: and preferring the language of Artizans, Countrymen, and Merchants, before that, of Wits, or Scholars. (113)

Despite this rejection of all rhetorical "swellings of style," Sprat clearly employs both literary and linguistic flourishes in the very text where he denounces them.

Sprat's *History* adopts and adapts the conventions of the literary epic to establish the cultural reputation of Royal Society as an institution that will preserve and strengthen the English nation – that will encourage political, social, and religious order in the reign of the newly restored Charles II by fostering a peaceful civility among Englishmen, and will provide England with the technological superiority to establish itself as an international and imperial powerhouse.

While the Royal Society is thus portrayed as having heroic potential, the institution in and of itself can not realize this potential without the assistance of its members. In this respect, the 'epic' heroes are actually the members of the Royal Society. The epic heroes are the new experimentalists.

Chapter 4: The Experimentalist as Epic Hero

Interpreting Thomas Sprat's *History of the Royal Society* as a literary epic encourages us in turn to interpret the seventeenth-century experimental philosopher as an epic hero. As I noted in chapter two, heroic references to the new experimentalist abound in both the primary and the secondary literature of the period. It is so common still today to heroicize the pursuits and achievements of certain experimentalists that Michael Hunter cautions both critics and historians against the "great man" view of the history of the Royal Society that tends to stress the importance and achievement of only a handful of particular men (*Fellows* 51). Acknowledging that the seventeenth century experimentalists were heroicized, I will in this chapter explore how the experimentalists were heroicized – how the characteristics of the epic hero were attributed to them and how they therefore became identified as English national heroes.

Steven Shapin has most prominently influenced my understanding of the seventeenth century experimentalist, and his *Social History of Truth* is an important precursor to my work in this chapter. Shapin argues that the character of the new experimentalist ultimately had to be made: Robert Boyle, he stresses, "did not *take on* the identity of the experimental philosopher, he was a major force in *making* that identity" (127).[26] Shapin emphasizes the fact that the

[26] All italics, punctuation, and parentheticals from both primary and secondary sources cited throughout are the authors' own. All capital letters that appear in the middle of cited passages are also the authors' own, although I have taken the liberty to alter the capitalization of the first words of those passages in order to incorporate them into my own text more smoothly.

character of the experimentalist was itself a rhetorical and ideological construction. Conscious decisions and rhetorical choices – such as whom he should be and what he should represent to the English nation – shaped the experimentalist's cultural identity.

Shapin explains how notions of gentility were used to create that identity. He claims that "truth is a social institution" (6); asserts that "gentility was a massively powerful instrument in the recognition, constitution, and protection of truth" (42); and explores "the cultural bases of gentlemanly truthfulness, the social practices mobilized around the description of gentlemen as truth-tellers, and the prescription that they ought to be so" (65). He also shows how Robert Boyle drew on these gentlemanly tropes to establish the identity of the experimentalist as a "Christian virtuoso" (191). Advocates and apologists for the new experimental philosophy rhetorically employed tropes of gentility to their benefit: the notions of the English gentleman and all they embodied – privilege, honor, respect, integrity, truthfulness, trustworthiness, and intelligence – were grafted onto and used both to establish and to legitimize the character of the new experimentalist.

Shapin's text, I should note, has been the subject of some criticism. Mordechai Feingold, for example, describes the *Social History of Truth* as "often empirically unsubstantiated" (139), and Barbara Beigun Kaplan asserts that its argument is so broad that Shapin is susceptible to "criticisms of overgeneralizing and failing to consider other factors that influenced the conduct of science in that period" (1157). Such criticism, however, does not in my mind diminish the value

or the validity of Shapin's argument overall. The particular critique of the *Social History of Truth* that is directly relevant to my focus, however, is offered by Ronald C. Pine, who notes that while he "tells us that the credo of early modern empiricism was rhetoric," Shapin "never considers the possibility that the notions of an English gentleman and Christian virtuoso were also rhetoric" (724).

I will in this chapter explore the powerful and enduring rhetorical and ideological construction of the Christian virtuoso – of the seventeenth century experimental philosopher – as an epic hero. Royal Society advocates and apologists adopted and adapted the literary tropes associated with the classical and the seventeenth century epic hero to define and explain to their contemporaries who the experimentalists were and what the experimentalists did. I indeed believe that these heroic descriptions of the experimentalist's character, the experimentalist's craft, and the experimentalist's relationship to the divine ultimately helped to establish not only the experimental philosopher as a trustworthy member of seventeenth-century English culture, but also the overall significance of the experimentalists and of the Royal Society itself to the English nation as well.

Thomas Sprat certainly was not the first writer to celebrate either the character or the accomplishments of the men who studied the natural world. The Roman poet Lucretius' *De rerum natura*, for example, is identified by W. R. Albury as "a classical model for the praise of scientific discoveries" (32). Francis Bacon portrays the experimental philosopher, according to John M. Steadman, as "heroic benefactor, founder, discoverer, conqueror; an exemplar not only of

heroic wisdom but of heroic charity" (5). And in *Experimental Philosophy in Three Books* (1664), Sprat's contemporary Henry Powers praises the "Heroick attempt" of "our modern Hero" (qtd. in Jones, 194). References to and portrayals of the experimentalist as heroic were thus familiar to the seventeenth century audience.

It is important to understand, though, that the "modern Hero" to which Powers refers differs in key respects from the classical epic hero. As noted in my previous chapter, critical opinion of the epic was changing in the seventeenth century: reverence for the classical epic was breaking down as writers pushed the boundaries of the genre to bring it more in line with contemporary aesthetic and cultural values. A reassessment of the intellectual and emotional characteristics of the epic hero was of course a key part of this generic revision. As with the epic itself, then, the seventeenth century epic hero is a hybrid between the classical epic hero and a seventeenth century English gentleman.

One key way that the seventeenth century hero resembles the Virgilian epic hero, for example, is in his selfless contribution to the nation. Quint explains that

> Virgil's politicization of epic for the ends of empire demanded a curbing of the Homeric heroic will, and the flatness and passivity of Aeneas became the virtuous traits of other hero-leaders of the imperial epic: of Tasso's own Goffredo and Camões' Vasco da Gama. As opposed to the wandering Odysseus and the rebellious Achilles, the hero of empire became an executive type who places

> duty over individual desire, the goals of history over the present moment. (95)

The seventeenth century hero does indeed suppress his own desires to attain the "goals of history," but the way in which he does so differs markedly from the classical hero.

Whereas the classical epic hero was physically and psychologically born to crave and excel in combat, his violence, passion, and emotion is diametrically opposed to the peace, rationality, and intellect of the seventeenth-century hero. According to Dean A. Miller, author of the massive critical study *The Epic Hero,* this change in the heroic ideal was influenced by the "intellectually inventive and rational-scientific inclinations and innovations" of the early modern period:

> The Renaissance leaves behind an ambivalent inheritance, recovering and enriching various antique types and expressions of heroic character, yet putting in train the intellectual attitudes that would stand against, deny, and denigrate much of the archaic hero's glory, as contained in his unthinking, primitive pose and his sincerely irrational, unconstrained joy in the use of force: his argument of blood. (15)

Royal Society advocates and apologists capitalized rhetorically on these changed cultural values by portraying the experimentalist as naturally embodying the new heroic ideal.

Even early commentators on seventeenth century experimentalism noted that advocates and apologists grafted the characteristics of the hybridized epic hero onto the experimentalist. Steadman, for example, explains that

> for Bacon and his seventeenth-century successors, the advancement of learning and the nobility and utility of the physical sciences were heroic themes; and in celebrating them, they turned to the commonplaces of the heroic tradition. The natural scientist and the inventor were 'godlike' men, exercising the gift of 'godlike' reason in the interests of the public good. The founders of the new sciences, the discoverers of new methodologies and new arts, were intellectual heroes, more eminent in deeds of peace than conventional heroes in acts of war. They were greater benefactors than the martial hero, for they served man instead of destroying him. They were greater conquerors, for they extended their empire not merely over a fraction of the globe, but over nature herself. The physical scientist possessed the dignities of active and contemplative heroes alike; the results of his labors were not only noble but useful. (15-16)

Reason, intellect, contemplation, and dignity are qualities shared by the experimentalist and the hero alike. Note that both the disposition and the deeds of the experimental hero are seen as superior to those of the classical "martial" hero, as the experimentalist is not only a discoverer and founder, but also a benefactor and servant of mankind.

One of the contemporary texts that participates in this celebration of superiority is Joseph Glanvill's Address "To the Royal Society," which serves as the prefatory piece to his *Scepsis Scientifica* (1665). Glanvill favorably compares the power and promise of the experimentalist to that of the martial hero:

> *For 'tis a* greater credit, *if we judge by equal measures, to* understand *the* Art *whereby the* Almighty Wisdom *governs the* Motions *of the great* Automaton, *and to know the wayes of* captivating Nature, *and making her* subserve *our* purposes *and* designments; *then to have* learnt *all the* intrigues *of* Policy, *and the* Cabals *of* States *and* Kingdoms; *yea, then to* triumph *in the* head *of* victorious Troops *over* conquer'd Empires. *Those* successes *being more* glorious *which bring* benefit *to the World; then such* ruinous ones *as are dyed in* humane blood, *and* cloathed *in the* livery *of* Cruelty *and* Slaughter. (sig. B3v-B4r)

Whereas the classical hero had only a limited and "ruinous" power over the political world of man, the experimental hero has the expansive and "glorious" power to understand Nature herself. For Glanvill and his seventeenth century post-civil war contemporaries, this non-violent potential to "*bring* benefit *to the World*" peacefully was an essential characteristic of experimental hero.

I do not agree with Steadman's assertion that "Bacon's heroes of science, the naturalist, the inventor, the experimenter, and the founder of scientific institutions, lacked only one adornment to render them the peers (or perhaps the superiors) of classical heroes, celebration in heroic poetry" (40). Although not

written in verse, Sprat's *History of the Royal Society* can be read as a literary epic that showcases, or at least as a text that uses the tropes and conventions of the literary epic to showcase, the experimentalist as its hero. I will in the following pages discuss the qualities and characteristics of the experimentalist that were both emphasized and celebrated by advocates and apologists for the new experimental philosophy – qualities and characteristics that are closely related to those embodied by the epic hero but revised in accordance with the values of seventeenth century English culture.

The classical hero, for example, is identified by Miller as having three fundamental character traits: his growth and prowess, his masculine asexuality, and his distinctive linguistic style. We see these same character traits in the heroes of the seventeenth century literary epics, although they appear – again – in a revised form. We likewise see these revised traits in the literature surrounding the new experimentalist. In addition to thus heroicizing the experimentalist, the rhetorical emphasis of these character traits is also intended to confer on the experimentalist cultural authority as well.

One significant character trait of the classical epic hero, according to Miller, is that his "growth and physical prowess" are achieved "immediately, or at least at a greatly accelerated pace" (84-85). This early growth and prowess is indeed noted in both the literary and the experimental heroes of the seventeenth century, but in an emotional and intellectual rather than a physical sense. Cowley's *Davideis*, noted by Timothy Dykstal to be "the first neoclassical epic in English" (95), was unfortunately left unfinished. We do, however, learn in Book 3

that David exhibited extraordinary characteristics at an early age. Joab says of David

> Bless me! how swift and growing was his wit?
> The wings of *Time* flag'd dully after it.
> Scarce past a *Child*, all wonders would he sing,
> Of *Natures Law*, and *Pow'er* of *Natures King*.
> His *sheep* would scorn their food to hear his lay,
> And savage *Beasts* stand by as *tame* as they.
> The fighting *Winds* would stop there, and admire;
> Learning *Consent* and *Concord* from his Lyre.
> *Rivers*, whose waves roll'd down aloud before;
> Mute, as their *Fish*, would listen to'wards the *shore*. (332)

David is here portrayed not only as musically, poetically, and intellectually gifted, but also perhaps as an experimentalist: Dykstal points to the couplet "Scarce past a *Child*, all wonders would he sing, / Of *Natures Law*, and *Pow'er* of *Natures King*" as evidence that "David himself was a natural philosopher" (105).

Given Cowley's interest in experimental philosophy, it is entirely possible that Cowley intended readers to make this connection, for David's intellectual gift is indeed one of the key traits that the hero shares with natural philosophers. Hunter notes that the biographies and autobiographies of "those who went on to scientific eminence" reveal "an early common characteristic" in that several of these men "recalled their youthful curiosity about technical processes, inventions

and the like" (*Science and Society* 59). Emotional maturity, natural curiosity, and intellectual capability are all celebrated qualities in the experimentalists.

Remember that, according to Shapin, Boyle played a key role in rhetorically creating the character and identity of the experimental philosopher. "An Account of Philaretus During His Minority" is Robert Boyle's autobiographical account of his early life. R. E. W. Maddison dates the text's composition to either 1648 or 1649, and notes that if the text was "indeed ever completed, then the concluding pages have long since disappeared" (1). The text is significant, however, despite its incompleteness. As an autobiography, the "Philaretus" tract can be read as Boyle's deliberate and self-conscious representation of himself as a "Lover of Truth." As might be expected, "Philaretus" emphasizes many of the heroic qualities that are possessed by the young Boyle.

We are told that Boyle even as a very young child took to learning both quickly and easily. Speaking of himself in this passage and throughout in the third person, Boyle notes that "as soone as his Age made him capable of (admitting) Instruction," he was taught to "write in a Faire hand, & to speake French and Latin; in which (especially the first) he prou'd no ill proficient; adding to a reasonable Forwardnesse in Study, a more then vsuall Inclination to it" (5). This remarkable proficiency, "Forwardnesse," and unusual inclination to study made Boyle something of a prodigy. Boyle's father, "ambitious to improve" his son's "early Studiousnesse" (6), sent Boyle at the age of eight "to be bred vp at Eaton Colledge" under the "especiall Care" of Provost Sir Henry Wotton (7). Wotton, Boyle significantly notes, was "not only a fine Gentleman himselfe, but

very well skill'd in th'Art of making others so" (7). Here we see Boyle begin to unite his academic and his social education, thus forging the key linkage noted by Shapin between the experimentalist and the gentleman.

Shortly after he arrived at Eton, Boyle attracted the attention of John Harrison, the Rector of the College who, "taking notice of some aptnesse & much Willingnesse in him to learne; resolu'd to improue them both by all the gentlest wayes of Encouragement" (9). Boyle describes the effect of Harrison's tutelage as follows:

> Not to be tedious, he was carefull to instruct him in such an affable, kind, & gentle way, that he easily preuail'd with him to consider /affect/ Studying not so much as a Duty of Obedience to his Superiors /Parents/ but as the Way to purchase for himselfe a most delightsome & invaluable Good. In Effect, he soone created in Philaretus so strong a Passion to acquire Knowledge, that what time he could spare from a Schollar's taskes (which his retentiue Memory made him not find vneasy;) he would vsually employ so greedily in Reading; that his Master would be sometimes necessitated to force him out to Play; on which, & vpon Study, he look't as if their natures were inverted. (15)

Three significant character traits of the young Boyle are highlighted in this passage: his tireless passion for acquiring knowledge, his unusual aptitude for learning, and his dedication to a scholarly life of study. Descriptions of the experimentalists in their youth as intellectually gifted, emotionally mature, and

morally upright young gentlemen gave advocates and apologists a stable foundation upon which to construct the cultural reputation of the experimental philosopher.

Rather than merely conveying information about the temperaments and values of the experimentalists, however, such passages also function rhetorically as the guarantors of those temperaments and values. There was perhaps no Englishman more noble, for example, than one who had honored truth and learning even at a young age, and there was certainly no one better to lead the English in the pursuit of knowledge than one who both loved and possessed a natural gift for learning and study. Depictions of the experimentalist as having demonstrated an accelerated intellectual growth and prowess in his youth thus not only endow the experimentalist with cultural authority, but also portray the experimentalist as naturally possessing both the attitude and the aptitude to fulfill a heroic role in the future of the English nation.

A second character trait of the classical epic hero is his "asexuality and singularity" in relation to sex and marriage (Miller 109). Here the seventeenth century literary hero differs from his classical counterpart, as it is not uncommon for him to play the role of a lover. The experimental hero, however, differs in turn from the literary hero, as the persona of a lover is one that the experimentalist does decidedly not embody.

Given that the seventeenth century epic takes on the characteristics of romance, it is perhaps to be expected that its hero likewise takes on the characteristics of a lover. Davenant's *Gondibert* is identified by Quint as one of

the texts in which we see "the transformation of the epic project into romance at work" (318). Duke Gondibert is indeed an hybridized hero: like the classical hero he is a gifted military leader, but unlike the classical hero is more of a lover than a warrior. Gondibert explains upon falling in love with Astragon's daughter Birtha that

> though I humanly have heretofore
> All beauty lik'd, I never lov'd till now;
> Nor think a Crown can raise his valew more,
> To whom already Heav'n does Love allow.
>
> Though, since I gave the *Hunns* their last defeat,
> I have the *Lombards* Ensignes onward led,
> Ambition kindled not this Victor's heat,
> But 'tis a warmth my Fathers prudence bred. (II.viii.27-28)

Note here that military ambition is not one of Gondibert's innate qualities, but rather has been bred into him by his father's influence. That Gondibert indeed values love more than political power is illustrated by the fact that he willingly gives up his own crown for love: although he has been chosen to marry King Aribert's daughter Rhodalind and thus inherit the kingdom, Gondibert gives up this prospect for Birtha. He affirms that

> Here all reward of conquest I would finde;
> Leave shining Thrones for *Birtha* in a shade;
> With Nature's quiet wonders fill my minde;

And praise her most, because she *Birtha* made. (II.viii.46)

Gondibert's propensity for love distinguishes him and his fellow seventeenth century heroes from both the classical and the experimental hero.

The experimentalist, on the other hand, is portrayed as more closely resembling the classical hero in his "asexuality and singularity" (Miller 109). Many members of the Royal Society were indeed married; this historical reality, however, does not undercut the rhetorical construction of the experimentalist as able to distance himself from women both physically and emotionally in order to concentrate on his serious intellectual studies. Shapin explains that "celibacy was recognized as a common condition for scholars and philosophers," noting further that Isaac Newton and Henry More were celibate, that John Locke and Thomas Hobbes lived "single lives," and that Robert Hooke was unmarried (*Social History* 165, n118). Robert Markley likewise affirms that "neither Boyle nor Newton ever married," and that "once past adolescence, neither seems to have had much to do with women beyond their immediate families" (124).

We do indeed see Boyle's asexuality in "Philaretus," which emphasizes that Boyle remained chaste even while on Tour during Carnival, that "season when Madnes is so generall in Italy that Lunacy dos for that time loose it's [sic] Name" (40). Boyle proudly explains that during that time "Nor did he sometimes scruple, in his Gouernor's Company, to visit the famousest Bordellos; whither resorting out of bare Curiosity, he retain'd there an vnblemish't Chastity, & still return'd thence as honest as he went thither" (40). These assertions help define the character of the experimentalist in several ways. The very fact that he was

on Tour at all, for example, identifies Boyle as a young English gentleman. Christopher Hibbert explains that since Elizabethan times, "the Grand Tour had been recognized as a means of gathering information which would be turned to the nation's advantage, and of training young gentlemen to take their places in a world in which patriotic Englishness would not be enough" (10). The Tour itself thus carries both a social and a political significance that reinforces the portrayal of the experimentalist as a gentleman worthy to govern and represent the English nation.

Boyle's conduct on Tour is likewise significant. Hibbert explains that "many an anxious parent" worried that his son would return from a Tour "an affected, foppish, extravagant, drunken, lazy dilettante, full of foreign prejudices and pretensions and of pagan irreverence, believing that manners were more important than morals" (222). Boyle, however, portrays himself as clearly steering away from such debauchery, claiming that he not only retained his chastity on Tour, but even visited the Bordellos at all merely out of curiosity. The exemplary young gentleman returned to England with his morality, his religiosity, and his honesty intact.

It is possible that Boyle remained chaste throughout his life, for Shapin notes that there "is nothing to contradict the idea that Boyle died a virgin" (*Social History* 165). At one point, Boyle's father had arranged a marriage between Boyle and Anne Howard, daughter of Lord Edward Howard, but Boyle avoided the match when Howard married her cousin Charles Howard instead. Boyle's sister, Lady Katherine, Viscountess Ranelagh, reveals that Howard's marriage

was likely a welcome one to her brother: she writes to Boyle that the marriage will "set you at liberty from all appearances you have put on of being a lover, which though they cost you some pains and use of art, were easier, because they were but appearances" (qtd. in Maddison, 55-56). Lady Katherine's letter confirms that Boyle was uninterested in playing the role of a lover and supports the possibility that Boyle did indeed remain celibate. Shapin explains that Boyle rhetorically capitalized on this virtue and the discipline it signified, for "Boyle publicly advertised his chastity and sensual disengagement, and he did so as signs of his personal integrity and as guarantees of an authentically Christian philosophy" (*Social History* 165). This construction of the experimentalist as celibate reinforces the characterization, discussed by Steven Shapin and Simon Schaffer, of the experimentalists as "priests of nature" (319).

The experimentalist's isolation from women certainly contributed to the establishment of seventeenth-century natural philosophy as an exclusively male-oriented pursuit. There were no women in the Royal Society, and there was even debate over whether to allow them to visit: Samuel I. Mintz notes that there was "considerable opposition" among Society fellows to Margaret Cavendish's proposed visit (171). Cavendish's visit did eventually take place, but Jonathan Sawday explains that the visit was "more in the nature of a public celebration of science rather than a serious attempt to include her in the Society's circle of virtuosi" (250). Desiree Hellegers notes that the nickname given to Cavendish – "Mad Madge" – is "an indication of the ridicule that was heaped upon women like

Cavendish who challenged the exclusively male preserves of learning and debate" (186 n44).

One seventeenth-century text that portrays experimental philosophy in particular as a male pursuit is Abraham Cowley's "To the Royal Society," which was written specifically to serve as a prefatory piece to Sprat's *History*. Cowley begins his poem by clearly personifying Philosophy as male: "Philosophy, I say, and call it *he*, / For whatsoe'er the painter's fancy be, / It a male virtue seems to me" (st.1). Sawday explains that Cowley had to invert the customary personification of Philosophy as female because "a female *Philosophia* would never do for this resolutely masculine endeavour" (237). For Cowley and his contemporaries, the study of natural philosophy was a fundamentally masculine pursuit that was weakened by any and all association with the feminine.

The masculine asexuality of the experimentalist bestowed upon him a certain air of authority.[27] Advocates and apologists wanted to emphasize the reason and intellect of the experimentalist. Distancing him from femininity and the unfettered emotion it was believed to entail was a powerful way to affirm his commitment to logical thought. Distancing the experimentalist from women was likewise a powerful way to affirm both his emotional and his physical self-control. The portrayal of the experimentalist as neither tempted nor distracted by women was rhetorically intended to cast the experimentalist as a steadfast male authority figure who was dedicated to a higher and more spiritual pursuit of truth and knowledge.

---

[27] For a discussion of how this trait applies to the modern scientist, see chapter four of Evelyn Fox Keller's *Reflections on Gender and Science.*

A third characteristic of the classical epic hero and the seventeenth century literary and experimental hero is that each has his own notable linguistic style. The classical hero's speech has "a peculiar – violent – tone" (Miller 230). The literary hero's speech is poetic and emotional. And the experimentalist's speech – or, more precisely, his writing – is unadorned and rational.

Dryden refers to the seventeenth century critical debate as to how or whether the linguistic style of the epic hero should be revised in his essay "Of Heroique Plays," which serves as the preface to his *Conquest of Granada* (1672). He explains that "whether Heroique verse ought to be admitted into serious Playes, is not now to be disputed: 'tis already in possession of the Stage: and I dare confidently affirm, that very few Tragedies, in this Age, shall be receiv'd without it" (8). As we might perhaps expect from the gifted poet, Dryden is in favor of keeping the hero's elevated and poetic diction. He defends his preference with the assertion that

> all the arguments, which are form'd against it, can amount to no more than this, that it is not so near conversation as Prose; and therefore not so natural. But it is very clear to all, who understand Poetry, that serious Playes ought not to imitate Conversation too nearly. If nothing were to be rais'd above that level, the foundation of Poetry would be destroy'd. And, if you once admit of a Latitude, that thoughts may be exalted, and that Images and Actions may be rais'd above the life, and describ'd in measure without Rhyme, that leads you insensibly, from your own Principles to mine: You are

> already so far onward of your way, that you have forsaken the imitation of ordinary converse. (8)

For Dryden, the gravity of heroic literature requires the exalted language and imagery of poetry. Ordinary prose conversation simply cannot convey the power and emotion of the hero.

For those heroes whose goal is the clear and concise communication of logical thought, however, ordinary prose language is the ideal rhetorical style. This was, of course, precisely the goal of the experimentalists, who accordingly prided themselves on their unadorned rhetorical style. I discussed in the previous chapter how Sprat portrays this unadorned linguistic style as representative of a strong English nation. Equally important is the fact that this style was characterized as both natural and manly.

Evidence of the increasing cultural belief in the value and necessity of the experimentalist's sparse rhetorical style can be seen in the textual revisions of the Royal Society's tireless advocate and apologist Glanvill. As Stephen Medcalf explains:

> *The Vanity of Dogmatizing* (1661) was Joseph Glanvill's first book, published when he was twenty-five. Its language is rich in metaphor and neologism, its thought is effervescent: he was soon so dissatisfied with these characteristics as to give the book a light but pervasive revision and rename it *Scepsis Scientifica*, in 1665: and so dissatisfied with this in turn as to translate it radically into one of a collection of *Essays on Several important subjects in*

> *Philosophy and Religion*, "Against Confidence in Philosophy, and Matters of Speculation" in 1676. The last revision, still recognisably the same book in structure and matter, is rendered wholly different by its spare and abstract diction: one can see in it the beginning of a style of thought and language which lasts into our own time, the classic style of English rational empiricism. (xiii)

In paring the *Vanity* text of 250 pages down to the "Against Confidence" essay of 33 pages, Glanvill indeed eliminated "rich" language and "effervescent" thought in favor of a "spare and abstract" diction. The revisions implicitly reflect Glanvill's increasing awareness of and respect for the sparse rhetorical style adopted by the experimentalists.

Glanvill's revisions also explicitly critique the florid writing style from which he is moving. His address "To the Royal Society," remember, serves as the prefatory piece to *Scepsis Scientifica.* It is important to note, however, that the address was not a part of the original *Vanity of Dogmatizing* text, but rather was written for that text's revision. Glanvill in this piece criticizes the metaphorical and effervescent style of his original text when he asserts, as if to atone for his past rhetorical flourishes, that

> *I must confess that* way *of* writing *to be less agreeable to my* present relish *and* Genius; *which is more gratified with* manly sense, *flowing in a* natural *and* unaffected Eloquence, *then in the* musick *and curiosity of* fine Metaphors *and* dancing periods. (sig. C4r)

Significant is not only the fact that Glanvill prefers his new "natural" and "unaffected Eloquence" to the "musick *and curiosity*" of a more poetic style, but also that Glanvill codes his new and unadorned rhetorical style as masculine – as "*gratified with* manly sense." This gendering both draws on and reinforces the cultural association of the natural, sparse, rational, and detached with the masculine, and the association of the affected, florid, irrational, and emotional with the feminine. By thus helping to distance the experimentalist from the feminine, this unadorned writing style in turn reinforces the cultural authority of the male experimentalist.

Cowley likewise codes this unadorned writing style as masculine. Referring to Sprat in the *History*, Cowley says

> His candid style like a clean stream does slide,
>
> And his bright fancy all the way
>
> Does like the sunshine in it play;
>
> It does like Thames, the best of rivers, glide,
>
> Where the god does not rudely overturn,
>
> But gently pour the crystal urn,
>
> And with judicious hand does the whole current guide.
>
> 'T had all the beauties nature can impart,
>
> And all the comely dress without the paint of art. (st.9)

Note that Sprat's "candid" writing style is described as naturally beautiful, "without the paint of art." For Cowley, a florid or poetic rhetorical style is essentially a feminine dressing-up of language: unlike women who "paint" their language and

themselves with trappings of "art," the experimentalists represented by Sprat instead favor a more sparse form of expression that is beautiful in and of itself. Cowley also significantly emphasizes the discipline that is represented by this sparse rhetorical style. Analogized to a "clean stream" whose current is guided by a "judicious hand," Sprat's style does not "rudely overturn" or overflow its boundaries with excessive passion, but is rather controlled by a sensible and rational intellect. The rhetorical style adopted by the experimentalists is in many ways a reflection of this discipline and self-control.

In addition to further distancing the experimentalist from the passionate and uncontrolled feminine, Cowley also alludes to the national significance of the experimentalists. By likening Sprat's rhetorical style to the Thames, the "best of rivers" that runs through London and the heart of England itself, Cowley both implicitly and explicitly associates the experimentalists with the English nation. The geographical reference may well have been intended to remind readers of Sprat's assertion in the *History* that the experimentalists "have begun to settle a *correspondence* through all Countreys" so that soon "there will scarce a Ship come up the *Thames*, that does not make some return of *Experiments*, as well as of *Merchandize*" (86). While thus implicitly recalling their importance to the nation's intellectual and economic well-being, Cowley explicitly portrays the experimentalists as having the natural strength and prominence to represent the English nation as well. The passage as a whole can ultimately be interpreted as a celebration of the experimentalist and the masculinity, naturalness, and

nationality that is both reflected in and represented by his unadorned rhetorical style.

Royal Society advocates and apologists emphasized the virtues of this unadorned rhetorical style in order to help establish the cultural authority of the experimentalist: his precise word choice, plain diction, and clear statements were often cited as evidence that members of the general public could look to him as a trustworthy source of knowledge and information. The experimentalist himself also used this rhetorical style in conjunction with a specific rhetorical form to establish his authority among his fellow members of the experimental community as well. Peter Dear explains in "*Totius in Verba*" that those who wished to participate in the Royal Society's experimental activities "needed to conform to certain standards so that they could each assume the mantle of a new kind of authority" (152). These standards related primarily to the rhetorical form of a paper or presentation:

> When a Fellow of the Royal Society made a contribution to knowledge, he did so by reporting an experience. That experience differed in important respects from the definition informing scholastic practice; rather than being a generalized statement about how some aspect of the world *behaves*, it was instead a report of how, in one instance, the world had *behaved.* (152, italics his)

To deviate from either this proper rhetorical form or from the proper unadorned linguistic style was ultimately to risk losing one's authority among members of the experimental community.

To demonstrate the proper rhetorical form and style, on the other hand, was to endow both one's self and one's findings with legitimate experimental authority. The rhetoric of experimentalism allowed the experimentalist to capitalize on the 'literary technology' of virtual witnessing. Virtual witnessing, Shapin explains, "involves the production in a reader's mind of such an image of an experimental scene as obviates the necessity for either its direct witness or its replication": its benefit was that "through virtual witnessing the multiplication of witnesses could be in principle unlimited," and its consequence was that virtual witnessing "was therefore the most powerful technology for constituting matters of fact" ("Pump and Circumstance" 491). The ultimate significance of this rhetorical style and form, then, as put by Shapin, is that "if one wrote an experimental report in the correct way, the reader could take on trust that these things happened" ("Pump and Circumstance" 493). As long as the appropriate rhetorical norms were observed, both the experimentalist himself and his experimental findings would command authority among the members of the experimental community.

His unadorned linguistic style, like his masculine asexuality and his early growth and prowess, ultimately bestowed a degree of cultural authority on the experimentalist. Royal Society advocates and apologists emphasized these heroic character traits in their efforts to establish a place for the new

experimentalist in mid-seventeenth century English culture. These character traits, however, were not the only associations made between the experimentalist and the epic hero, as advocates and apologists for the new experimental philosophy also made analogies between the experimentalist's craft and the epic hero's quest. As with the hero's character traits, the elements of the hero's quest were likewise modified where necessary to reflect the changing English values.

The classical epic hero's quest is characterized by four key elements: its command over physical space, its communal nature, its battle against foes, and its specialized weaponry. The quests of the seventeenth century literary and experimental hero also incorporate these elements, although in a form revised in accordance with contemporary aesthetic and cultural values. In addition to heroicizing the experimentalist and his craft, the rhetorical emphasis of these traits is also intended to confer the experimentalist with cultural respect.

Miller identifies one important aspect of the hero's quest as the physical space in which its journey and adventure plays out (133). Unlike the classical hero who can roam expansively over the heavens, the earth, and the underworld, the seventeenth century hero's quest is usually confined to the geographical earth. His ability to range freely over this geography, though, is ultimately improved by the successes of the experimental hero. Davenant makes this connection explicit in Canto 6 of Book 2 of *Gondibert*. The injured Gondibert is taken to the House of Astragon, which is an intellectual and spiritual haven where God and His natural world are studied and celebrated. Gondibert arrives shortly

before Astragon's successful discovery of the compass is lauded. Ulfin explains the benefit that this discovery will give to those who navigate the sea:

> They with new *Tops* and *Formasts* and the *Main*,
> And *Misens* new, shall th'Ocean's Breast invade;
> Stretch new Sayles out, as Armes to entertain
> Those windes, of which their Fathers were afraid.
>
> Then (sure of either Pole) they will with pride,
> In ev'ry storm, salute this constant Stone!
> And scorn that Star, which ev'ry Cloud could hide;
> The Seamen's spark! which soon, as seen, is gone!
>
> 'Tis sung, the Ocean shall his Bonds untie,
> And Earth in half a Globe be pent no more;
> *Typhis* shall sayle, till *Thule* he descry,
> But a domestick step to distant Shore! (II.vi.38-40)

Gondibert in Canto 7 falls in love with Birtha and in Canto 8 declares his intention to marry Birtha instead of Rhodalind. It is thus here, shortly before Gondibert announces the end of his own personal journey toward political power over the nation, that Davenant reveals the beginning of this new and more universal journey toward political power across the globe. We can perhaps interpret Davenant's timing as evidence that this latter journey is truly the more epic or heroic one.

David F. Gladish notes that the "tone of praise" in Davenant's last stanza above is similar to that found in Dryden's *Annus Mirabilis*, Sprat's *History*, and Cowley's ode "To the Royal Society" (305 n40). Note that Davenant's text was published before all three of these, and may perhaps have helped to lay the groundwork for portraying the experimentalist's endeavors as worthy of epic status. Like the classical epic hero who ranges over the heavens, the earth, and the underworld, the experimentalist is similarly portrayed as having the ability to study all of creation. Even when they confined him to particular indoor spaces, experimental apparati such as the microscope and the telescope theoretically allowed the experimentalist to peer into the most minute and the most infinite realms of nature, effectively making all of creation the experimentalist's laboratory.

One image that signified the experimentalist's capability to access all of earthly creation was the Pillars of Hercules, which in the seventeenth century symbolically marked the boundary between the known and the unknown world. Francis Bacon had famously used the image of a ship sailing through these Pillars on the title page of his *Instauratio Magna* (1620). Steadman explains the potent and "emphatically heroic associations" that this image possessed:

> For many of Bacon's contemporaries and successors, few images could have been more challenging than his adaptation of the motif of Hercules' Columns and his transformation of the motto *Ne plus ultra* into *Plus ultra*. This metaphor brought the scientist into conscious rivalry not only with the greatest of classical heroes (for

> Hercules had long since become the paradigm and archetype of heroic virtue), but with the greatest and most extensive of world-empires (for the phrase *Plus ultra* had served as motto and emblem for Charles V). (4)

Note that Bacon not only posits the experimentalist as the rival of Hercules, the "greatest of classical heroes," but also depicts the experimentalist as having the confident power to go "yet further," which is the literal translation of *Plus ultra*. Steadman ultimately interprets Bacon's image as having "promised an empire over nature, achieved by and through the lowly mechanical arts" (4).

In addition to having gained access to the entire earth, the experimentalist was also portrayed as having gained access to the heavens as well. English Astronomer Edmond Halley was responsible for the publication of Newton's *Principia*. As the preface to Newton's now famous text, Halley included his own ode to Newton, "On This Mathematico-Physical Work, A Singular Glory of Our Age and Nation, By a Most Illustrious Man" (1687). Halley in this ode hails Newton as having both "set out" the "pattern of the heavens" and "thrown open" the "innermost recesses of the conquered heavens." As a result of these achievements, Halley claims that

> No longer does
> error oppress doubtful mankind with its darkness: the keenness of a sublime Intellect has allowed us to penetrate the dwellings of the Gods and to scale the heights of Heaven. (qtd. in Albury)

Newton's "sublime Intellect," Halley elaborates, has given mankind access to knowledge that had previously been forbidden:

> But now we are truly admitted as table-guests of the Gods; we are allowed to examine the Laws of the high heavens; and now are exposed the hidden strongholds of the secret Earth, and the unchanging order of things, and matters which have been concealed from the generations of past mankind. (qtd. in Albury)

Halley's use of "Gods" – plural – is significant in that it links Newton to the classical heroic tradition. Halley's image of mankind as "table-guests of the Gods" is also significant, as the act of breaking bread together symbolically indicates a certain degree of equanimity and mutual respect. The portrayal of mankind as sharing a table with the gods thus powerfully implies that man has gained the confidence of the gods – an implication corroborated by his claim that mankind is now free to see that which has been "concealed" from generations of the past. Constrained neither by physical nor intellectual boundaries, the experimentalist and his power to go 'yet further' is portrayed by Halley as worthy of the respect of the divine.

The experimentalist was thus of course worthy of the respect of his fellow Englishmen – particularly given the fact that his power would ultimately benefit the English nation. I discussed in my previous chapter Sprat's assertion that the experiments undertaken by Royal Society members will be of great advantage to "the Universal Interest of the whole *Kingdom*" (322-23). Certainly one of the

most important of these advantages is that the experimentalists will establish England as an intellectual powerhouse. In "To the Royal Society," for example, Glanvill describes the Royal Society Fellows as "*a* Constellation *of* Worthies *from whom the Learned World expects to be informed*" (sig. A4r). The description not only emphasizes the Society's position as an intellectual leader, but also celebrates the international reputation that its position bestows on England as well. Speaking here both to and of the Royal Society, Glanvill predicts that

> Doubtless, the success of those your great and Catholick Endeavours will promote the Empire of Man over Nature, and bring plentiful accession of Glory to your Nation; making BRITAIN more justly famous then the once celebrated GREECE; and LONDON the wiser ATHENS. (sig. C1r-v)

The comparisons of Britain to Greece and of London to Athens are noteworthy ones. Greece was the most celebrated ancient civilization, and Athens was considered the birthplace of civilization and knowledge. By asserting that Britain will be "more justly famous" than Greece and that London will be the "wiser" Athens, Glanvill is foreseeing England and its London-based Royal Society as the new center of human civilization and knowledge. As the heart of this new center, the Royal Society will garner both national and international respect for England as it masters all of creation in its quest for knowledge.

A second element of similarity between the experimentalist's craft and the hero's quest is that their protagonists are rarely ever alone. Miller notes that the classical epic hero "frequently has partners, companions, or a supporting cast of

characters fitted to his feats, though some will be only modest ancillaries in the heroic adventure enterprise" (102). This description applies not only to the seventeenth century literary analogs of the Royal Society, but also to the Society itself. The experimental hero's quest for knowledge can indeed be seen as a communal endeavor in which great fame was achieved by only a comparative few.

As noted in my previous chapter, the House of Astragon in *Gondibert* and the Prophet's College in *Davideis* are analogous to the Royal Society: all three institutions function as havens from the outside world, all foster the civic virtues and moral values idealized in seventeenth century English culture, and all are working communities whose members learn about and celebrate God and His natural creation. The Prophet's College, for example, is peopled with "*Schollars*, *Doctors* and *Companions*" (259) who study the religious history of the world. They learn of the creation of the world and of mankind, and

> This, and much more of *Gods* great works they told;
> His *mercies*, and some *judgments* too of old:
> How when all earth was deeply stain'd in sin;
> With an impetuous noyse the waves came rushing in.
> Where *birds* e're while dwelt, and securely sung;
> There *Fish* (an unknown *Net*) entangled hung.
> The face of *shi[pw]rackt Nature* naked lay;
> The *Sun* peep'd forth, and beheld nought but *Sea*.
> This men forgot, and burnt in lust again;

Till show'rs, strange as their Sin, of *fiery rain*,
And scalding brimstone, dropt on *Sodoms* head;
Alive they felt those *Flames* they fry in *Dead*.
No better end rash *Pharaohs* pride befell
When *wind* and *Sea* wag'ed war for *Israel*.
In his gilt chariots amaz'ed *fishes* sat,
And grew with corps of wretched *Princes* fat.
The waves and rocks half-eaten bodies stain;
Nor was it since call'd the *Red-sea* in vain.
Much too they told of faithful *Abrams* fame,
To whose blest passage they owe still their *Name*:
Of *Moses* much, and the great seed of *Nun*;
What wonder they perform'd, what lands they won.
How many *Kings* they slew or *Captive* brought;
They held the *Swords*, but *God* and *Angels* fought.
Thus gain'd they the wise spending of their days;
And their whole *Life* was their dear *Makers* praise. (263)

It is important to keep in mind that this praise and learning is undertaken by the entire community. While an individual can certainly have a knowledge of the moral issues and natural phenomena at stake in events such as the Great Flood, the destruction of Sodom, and the parting of the Red Sea, there is undoubtedly a greater understanding of these events to be had when multiple perspectives on them are taken into account.

This communal philosophy is likewise at work in the House of Astragon, whose members closely resemble the experimentalists in that they honor and celebrate God through their greater understanding of and respect for His natural world. Also like the Royal Society, the House of Astragon relies upon the skills and knowledge of a wide range of individuals in order to gain a broad understanding of Nature. Ulfin explains that in the House

> Art by such a diligence is serv'd,
> As does th'unwearied Planets imitate;
> Whose motion (life of Nature) has preserv'd
> The world, which God vouchsaf'd but to create.
>
> Those heights, which els Dwarf Life could never reach,
> Here, by the wings of diligence they climbe;
> Truth (skar'd with Terms from canting Schools) they teach;
> And buy it with their best sav'd Treasure, Time.
>
> Here all Men seem Recov'rers of time past;
> As busy as intentive *Emmets* are;
> As alarm'd Armies that intrench in haste,
> Or Cities, whom unlook'd-for sieges skare.
>
> Much it delights the wise Observers Eie,
> That all these toiles direct to sev'ral skills;

Some from the Mine to the hot Furnace hie,

And some from flowry Fields to weeping Stills.

The first to hopeful *Chymicks* matter bring,

Where Med'cine they extract for instant cure;

These bear the sweeter burthens of the Spring;

Whose vertues (longer known) though slow, are sure.

See there wet *Divers* from *Fossone* sent!

Who of the Seas deep Dwellers knowledge give;

Which (more unquiet then their Element)

By hungry war, upon each other live.

Pearl to their Lord, and Cordial Coral these

Present; which must in sharpest liquids melt;

He with *Nigella* cures that dull disease

They get, who long with stupid Fish have dwelt.

Others through Quarries dig, deeply below

Where Desart Rivers, cold, and private run;

Where Bodies conservation best they know,

And Mines long growth, and how their veines begun. (II.v.7-14)

Note that it is the men of diverse talents working together – the miners, the botanists, the chemists, and the divers – that enable them all to succeed in their quest for knowledge. This collective effort ultimately allows them to scale the heights which mankind otherwise in his "Dwarf Life" could never reach.

We see this same sort of collaboration at work in the Royal Society. The general membership of the Society has been categorized by critics in a number of ways. Walter E. Houghton Jr., for example, describes individual members as either "'sincere' inquirers into nature" or "amateurs or dilettantes" ("Part I" 54) – groups that he respectively characterizes as the "real natural scientists" and the "mob of gentlemen who played with science" ("Part II" 202). Dorothy Stimson likewise distinguishes among members, asserting that the amateur fellows were useful in the "assembling of observations and the amassing of any evidence" that could "prove to be of much service" to the virtuosi, to whom she refers as "the true leaders of scientific thought" ("Amateurs" 37). Hunter, on the other hand, makes a quantitative rather than a qualitative distinction, separating the small group of men who actively participated in experimental endeavors from the Society's "rank and file" members who attended meetings and provided financial support (*Fellows* 17-22).

Regardless of how one categorizes the individual members of the Society, it is arguably safe to see the membership as a whole as ideologically joined in one fundamental respect. William T. Lynch asserts that early members were "united in their commitment to link knowledge and utility, to carry out cooperative empirical work, and to criticize traditional sources of philosophical authority" (7).

We can thus, like Dear, see the Royal Society as a symbol of "*cooperative* natural philosophy" (146) in which all members worked together to advance mankind's collective understanding of the natural world. As the Secretary of the institution, Henry Oldenburg organized what Steven Shapin and Simon Schaffer describe as a "network of correspondence" (69) between experimentalists both in England and abroad. The *Philosophical Transactions* facilitated the advance and spread of new knowledge, as did the countless unpublished discussions and debates that occurred between and among members of the experimental community.

Despite the fact that the Royal Society was thus, as R. H. Syfret describes, "an association of men working together, openly, patiently, with unbiassed [sic] minds, pooling their knowledge, conducting common experiments and combining 'the joint force of many men'" (211-12), very few of these men rose to the status of cultural icon. The vast majority of those who dedicated their time and effort to experimental philosophy simply did not garner much attention. Their relative anonymity can perhaps be seen as an outgrowth of the inductive method as described by Francis Bacon. In Aphorism 61 of *Novum Organum*, for example, Bacon asserts that his method "leaves only a small role to sharpness and power of wits, but puts all wits and understandings more or less on a level" (66). He echoes this sentiment later in Aphorism 122 by explaining that this method "places men's natural talents almost on a level, and does not leave much to their individual excellence, since it performs everything by the surest roles and

demonstrations" (125). For Bacon, then, experimentalism is more about the process than about the personality of the experimentalist.

In one respect, Bacon's view seems to undercut the heroism of the experimentalist. Indeed, if the inductive method can be successfully utilized by anyone, there is nothing inherently remarkable about the experimentalist. It is, however, for precisely this reason that the experimentalists who excelled above their peers were noteworthy. Society advocates and apologists constructed the heroic character of the experimentalist with men like Boyle and Newton. We should not forget, however, to remember and respect the men like Robert Hooke who made the Boyles and the Newtons possible – who recorded the observations, catalogued the findings, fine-tuned the experiments, and documented the results that enabled the heroic Boyle and Newton to succeed in their quests for knowledge.

A third element shared by the experimentalist's craft and the hero's quest is its protagonist's engagement in combat. According to Miller, "the clash of arms is what the warrior-hero is made and imagined for" (217). Unlike the classical epic hero, however, a number of the seventeenth century literary heroes are portrayed as unwillingly engaged in combat. The experimental hero, on the other hand, is portrayed as decidedly against any physical combat: his battles are thus figured as intellectual rather than physical ones. In their revisions of the martial characteristics of the classical epic hero, Royal Society advocates and apologists celebrate the experimentalist in his battle to combat human ignorance and his (con)quest to discover Nature's hidden secrets.

It is, for example, indeed an injury suffered in combat that takes Gondibert to the House of Astragon. Gondibert, however, was not necessarily a willing participant in that combat: rather, he was ambushed by Prince Oswald, who accused Gondibert of usurping his claim to the hand of Rhodalind and the political power that the match would bring (I.iii.14). Although he agrees to defend himself against the challenge, Gondibert urges Oswald that they should not involve their respective troops in the duel. Gondibert says

> Not these, who kindle with my wrongs their rage,
> Nor those bold Youth who warmly you attend,
> Our distant Camps by action shall ingage;
> But we our own great cause will singly end. (I.iii.37)

Gondibert believes that to risk mens' lives unnecessarily is both foolish and irresponsible. The men, unfortunately, are not of the same opinion. They do eventually join in the battle, and many pay with their lives. During the slaughter, Davenant's narrator interjects with this warning:

> Be not with Honor's guilded Baites beguild;
> Nor think Ambition wise, because 'tis brave;
> For though we like it, as a forward Child,
> 'Tis so unsound, her Cradle is her Grave. (I.v.75)

By thus exposing its mortal reality, *Gondibert* undercuts the values of honor and ambition that drive the combat of the classical hero.

The *Davideis* likewise undercuts the value of its hero's physical combat – a task of particular rhetorical difficulty given the Biblical sources from

which Cowley was drawing. Dykstal asserts that had Cowley finished the text, "he would have had to face the problem of David at war eventually, so it is significant how he deals with it in Book IV of his epic" (110). Here, Dykstal explains,

> David narrates to Moab events that actually happened before David is even introduced in the biblical text: Saul's battles against the Ammonites and the Philistines. As David tells them, however, the hero of these scenes is not Saul but Jonathan, even though the biblical text supports his presence only at the second battle. Indeed, Cowley even admits to 'a Stroke of Poetry' when he invents a fight to the death between Jonathan and Nahash, the leader of the Ammonites, which ends with a particularly vivid description of Jonathan's sword piercing Nahash's side. The quality of heroic energy that Cowley manages to convey in these battle scenes, which certainly exceeds that in his presentation of David's 'fight' with Goliath, suggests that he has learned from Tasso and others how to free his primary hero from too much taint of war while yet incorporating its epic potential. . . In Book IV of the *Davideis*, Jonathan acts 'Th'insatiate Conqu'erer', and David escapes with his Christian magnanimity intact. (110)

By emphasizing the battles of other characters, exercising poetic license, and subduing the descriptions of David's fight, Cowley is able to minimize the physical combat of his epic hero. This revision strategy serves as a good example of how seventeenth century writers put forth a conscious effort to portray their heroes as minimally violent as possible.

Royal Society advocates and apologists did not have to adopt these same rhetorical strategies because the experimental hero was portrayed as innately peaceful and nonviolent. His enemies are the common intellectual enemies of all mankind. In the *History*, for example, Sprat describes the battle against the "barbarous Foes" of "*Ignorance*" and "*False Opinions*" as a war:

> And indeed all *Europe* at this time, have two general Wars, which they ought in honor to make: The one a *holy*, the other a *Philosophical*: The one against the common Enemy of *Christendom*, the other also against powerful, and barbarous Foes, that have not been fully subdu'd almost these six thousand years, *Ignorance*, and *False Opinions*. (57)

In addition to linking the experimentalist with the epic hero, likening the campaign against intellectual error to the religious war against the enemies of Christendom highlights both the seriousness and significance of experimental endeavors. As it is honorable to fight for religious truth, so too is it honorable to fight for philosophical truth. These battles are portrayed by Sprat and his fellow Society advocates and apologists as equally heroic.

Cowley emphasizes this heroism by likening the Royal Society itself to Hercules. Cowley declares that

> With courage and success, you the bold work begin;
>
> Your cradle has not idle been:
>
> None e'er but Hercules and you could be
>
> At five years' age worthy a history.

And ne'er did fortune better yet

Th' historian to the story fit:

As you from all old errors free

And purge the body of philosophy,

So from all modern follies he

Has vindicated eloquence and wit. (st.9)

Note here that Cowley portrays the unadorned linguistic style of the *History* itself as symbolic of the knowledge to be discovered by the experimentalists: as Sprat has vindicated eloquence from "modern follies," the Society will purge philosophy of "old errors." Success in this endeavor confirms the heroic status of the experimentalists and of the Society as a whole. The explicit reference to Hercules portends the Society's victory, as the experimentalists will with the "courage and success" of the great warrior triumph on their own "bold" and heroic quest for truth and knowledge.

Cowley elsewhere figuratively uses military rhetoric to describe the experimentalists and their quest, portraying the experimentalists as the best "troop" in Learning's numerous "armies":

From you, great champions, we expect to get

These spacious countries but discovered yet;

Countries where yet instead of nature we

Her images and idols worshipped see.

These large and wealthy regions to subdue,

Though learning has whole armies at command,

Quartered about in every land.

A better troop she ne'er together drew. (st.6)

One interpretation of this passage can see the experimentalists as something of a peace-keeping force who share knowledge and technology with people around the globe and thereby improves the lot of mankind. A more likely interpretation of the passage, however, is an imperial one in which the knowledge and technology possessed by the "great champions" of the Royal Society will give England the power to possess and "subdue" those "large and wealthy regions" of the globe where native inhabitants worship "images and idols." Indeed, this latter and more literal reading of Cowley's stanza is entirely consistent with the nationalist overtones classically associated with the epic hero and his quest. In this respect, the English people and the English nation will be the ultimate beneficiaries of the experimentalists' triumph over human ignorance.

The English people and the English nation will likewise benefit from the experimentalists' triumph in their second struggle as well – the struggle to reveal Nature's secrets. In addition to the power that this triumph implied, mastery over Nature was often overtly sexualized and described as pleasurable. One of the things that Cowley most admires about the Royal Society, for example, is its ability to read and understand Nature. He declares that

Nature's great works no distance can obscure;

No smallness her near objects can secure;

You've taught the curious sight to press

Into the privatest recess

Of her imperceptible littleness.

You've learned to read her smallest hand,

And well begun her deepest sense to understand. (st.7)

Cowley is in one respect here celebrating actual technological achievements. The telescope had since the time of Galileo allowed man to see into the heavens, dramatically shrinking the distance between man and the worlds above. Advances in microscopy likewise revealed an entirely new realm of Nature by allowing experimentalists like Robert Hooke, author of the landmark *Micrographia* (1665), to see that which was imperceptible to the naked eye. This ever-increasing accessibility of the natural world generated a considerable enthusiasm among those who recognized its power and potential.

The language that Cowley uses to convey this enthusiasm, however, colors his passage with darker overtones. Experimental philosophy developed as an exclusively male pursuit, and the experimentalist was rhetorically constructed as isolated from women. The gendering in Cowley's passage thus reveals what is perhaps the only truly desirable relationship of the experimentalist to the female – a relationship of dominance. Carolyn Merchant explains that experimental philosophy and experimental philosophers conceived Nature as "a female to be controlled and dissected through experiment" (189). This control and dissection is exactly what Cowley celebrates. Nature now can keep no secret from the experimentalist because she is completely available for his study.

The feminized Nature is also, of course, completely available to the experimentalist's male gaze as well. Celebrations of the experimentalist's power

over Nature often contain highly sexualized language and imagery. Cowley's enthusiasm for the experimentalists' ability to "press" into Nature's "privatest recess" can be interpreted as voyeuristic. Glanvill's delight at experimentalists' ability "*to know the wayes of* captivating Nature, *and making her* subserve *our* purposes *and* designments" ("To the Royal Society" sig. B3v-B4r) can be seen as sadistic. And Sprat's anticipation of the experimentalist's access to Nature's intellectual bounty – his anticipation that the Royal Society's "*Systeme of Natural Philosophy*" will be the means through which "The Beautiful Bosom of *Nature* will be Expos'd to our view: we shall enter into its *Garden*, and tast of its *Fruits*, and satisfy our selves with its *plenty*" (327) – can be read as a sexual conquest. In each case, the male experimentalist is portrayed as having the power to successfully manipulate and master the once-reticent female Nature.

Portrayals of the experimentalists as victors over human ignorance and over Nature herself were rhetorically calculated to inspire cultural respect for the experimentalist, for his partners, and for his quest as a whole. The use of military and sexual imagery to describe the experimentalist's combat against these forces ultimately enabled Royal Society advocates and apologists to emphasize the raw power of and the national and imperial benefits to be gained from the experimental quest. In addition to thus linking the experimental craft to the epic quest, depictions of the experimentalist and his partners as victorious in their philosophical combat were powerful symbols of English national and international power and potential.

The fourth element of similarity between the experimentalist's craft and the classical hero's quest is a special weapon that guarantees the protagonist's success in combat. Miller describes this weapon as "a dreadful and wonderful congruence between human imagination and human skill; between symbol and solid fact, fancied notion and finished craft" (206). The seventeenth century literary and experimental hero, however, is often armed with a special but non-specialized weapon that anyone could successfully yield.

Neither David nor Gondibert, for example, employs a specialized weapon in the battle with his adversary. Gondibert plans to use no weapon at all in his duel with Oswald: he tells Oswald that "Where with no more defensive Armes then was / By Nature ment us, who ordain'd Men Friends, / We will on foot determine our great cause" (I.iii.40). David likewise refuses the traditional garb and weaponry of war, as he opts to fight without the battle armor in which Saul has him clothed. Joab here describes David's preparation for battle against Goliath:

> He lost himself in that *disguise of warre*,
> And guarded seems as men by *Prisons* are.
> He therefore to *exalt* the wondrous sight,
> *Prepares* now, and *disarms* himself for fight.
> 'Gainst Shield, Helm, Breast-plate, and instead of those
> Five sharp smooth stones from the next brook he chose,
> And fits them to his sling. (337)

Clearly uncomfortable in the physical trappings of a warrior, David fells his adversary with an ordinary slingshot. Cowley and Davenant thus both give us literary heroes that refuse to utilize specialized weapons of war.

The experimental hero also did not use a specialized weapon in his intellectual battle. Methodology was of crucial importance to the experimentalists. Remember Bacon's conviction, as explained by Dear, that "the acquisition of knowledge was somehow an automatic process, once the correct procedure was followed" (147). This experimental belief invested the weapon of the experimental hero – the inductive method – with incredible power. Functionally, this method was hailed as the process by which mankind would accumulate knowledge and thereby increase its understanding of the natural world.

Perhaps even more important than its functional power, however, was the symbolic power of the inductive method. A common belief in the seventeenth century mindset, for example, was that man had literally fallen away from God as a consequence of original sin. As part of the Fall, mankind's relationship to Nature had fundamentally changed as well. Whereas he had once been master over all of Nature, man was now powerless against it. The inductive method, however, gave mankind the opportunity to regain what Adam had lost. Because he now had a better ability to understand God's works, the experimentalist ultimately had the potential to become closer to God. The experimentalist also now had the ability to harness Nature for his own purpose and benefit. The inductive method was therefore portrayed by Royal Society advocates and

apologists as a powerful weapon in man's fight to reverse the disastrous consequences of original sin – a portrayal, it should be noted, that also reinforces the characterization discussed in Chapter 3 of the Royal Society itself as having the potential to redeem Englishmen and all mankind.

The inductive method also served as a unifying force for the experimental community. Differences among Society members in terms of age, political orientation, and religious conviction were in theory subsumed under their overarching dedication to the inductive method. This experimental methodology was significant not only because the entire community believed in it, but also because the entire community could utilize it. Whereas the epic hero's weapon could be effectively employed only by the hero himself, the inductive method could be successfully employed by each and every member of the experimental community. Only Odysseus could wield his mighty bow, but all experimentalists could utilize the inductive method.

As the inductive method itself can be seen as a weapon, so too can the knowledge derived from that method be seen as a weapon. Royal Society advocate and apologist Simon Patrick wrote a tract entitled "A Brief Account of the new Sect of Latitude-Men, Together with some reflections upon the New Philosophy" (1662) at the request of a friend who wanted more information about the "*certain new Sect of men called* Latitude-men," which he had heard "*represented as a party very dangerous both to the King and Church, as seeking to undermine them both*" (3). The "Brief Account" defends the "new sect" of experimentalists from a religious standpoint, and specifically uses the language

of combat and weaponry to explain how the religious community can use experimental knowledge to defend religion against its enemies. Patrick here, for example, argues the necessity of equipping the religious community with experimental knowledge:

> Nor will it be possible otherwise to free Religion from scorn and contempt, if her Priests be not as well skilled in nature as the people, and her Champions furnished with as good Artillery as her enemies. How shall the Clergy be able to maintain their credit with the ingenuous Gentry, who begin generally to be acquainted with the *atomical Hypothesis*, and know how to distinguish between a true Gemme and a *Bristol*-Diamond? or how shall they encounter with the witts (as they are called) of the age, that assault Religion with new kind of weapons? will they acquiesce in the authority of *Aristotle* or St. *Thomas*? or be put off with *Contra negantem principia*? let not the Church send out her Souldiers armed with Dock-leaves and Bullrushes, to encounter swords and Guns, but let them wear as good brass and steel as their enemyes, and fight with them at their own weapons; and then having Truth and Right on their side, let them never despair of victory. (24)

The sheer amount of military rhetoric that Patrick uses in this passage is overwhelming. Experimental knowledge is "good Artillery": it "arms" the Church "Souldiers" in "good brass and steel," and enables the "champions" of Religion to counter the "assaults" of their "enemyes" – i.e. the "assaults" of the wits and the

ingenuous who also have access to experimental knowledge and will therefore not simply yield to ancient authority. The imagery constructs both experimental knowledge itself and, by extension, the inductive method from which that knowledge is derived as powerful weapons of "Truth and Right."

The overall point that Patrick makes is also highly significant. In order to maintain the respect of their increasingly knowledgeable parishioners, religious authorities must themselves be kept abreast of new knowledge. Note that this assertion invests experimental knowledge with the power to serve as a stabilizing force in English culture. Advocates and apologists for the Royal Society likewise emphasized the stabilizing potential of experimentalism by aligning it with liberal Anglicanism, or latitudinarianism. This alignment ultimately bound natural philosophy with both religious orthodoxy and social and political conservatism – a combination of values that constructed the experimentalist as an exemplar of civic virtue who could rightfully use his weapon either offensively, to attack error and misinformation, or defensively, to protect what is right and true.

The characterization of the inductive method as a weapon combines with the portrayals of the experimental endeavor as intellectual combat, the experimental community as a partnership, and the experimentalist's command over physical space to construct the experimental craft as an epic quest. This construction in turn reinforces the cultural construction of the experimentalist himself as an epic hero. And now one final but critical connection between the experimentalist and the epic hero remains: his relationship to the divine.

One of the most important cultural relationships for Royal Society advocates and apologists to establish was that of the experimental philosopher to religion. Miller notes that the classical epic hero often comes from divine parentage (70). For Royal Society advocates and apologists to claim in the mid-seventeenth century that the experimentalists were descended from the divine would have been a foolish rhetorical move: that claim would likely have put the experimentalists at risk of being viewed as both hubristic and blasphemous – views that advocates and apologists were specifically working to deter. Advocates and apologists thus revised this particular heroic trait and instead portrayed the experimentalists as having three different but interrelated relationships to the divine: one between God and experimental philosophy itself, one between God and the experimentalists as a group, and one between God and certain noteworthy individual experimentalists. Taken together, these relationships reinforce the overall rhetorical and ideological construction of the experimentalist as a devout authority worthy of much cultural respect.

Some of the liveliest critical debate surrounding the early Royal Society was that focused on religion. Robert K. Merton published in 1938 his now classic formulation of the "Puritan Thesis," which was predicated on the point that "the originative spirits of the Society were markedly influenced by Puritan conceptions" (473). Despite Lewis S. Feuer's argument in 1963 that the "dominant ethic" among Society members was "not that of the Puritan virtues; it was hedonist-libertarian" (422), Christopher Hill argued again in favor of Puritan connections in 1964. Barbara J. Shapiro contrarily argued in 1968 for an "open

alliance between liberal religion and scientific inquiry" (34), whereas Douglas M. Kemsley argued in that same year that the Royal Society was actually "unbounded by the tenets of any philosophical sect or particular religious system" (221). Merton in 1970 then reasserted his argument for a "happy marriage" between Puritanism and the new experimental philosophy due to their "intrinsic compatibility" (136). Charles Webster in 1975 echoed that reassertion. Most historians, however, would perhaps now agree with the argument put forth by Lotte Mulligan in 1980 that the Society adhered to "a general English providential view of the natural order rather than on the peculiar millenarian, pansophist element of the radical Puritans" (468).

My own critical view is that determining the actual religious sympathies of the early Royal Society is far less important than recognizing the relationship to religion that advocates and apologists rhetorically created for the Society. One element of this relationship, for example, portrayed experimental philosophy as something of a religion in and of itself. Experimentalism was not posited as an alternative to spiritual religion, however: the discipline and faith needed to dedicate oneself to the pursuit of truth and knowledge was portrayed as analogous to the discipline and faith needed to dedicate oneself to God. As explained by Jones, a "common ground for all members of the Royal Society" was the conviction that "experiment and observation as the proper method for the discovery of natural truths represented a faith, to doubt which was heresy" (185).

Sprat, for example, portrays the study of Nature as man's original religion. He describes the impact that the study of natural philosophy will have on the experimentalist in this lengthy passage:

> from hence he will best understand the infinit distance between *himself*, and his *Creator*, when he finds that all things were produc'd by him: whereas he by all his study, can scarce imitate the least effects, nor hasten, or retard the common cours of *Nature*. This will teach him to *Worship* that *Wisdom*; by which all things are so easily sustain'd, when he has look'd more familiarly into them, and beheld the chances, and alterations, to which they are expos'd. Hence he will be led to admire the wonderful contrivance of the *Creation*; and so to apply, and direct his praises aright: which no doubt, when they are offer'd up to *Heven*, from the mouth of one, who has well studied what he commends, will be more sutable to the *Divine Nature*, than the blind applauses of the ignorant. This was the first service, that Adam perform'd to his *Creator*, when he obey'd him in mustring, and naming, and looking into the *Nature* of all the *Creatures*. This had bin the only *Religion*, if men had continued innocent in *Paradise*, and had not wanted a *Redemption*. Of this the *Scripture* itself makes so much use, that if any devout man shall reject all *Natural Philosophy*, he may blot *Genesis*, and *Job*, and the *Psalms*, and some other Books, out of the *Canon* of the *Bible*. *God* never yet left himself without witness in the *World*:

> And it is observable, that he has commonly chosen the dark and ignorant *Ages*, wherein to work Miracles; but seldom or never the times when *Natural Knowledge* prevail'd: For he knew there was not so much need to make use of extraordinary signs, when men were diligent in the works of his hands, and attentive on the impressions of his footsteps in his *Creatures*. (349-50)

Sprat not only identifies the study of Nature – the "mustring, and naming, and looking into the *Nature* of all the *Creatures*" – as man's original religion in Paradise, but also claims that this study would have remained man's only religion had Adam "continued innocent in *Paradise*." Because they imply that the study of Nature is an important component of religious devotion, these assertions could perhaps have struck some of Sprat's contemporary readers as blasphemous. And readers who were not offended by these assertions could well have been offended by Sprat's claim that God prefers the devotion of those who have dedicated themselves to the study of the natural world over the devotion of those who have not – that the praises "offer'd up to *Heven*, from the mouth of one, who has well studied what he commends, will be more sutable to the *Divine Nature*, than the blind applauses of the ignorant."[28]

Sprat's ultimate intent in this passage, however, is to emphasize that experimentalism is in no way contrary to religion. The Bible itself, Sprat notes, "makes so much use" of natural philosophy that to reject it is also to reject

[28] In his "Censure upon certain passages contained in the History of the *Royall Society*," for example, Henry Stubbe argues that "the former part of this passage is contrary to the *Analogy of Faith* and *Scripture*, in that it makes the acceptableness of mens prayers to depend more or less on the study of Natural Philosophy" (36).

"*Genesis*, and *Job*, and the *Psalms*, and some other Books, out of the *Canon* of the *Bible*." Sprat's point is that the study of the natural world will instill the experimentalist with a deep respect for God when he realizes that he "can scarce imitate" even the least of God's works. In that it ultimately inspires both awe and respect for God and His works, experimental philosophy is portrayed by Royal Society advocates and apologists as having an harmonious relationship to the divine.

Advocates and apologists may well have been helped in making this argument by the literary portrayals of the House of Astragon and the Prophet's College. The Prophet's College, of course, is an explicitly religious institution in which pious and devout men join together to study God's word and God's world. There is clearly no conflict between religion and the study of Nature in that institution. Neither is there in the House of Astragon, which, although more overtly dedicated to the study of Nature, is also built upon a strong religious foundation. Ulfin explains of the men in the House that

> The Wise I here observe,
> Are wise tow'rds God; in whose great service still,
> More then in that of Kings, themselves they serve.
>
> He who this Building's Builder did create,
> Has an Apartment here Triangular;
> Where *Astragon*, Three Fanes did dedicate,
> To daies of *Praise*, of *Penitence*, and *Pray'r*.

To these, from diff'rent motives, all proceed;
For when discov'ries they on Nature gain,
They praise high Heav'n which makes their work succeed,
But when it fails, in Penitence complain.

If after *Praise*, new blessings are not giv'n,
Nor mourning *Penitence* can ills repair,
Like practis'd Beggers, they solicite Heav'n,
And will prevail by violence of *Pray'r.* (II.vi.3-6)

In the House of Astragon, then, the men work with God to study the natural world: they praise Him for their successes, they offer penitence in hopes that He will help them overcome their failures, and they pray to Him fervently for their future triumphs. Thus, in both the literary analogs of the Royal Society and in the Royal Society itself, religion and the study of Nature exist in harmony.

Dependent in turn on this harmonious relationship between experimental philosophy and the divine was the relationship between the experimentalists and the divine. The most influential of these relationships, as discussed above, is that of the experimentalist as a 'priest of Nature.' In *Leviathan and the Air-Pump,* Shapin and Schaffer analyze Boyle's construction of the experimentalists as "a new kind of clergy," and confirm that the experimentalists "consistently displayed themselves as a godly community" (310, 318). It is certainly worth noting that contemporary notions of gentility may well have helped foster the idea of the

experimentalist as a godly 'priest of Nature.' According to Shapin, "from the early seventeenth century, it was increasingly argued in England that the gentleman, enjoying divine donatives, stood in a special relationship with God" (*Social History* 81). This cultural belief that English gentlemen had a special relationship with the divine could indeed have increased the plausibility that the experimentalist – as an English gentleman – could have had a special relationship to the divine as well.

The most important element of this relationship to the divine is undoubtedly the experimentalists' respect and reverence for divine truths. In his Author's Preface to *The Excellency of Theology Compar'd with Natural Philosphy* (1674), for example, Boyle clearly elevates the study of the Divine, famously portraying natural philosophy "if not as an *Handmaid* to Divinity, yet as a Lady of a lower rank." Particularly noteworthy is the fact that, because the text argues so passionately for the superiority of studying divine truths, Boyle suppressed publication of the text for nearly ten years for fear that "it might be misapply'd by some Enemies to Experimental Philosophy."

Far from denigrating natural philosophy, however, Boyle asserts that experimentalism has the potential to increase man's understanding of scriptural truths, as the intellectual rigor that experimental philosophy both teaches and demands can be fruitfully applied to the study of the Bible. Those "persons of a Philosophical Genius, well furnish'd with Critical Learning, and the Principles of true Philosophy," Boyle explains,

by exercising upon Theological matters, that Inquisitiveness and Sagacity that has made in our Age such a happy Progress in Philosophical ones, will make Explications and Discoveries, that will justifie more than I have said in praise of the study of our Religion and the Divine Books that contain Articles of it. For these want not Excellencies, but only skilful Unvailers. (47)

Because they are thus ideally suited for biblical study, the experimentalists will make a significant contribution to theological knowledge, given that there are as many unrevealed "Mysteries" in the Books of Scripture as there are in the Book of Nature (48). It is this ability to understand and explicate divine texts that placed the experimentalists in a special relationship with God.

Royal Society advocates and apologists emphasized this special relationship to God by portraying the experimentalists as a chosen people. In "To the Royal Society," for example, Cowley asserts

Methinks, like Gideon's little band,
God with design has picked out you,
To do those noble wonders by a few. (st.6)

The "you" in this stanza, of course, refers to the "great champions" of the Royal Society. Cowley's analogy here functions in two significant ways. First, it affirms that the experimentalists are favored by God. Like those who became part of Gideon's band in Judges 7.4-7, the experimentalists have honorably distinguished themselves in the eyes of God. Second, and perhaps more importantly, the analogy likens the experimentalists to the Israelites -- a portrayal

that resonates with nationalist meaning. As Gideon's band saved the Israelites from their enslavement by the Midianites, the experimentalists will free the English people – and, indeed, all of mankind – from enslavement by intellectual error and false knowledge.

As important as the fact that they were chosen by God is perhaps the way in which the experimentalists were chosen. Cowley explains

> And now He chooses out His men,
> Much in the way that He did then;
> Not those many whom He found
> Idly extended on the ground,
> To drink with their dejected head
> The stream just so as by their mouths it fled;
> No, but those few who took the waters up,
> And made of their laborious hands the cup. (st.6)

While he does follow the Biblical text very closely, Cowley may also be read here as implying that the experimentalists were selected for their thinking and problem solving skills. If one interprets the stream in the passage as a metaphorical river of knowledge, the experimentalists can be seen as willing to work in order to experience and understand that knowledge. Not content passively to glean what he can from the river as it flows by, the experimentalist actively uses his "laborious hands" to drink deeply from it. For Cowley, this active laborer for knowledge is the sort of man the experimentalist is, and the sort of man that God Himself prefers.

This desire to interrogate God's natural works, however, could still be interpreted as an inappropriate human aspiration. The view of the experimentalist as a Promethean overreacher was, remember, one of the character traits of the classical epic hero from which Royal Society advocates and apologists wanted to distance the experimentalists. Sprat creates this distance by confirming that the experimentalists

> meddle no otherwise with *Divine things*, than onely as the *Power*, and *Wisdom*, and *Goodness* of the *Creator*, is display'd in the admirable order, and the workman-ship of the Creatures. It cannot be deny'd, but it lies in the *Natural Philosophers* hands, best to advance that part of *Divinity*: which, though it fills not the mind, with such *tender*, and *powerful contemplations*, as that which shews us Man's *Redemption* by a *Mediator*; yet it is by no means to be pass'd by unregarded: but is an excellent ground to establish the other. (82)

Sprat works in this passage to dispel the belief that the experimentalists are hubristically meddling where they should not. Rather than interfering with or working against religion, the experimentalists are instead portrayed as faithful advocates of a divinity that seeks to understand the "*Power*," "*Wisdom*," and "*Goodness*" of the creator.

Sprat also employs Biblical imagery to explain how the study of the natural world brings the experimentalists closer to God:

There is nothing of all the works of Nature, so inconsiderable, so remote, or so fully known; but, by being made to reflect on other things, it will at once enlighten them, and shew it self the clearer. Such is the dependance amongst all the orders of creatures; the inanimate, the sensitive, the rational, the natural, the artificial: that the apprehension of one of them, is a good step towards the understanding of the rest: And this is the highest pitch of *humane reason*; to follow all the links of this chain, till all their secrets are open to our minds; and their works advanc'd, or imitated by our hands. This is truly to command the world; to rank all the *varieties*, and *degrees* of things, so orderly one upon another; that standing on the top of them, we may perfectly behold all that are below, and make them all serviceable to the quiet, and peace and plenty of Man's life. And to this happiness, there can be nothing else added: but that we make a second advantage of this *rising ground*, thereby to look the nearer into heaven: An ambition, which though it was punish'd in the *old World*, by an *universal Confusion*; when it was manag'd with *impiety*, and *insolence:* yet, when it is carried on by that *humility* and *innocence*, which can never be separated from true knowledg; when it is design'd, not to *brave* the Creator of all things, but to *admire* him the more: it must needs be the utmost perfection of *humane Nature*. (110-11)

Sprat's lengthy passage contains three important points. The first is that the elements of the natural world are interconnected in such a way that to learn more about one element will in turn lead to a better understanding of the rest. This point helps to legitimize all of the studies – of "the inanimate, the sensitive, the rational, the natural, the artificial" – undertaken by the experimentalists. Sprat's second point is that these studies will allow the experimentalists not only to attain the "highest pitch of *humane reason*," but also to "command the world." This assertion is rhetorically intended to stifle opponents of and recruit supporters to the Royal Society, and would perhaps have been particularly effective when the English experimentalists' promise to "command the world" was understood in a literal and imperial sense.[29]

The third and perhaps most important point in this passage, though, is that the experimentalists' purpose is "not to *brave* the Creator of all things, but to *admire* him the more." Sprat's image is a significant one. As he increases his understanding of the many creatures of nature, man rises above those creatures. The higher man rises along the Great Chain of Being, the closer he is in turn to God. Sprat's claim is that while the impious and insolent ambition of the ancients to climb nearer to God had been punished by the "*universal Confusion*" of Babel, the rise of the experimentalists' will yield no such punishment. Rather, the experimentalists will attain the "utmost perfection of *humane Nature*" because they will proceed with the humility and innocence that reflects their harmonious relationship to the divine.

---

[29] For a study of the relationship between the Royal Society and imperialism, see J. R. Jacob's "The New England Company, the Royal Society and the Indians."

While the experimentalists as a group were portrayed as having a special relationship to the divine, a number of experimentalists were also portrayed as having individual relationships to the divine. The two most important experimentalists of the mid- and late seventeenth century were Boyle and Newton. It is no surprise, then, that both of these men are indeed constructed as and celebrated for having their own relationships to the divine.

In the "Philaretus" tract, Boyle portrays himself as having been specifically watched over by God. Boyle was the youngest of the fourteen children born in his family, and he thanks "God's Assignement" for having been "borne in a Condition, that neither was high enuf to proue a Temptation to Lazinesse; nor low enuf to discourage him from aspiring" (3). In addition to having been the object of divine fortune even before he was born, Boyle also recounts a number of divine interventions in his early life. He suffered, for example, from a frequently troublesome stutter, and he explains this affliction as follows:

> The second Misfortune that befell Philaretus, was his Acquaintance with some Children of his owne Age, whose stuttring Habitude he so long Counterfeited that he at last contracted it. Possibly a iust Judgment vpon his Derision, & turning the Effects of God's Anger into the Matter of his Sport. (4)

This claim serves as a justification for his impediment. Boyle acknowledges that in some people a "stuttring Habitude" is indeed a sign of "God's Anger," but he is careful to note that this is not the case with him: he "contracted" his stutter because he "so long Counterfeited" the affliction of others. And even though his

stutter could possibly have been a "just judgment" for his derision and sport, Boyle immediately thereafter notes that "the Afflictions made him not lesse the Obiect of Heu'n's Care" (5).

Boyle also mentions numerous additional incidents in which he "ow'd his Deliuerance" to divine intervention (5). He "reckon'd it both amongst the Greatest & the vnlikelyest Deliuerances he ow'd Prouidence" that he was spared a fondness to gambling (9). When a wall in his bedroom suddenly collapsed, he believed he would have "(in all probability) been remedilesly oppres't; had not his Bed been curtain'd by a watchfull Prouidence" (15). Boyle also recounts two separate occurrences when he was spared from death in accidents involving horses, and a third occurrence when he was saved from an apothecary's mistake (16). About these latter three incidents, Boyle affirms that

> Philaretus wud not ascribe any of these Rescues vnto Chance, but would be still industrious to perceiue the hand of Heu'n in all these Accidents: & indeed he would professe that in the Passages of his Life he had obseru'd so gratious & so peculiar a Conduct of Prouidence, that he should be equally blind & vngratefull, shud he not both Discerne & Acknowledge it. (16)

The overall impression left by the "Philaretus" tract is that God did indeed move the "hand of Heau'n" in Boyle's life, thus confirming that Boyle was of special significance to the divine.

Isaac Newton was likewise portrayed as having had an individual relationship to the divine. In praising Newton and his achievements in the

"Singular Glory" ode, Halley describes Newton as "a heaven-born Mind" whose "sublime Intellect has allowed us to penetrate / the dwellings of the Gods and to scale the heights of Heaven." Whereas Boyle represented himself as watched over by Providence, Newton is described here as an associate of the Gods:

> You who rejoice to eat the heavenly nectar, celebrate in Songs
>
> with me the man who reveals such things – Newton unlocking the archives of hidden Truth; Newton dear to the Muses; to whom pure-hearted Phoebus is present and possesses the mind with the fullness
>
> of Divinity: nor is it permitted for a Mortal to come nearer to the Gods. (qtd. in Albury)

Halley portrays Newton as an heroic mortal intellectually in commune with Phoebus Apollo, the classical god of truth and of light. In that he has unlocked the "archives of hidden Truth," Newton is hailed for being as near to the gods as his human mortality will permit. Newton's ability to "rejoice to eat the heavenly nectar" reveals his particularly intimate individual relationship to the divine.

Such portrayals of Newton persisted well into the eighteenth century. Perhaps the most well-known of these is by Alexander Pope, whose epitaph "Intended for Sir Isaac Newton" reads "Nature and Nature's laws lay hid in night: / God said, *Let Newton be!* And all was light" (390). Pope's play on Genesis 1.3 substitutes Newton for light as one of God's first creations, and thereby establishes a primacy for Newton not only in the universe of man, but also in

relation to God Himself. In "To the Memory of Sir Isaac Newton," written in 1727 but not published in full until 1792, *The Seasons* author James Thomson hails Newton as "beloved / Of Heaven" (72-73) and "our philosophic sun" (90). His description of Newton's intellect as "that light / So plenteous rayed into thy mind below / From Light Himself" (196-98) likewise implies that Newton had been especially favored by God. And Richard Glover, whose "Poem on Sir Isaac Newton" was published with Henry Pemberton's *A View of Sir Isaac Newton's Philosophy* (1728), also asserts that it was God – the "great dispenser of the world" and the "majestic ruler of the skies" – who "gav'st NEWTON thought" and "taught great NEWTON the all-potent laws / Of gravitation, by whose simple power / The universe exists." All of these works portray Newton as having a special relationship to the divine that elevated him above his fellow man.

Portrayals such as these were rhetorically designed to emphasize how truly exceptional men like Boyle and Newton were. They not only reinforce the characterization of the experimentalists as legitimate authorities worthy of cultural respect, but also contribute to the overall creation of the experimentalist as a hero by Christianizing his character so that he becomes a devout student of divine knowledge and power. Markley asserts that "as a mediator between God and humankind, Newton is figured as both prophet and epic hero" (184). It is in many ways precisely this image of an extraordinary individual relationship to the divine that rounds out the rhetorical construction of the seventeenth-century experimental philosopher as an epic hero.

I now bring to a close my brief but hopefully thought-provoking study of the rhetorical process by which the Royal Society, its experimental philosophers, and its experimental philosophy were culturally legitimized in the years immediately following the Society's establishment. The ideological and rhetorical construction of the experimental philosopher into an epic hero and of the Royal Society into an institution with far-reaching nationalist implication did of course not happen overnight. Once these heroic associations became rooted in the English cultural mindset, however, the impact that they had both in England and around the globe were profound and enduring. Recall that Hunter's admonition against the "great man" view of the history of the Royal Society was published fewer that fifteen years ago.

We still today, of course, invest scientists with heroic qualities and endow science, and perhaps particularly medicinal research, with redemptive powers. The image of the brilliant scientist blazing into unknown intellectual territory is certainly not our own: it was handed down to us from the pens of seventeenth century Royal Society advocates and apologists. My particular interest here lies in the fact that this image was fundamentally grounded in literature – was both constructed and supported by the tropes and conventions associated with epic and heroic literature. My hope is that my work here will inspire further studies of the complex cultural relationships that exist between literature and science, both in the seventeenth century and in our own century as well.

Works Cited

Albury, W. R. "Halley's Ode on the *Principia* of Newton and the Epicurean Revival in England." *Journal of the History of Ideas* 39 (1978): 24-43.

Anderson, Benedict. *Imagined Communities: Reflections on the Origin and Spread of Nationalism.* 1983. New York: Verso, 1991.

Bacon, Francis. *Novum Organum.* 1620. *Novum Organum, with Other Parts of the Great Instauration.* Ed. Peter Urbach and John Gibson. Chicago: Open Court, 1994.

Borris, Kenneth. *Allegory and Epic in English Renaissance Literature: Heroic Form in Sidney, Spenser, and Milton.* Cambridge: Cambridge University Press, 2000.

Boyle, Robert. "An Account of Philaretus During His Minority." *The Life of the Honourable Robert Boyle, F.R.S.* Ed. R. E. W. Maddison. New York: Barnes and Noble, 1969. 2-45.

---. *Certain Physiological Essays Written at Distant Times, and on Several Occasions.* London: Henry Herringman, 1661.

---. *The Excellency of Theology Compar'd with Natural Philosophy.* London: Henry Herringman, 1674.

---. *The Origine of Formes and Qualities.* Oxford: H. Hall, 1666.

---. *The Sceptical Chymist.* 1661. London: J. M. Dent, 1949.

Buchanan-Brown, J. "The Books Presented to the Royal Society by John Aubrey, F. R. S." *Notes and Records of the Royal Society of London* 28 (1974): 167-93.

Burke, Helen M. "*Annus Mirabilis* and the Ideology of the New Science." *English Literary History* 57.2 (1990): 307-34.

Chapman, Allan. "Edmond Halley's Use of Historical Evidence in the Advancement of Science." *Notes and Records of the Royal Society of London* 48 (1994): 167-91.

Clericuzio, Antonio. "Carneades and the Chemists: A Study of *The Sceptical Chymist* and it Impact on Seventeenth-Century Chemistry." Hunter, *Robert Boyle Reconsidered.* 79-90.

Cope, Jackson I., and Harold Whitmore Jones. Introduction. *History of the Royal Society.* Ed. Jackson I. Cope and Harold Whitmore Jones. St. Louis: Washington University, 1959. xii-xxxii.

Cowley, Abraham. *Davideis, a Sacred Poem of the Troubles of David. Poems.* Ed. A. R. Waller. Cambridge: Cambridge University Press, 1905. 239-401.

---. "To the Royal Society." *Ben Jonson and the Cavalier Poets.* Ed. Hugh Maclean. New York: Norton, 1974. 343-47.

Cressy, David. "National Memory in Early Modern England." *Commemorations: The Politics of National Identity.* Ed. John R. Gillis. Princeton: Princeton University Press, 1994. 61-73.

Davenant, William. *The Author's Preface to his Much Honor'd Friend, M. Hobbes. Sir William Davenant's* Gondibert. Ed. David F. Gladish. Oxford: Clarendon Press, 1971. 3-44.

---. *Gondibert: An Heroick Poem. Sir William Davenant's* Gondibert. Ed. David F. Gladish. Oxford: Clarendon Press, 1971.

Dear, Peter. "*Totius in verba*: Rhetoric and Authority in the Early Royal Society." *Isis* 76 (1985): 145-61.

Debus, Allen G., ed. *Science, Medicine, and Society in the Renaissance. Essays to Honor Walter Pagel.* Vol. 2. New York: Science History Publications, 1972. 2 vols.

Dickson, Donald R. "Thomas Henshaw and Sir Robert Paston's Pursuit of the Red Elixir: An Early Collaboration between Fellows of the Royal Society." *Notes and Records of the Royal Society* 51 (1997): 57-76.

Dobbs, Betty Jo Teeter. *The Foundations of Newton's Alchemy, or "The Hunting of the Greene Lyon."* Cambridge: Cambridge University Press, 1975.

---. *The Janus Face of Genius: The Role of Alchemy in Newton's Thought.* Cambridge: Cambridge University Press, 1991.

---. "Newton's Alchemy and His Theory of Matter." *Isis* 73 (1982): 511-28.

---. "Studies in the Natural Philosophy of Sir Kenelm Digby." *Ambix* 18 (1971): 1-25.

---. "Studies in the Natural Philosophy of Sir Kenelm Digby: Part II. Digby and Alchemy." *Ambix* 20 (1973): 143-163.

---. "Studies in the Natural Philosophy of Sir Kenelm Digby: Part III. Digby's Experimental Alchemy – The Book of Secrets." *Ambix* 21 (1974): 1-28.

Donne, John. "An Anatomy of the World: The First Anniversary." *John Donne: The Complete English Poems.* Ed. A. J. Smith. 1971. New York: Penguin, 1996. 269-85.

---. "Love's Alchemy." *John Donne: The Complete English Poems.* Ed. A. J. Smith. 1971. New York: Penguin, 1996. 65.

---. "A Nocturnal Upon S. Lucy's Day." *John Donne: The Complete English Poems.* Ed. A. J. Smith. 1971. New York: Penguin, 1996. 72-73.

Dryden, John. *Annus Mirabilis. The Works of John Dryden.* Ed. Edward Niles Hooker and H. T. Swedenberg, Jr. Vol. 1. Berkeley: University of California Press, 1956. 59-105. 20 vols. 1956-1987.

---. "Of Heroique Plays." *The Works of John Dryden.* Ed. Edward Niles Hooker and H. T. Swedenberg, Jr. Vol. 11. Berkeley: University of California Press, 1956. 8-18. 20 vols. 1956-1987.

Dykstal, Timothy. "The Epic Reticence of Abraham Cowley." *Studies in English Literature* 31.1 (1991): 95-115.

Eamon, William. "From the Secrets of Nature to Public Knowledge." *Reappraisals of the Scientific Revolution.* Ed. David C. Lindberg and Robert S. Westman. Cambridge: Cambridge University Press, 1990. 333-65.

Feingold, Mordechai. "When Facts Matter." *Isis* 87 (1996): 131-39.

Feuer, Lewis S. *The Scientific Intellectual: The Psychological & Sociological Origins of Modern Science.* New York: Basic, 1963.

Finocchiaro, Maurice A. "Introduction." *The Galileo Affair: A Documentary History.* Ed. Maurice A. Finocchiaro. Berkeley: University of California Press, 1989. 1-43.

Fisch, H. And H. W. Jones. "Bacon's Influence on Sprat's *History of the Royal Society.*" *Modern Language Quarterly* 12 (1951): 399-406.

Gladish, David F., ed. *Sir William Davenant's* Gondibert. Oxford: Clarendon Press, 1971.

Glanvill, Joseph. "Against Confidence in Philosophy, And Matters of Speculation." *Essays on Several Important Subjects in Philosophy and Religion.* London: 1676. 1-33.

---. *Plus Ultra; or, The Progress and Advancement of Knowledge Since the Days of Aristotle.* 1668. Gainesville: Scholars' Facsimiles & Reprints, 1958.

---. "To the Royal Society." *Scepsis Scientifica: or Confest Ignorance, the Way to Science. The Vanity of Dogmatizing: The Three 'Versions.'* Ed. Stephen Medcalf. Hove, Sussex, England: Harvester, 1970.

---. *The Vanity of Dogmatizing, or Confidence in Opinions Manifested in a Discourse of the Shortness and Uncertainty of Our Knowledge.* London: 1661.

Glover, Richard. "A Poem on Sir Isaac Newton." *A View of Sir Isaac Newton's Philosophy.* By Henry Pemberton. Ed. I. Bernard Cohen. New York: Johnson Reprint Corporation, 1972. N. pag.

Golinski, J. V. "A Noble Spectacle: Phosphorus and the Public Cultures of Science in the Early Royal Society." *Isis* 80 (1989): 11-39.

Grabes, Herbert. "Introduction: 'Writing the Nation' in a Literal Sense." *Writing the Early Modern English Nation: The Transformation of National Identity in Sixteenth- and Seventeenth-Century England.* Ed. Herbert Grabes. Amsterdam: Rodopi, 2001. ix-xv.

Greenblatt, Stephen. *Renaissance Self-Fashioning from More to Shakespeare.* Chicago: University of Chicago Press, 1980.

Guibbory, Achsah. "Imitation and Originality: Cowley and Bacon's Vision of Progress." *Studies in English Literature, 1500-1900* 29 (1989): 99-120.

Hall, Marie Boas. "Boyle's Method of Work: Promoting His Corpuscular Philosophy." *Notes and Records of the Royal Society of London* 41 (1987): 111-43.

---. *Promoting Experimental Learning: Experiment and the Royal Society, 1660-1727.* New York: Cambridge University Press, 1991.

Halley, Edmond. "On This Mathematico-Physical Work, A Singular Glory of Our Age and Nation, By a Most Illustrious Man, Mr. Isaac Newton." Albury, 27.

Hellegers, Desiree. *Handmaid to Divinity: Natural Philosophy, Poetry, and Gender in Seventeenth Century England.* Norman: University of Oklahoma Press, 2000.

Herbert, George. "Easter." *George Herbert and the Seventeenth-Century Religious Poets.* Ed. Mario DiCesare. New York: Norton, 1978. 18.

---. "The Elixir." *George Herbert and the Seventeenth-Century Religious Poets.* Ed. Mario DiCesare. New York: Norton, 1978. 65-66.

Heyd, Michael. "The New Experimental Philosophy: A Manifestation of 'Enthusiasm' or an Antidote to It?" *Minerva* 25 (1987): 423-40.

Hibbert, Christopher. *The Grand Tour.* New York: G. P. Putnam's Sons, 1969.

Hill, Christopher. "Puritanism, Capitalism and the Scientific Revolution." *Past and Present* 29 (1964): 88-97.

---. *The World Turned Upside Down: Radical Ideas During the English Revolution.* 1972. London: Penguin, 1991.

Hoppen, K. Theodore. "The Nature of the Early Royal Society Part I." *British Journal for the History of Science* 9 (1976): 1-24.

---. "The Nature of the Early Royal Society, Part II." *British Journal for the History of Science* 9 (1976): 243-273.

Houghton, Walter E., Jr. "The English Virtuoso in the Seventeenth Century: Part I." *Journal of the History of Ideas* 3 (1942): 51-73.

---. "The English Virtuoso in the Seventeenth Century: Part II." *Journal of the History of Ideas* 3 (1942): 190-219.

Hunter, Michael. "Alchemy, Magic, and Moralism in the Thought of Robert Boyle." *British Journal for the History of Science* 23 (1990): 387-410.

---. *Establishing the New Science: The Experience of the Early Royal Society.* Woodbridge, Suffolk: Boydell, 1989.

---. *The Royal Society and Its Fellows 1660-1700: The Morphology of an Early Scientific Institution.* 2nd ed. Oxford: British Society for the History of Science, 1994.

---. *Science and Society in Restoration England.* 1981. Aldershot, Hampshire, England: Gregg Revivals, 1992.

Hunter, Michael, ed. *Robert Boyle Reconsidered.* Cambridge: Cambridge University Press, 1994.

Jacob, James R. *Henry Stubbe: Radical Protestantism and the Early Enlightenment.* Cambridge: Cambridge University Press, 1983.

---. "The New England Company, the Royal Society and the Indians." *Social Studies of Science* 5 (1975): 450-55.

Jagger, Graham. "Joseph Moxon, F.R.S., and the Royal Society." *Notes and Records of the Royal Society* 49 (1995): 193-208.

Janacek, Bruce. "Catholic Natural Philosophy: Alchemy and the Revivification of Sir Kenelm Digby." Osler, 89-118.

Jones, Harold Whitmore. "Mid-Seventeenth Century Science: Some Polemics." *Osiris* 9 (1950): 254-74.

Jones, Richard Foster. *Ancients and Moderns: A Study of the Rise of the Scientific Movement in Seventeenth-Century England.* 1961. New York: Dover, 1982.

Jonson, Ben. *The Alchemist. The Alchemist and other Plays.* Ed. Gordon Campbell. Oxford: Oxford University Press, 1998. 211-326.

Kaplan, Barbara Beigun. "A Social History of Truth: Civility and Science in Seventeeth-Century England." *American Historical Review* 102 (1997): 1156-57.

Keller, Evelyn Fox. *Reflections on Gender and Science.* New Haven: Yale University Press, 1985.

Kemsley, Douglas M. "Religious Influences in the Rise of Modern Science." *Annals of Science* 24 (1968): 199-226.

Kohn, Hans. *The Idea of Nationalism: A Study in Its Origins and Background.* New York: Macmillan, 1960.

Linden, Stanton J. "Alchemy and Eschatology in Seventeenth-Century England." *Ambix* 31 (1984): 102-24.

---. *Darke Hierogliphicks: Alchemy in English Literature from Chaucer to the Restoration.* Lexington: University Press of Kentucky, 1996.

Lloyd, Claude. "Shadwell and the Virtuosi." *Publications of the Modern Language Assocation* 44 (1929): 472-94.

Lynch, William T. *Solomon's Child: Method in the Early Royal Society of London.* Stanford: Stanford University Press, 2001.

Lyons, Henry. *The Royal Society, 1660-1940: A History of its Administration Under its Charters.* Cambridge: Cambridge University Press, 1944.

Maddison, R. E. W. *The Life of the Honourable Robert Boyle, F.R.S.* New York: Barnes and Noble, 1969.

Mallet, Charles Edward. *A History of the University of Oxford.* 1924. Vol. 2. New York: Barnes and Noble, 1968. 3 vols.

Markley, Robert. *Fallen Languages: Crises of Representation in Newtonian England 1660-1740.* Ithaca: Cornell University Press, 1993.

Medcalf, Stephen. Introduction. *The Vanity of Dogmatizing: The Three 'Versions.'* Ed. Stephen Medcalf. Hove, Sussex, England: Harvester, 1970. xiii-xlvi.

Mendelsohn, J. Andrew. "Alchemy and Politics in England, 1649-1660." *Past and Present* 135 (1992): 30-78.

Merchant, Carolyn. *The Death of Nature: Women, Ecology, and the Scientific Revolution.* 1980. San Francisco: HarperCollins, 1990.

Merton, Robert K. "Science, Technology and Society in Seventeenth Century England." *Osiris* 4 (1938): 360-632.

---. *Science, Technology & Society in Seventeenth Century England.* New York: Howard Fertig, 1970.

Miller, Dean A. *The Epic Hero.* Baltimore: Johns Hopkins University Press, 2000.

Milton, John. *Paradise Lost. Complete Poems and Major Prose.* Ed. Merritt Y. Hughes. New York: Odyssey, 1957. 207-469.

---. *The Second Defense of the People of England.* Ed. Merritt Y. Hughes. New York: Odyssey, 1957. 817-38.

Mintz, Samuel I. "The Duchess of Newcastle's Visit to the Royal Society." *Journal of English and Germanic Philology* 51 (1952): 168-176.

More, Louis Trenchard. "Boyle as Alchemist." *Journal of the History of Ideas* 2.1 (1941): 61-76.

Mulligan, Lotte. "Puritans and English Science: A Critique of Webster." *Isis* 71 (1980): 456-69.

Newman, William R. "Boyle's Debt to Corpuscular Alchemy." Hunter, *Robert Boyle Reconsidered.* 107-18.

Osler, Margaret J., ed. *Rethinking the Scientific Revolution.* Cambridge: Cambridge UP, 2000.

Oster, Malcolm. "Millenarianism and the New Science: The Case of Robert Boyle." *Samuel Hartlib and Universal Reformation: Studies in Intellectual Communication.* Ed. Mark Greengrass, Michael Leslie, and Timothy Raylor. Cambridge: Cambridge University Press, 1994. 137-48.

---. "Virtue, Providence, and Politcal Neutralism: Boyle and Interregnum Politics." Hunter, *Robert Boyle Reconsidered.* 19-36.

Patrick, Simon. "A Brief Account of the new Sect of Latitude-Men, Together with some reflections upon the New Philosophy." London: 1662.

Pepys, Samuel. *The Diary of Samuel Pepys.* Ed. Robert Latham and William Matthews. Vol. 5. Berkeley: University of California Press, 1971. 9 vols.

Pine, Ronald C. "A Social History of Truth: Civility and Science in Seventeenth Century England." *Philosophy of Science* 65 (1998): 722-725.

Pope, Alexander. *The Works of Alexander Pope.* New ed. Vol. 4. New York: Gordian Press, 1967. 10 vols.

Principe, Lawrence M. "The Alchemies of Robert Boyle and Isaac Newton: Alternate Approaches and Divergent Deployments." Osler, 201-20.

---. *The Aspiring Adept: Robert Boyle and His Alchemical Quest.* Princeton: Princeton University Press, 1988.

---. "Boyle's Alchemical Pursuits." Hunter, *Robert Boyle Reconsidered.* 91-105.

---. "Newly Discovered Boyle Documents in the Royal Society Archive: Alchemical Tracts and His Student Notebook." *Notes and Records of the Royal Society of London* 49 (1995): 57-70.

Purver, Margery. *The Royal Society: Concept and Creation.* Cambridge: M.I.T. Press, 1967.

Quint, David. *Epic and Empire: Politics and Generic Form from Virgil to Milton.* Princeton: Princeton University Press, 1993.

Rattansi, P. M. "The Helmontian-Galenist Controversy in Restoration England." *Ambix* 12 (1964): 1-23.

---. "Newton's Alchemical Studies." Debus, 167-82.

Sawday, Jonathan. *The Body Emblazoned: Dissection and the Human Body in Renaissance Culture.* New York: Routledge, 1995.

Schuler, Robert M. "Some Spiritual Alchemies of Seventeenth-Century England." *Journal of the History of Ideas* 41.2 (1980): 293-318.

Shadwell, Thomas. *The Virtuoso.* 1676. Ed. Marjorie Hope Nicolson and David Stuart Rhodes. Lincoln: University of Nebraska Press, 1966.

Shapin, Steven. "Pump and Circumstance: Robert Boyle's Literary Technology." *Social Studies of Science* 14 (1984): 481-520.

---. *A Social History of Truth: Civility and Science in Seventeenth-Century England.* Chicago: University of Chicago Press, 1994.

Shapin, Steven, and Simon Schaffer. *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life.* Princeton: Princeton University Press, 1985.

Shapiro, Barbara J. "Latitudinarianism and Science in Seventeenth Century England." *Past and Present* 40 (1968): 16-41.

Snider, Alvin. *Origin and Authority in Seventeenth-Century England: Bacon, Milton, Butler.* Toronto: University of Toronto Press, 1994.

Sprat, Thomas. *History of the Royal Society.* Ed. Jackson I. Cope and Harold Whitmore Jones. St. Louis: Washington University, 1959.

---. *Observations on Monsieur de Sorbier's Voyage into England.* London: John Martyn and James Allestry, 1665.

Steadman, John M. "Beyond Hercules: Bacon and the Scientist as Hero." *Studies in the Literary Imagination* 4 (1971): 3-47.

Stearns, Raymond Phineas. "Colonial Fellows of the Royal Society of London, 1661-1788." *William and Mary Quarterly* 3rd ser. 3 (1946): 208-268.

Stimson, Dorothy. "Amateurs of Science in 17th Century England." *Isis* 31 (1939): 32-47.

Stubbe, Henry. *Campanella Revived, or An Enquiry into the History of the Royal Society, whether the Virtuosi There Do Not Pursue the Projects of Campanella for the Reducing England unto Popery.* London: n.p., 1670.

---. "A censure upon certain passages contained in the *History of the Royall Society*, as being destructive to the established religion and Church of England." Oxford: 1671.

Swedenberg, H. T. *The Theory of the Epic in England, 1650-1800.* New York: Russell & Russell, 1972.

Syfret, R. H. "Some Early Reactions to the Royal Society." *Notes and Records of the Royal Society of London* 7 (1950): 207-58.

Taylor, Alan B. H. "An Episode with May Dew." *History of Science* 32 (1994): 163-84.

Taylor, F. Sherwood. "Alchemical Papers of Dr. Robert Plot." *Ambix* 4 (1949): 67-76.

Thomas, Keith. *Religion and the Decline of Magic.* New York: Scribner's, 1971.

Thomson, James. "To the Memory of Sir Isaac Newton." *The Complete Poetical Works of James Thomson.* Ed. J. Logie Robertson. London: Oxford University Press, 1908. 436-42.

Tillyard, E. M. W. *The English Epic and Its Background.* London: Chatto and Windus, 1954.

Vickers, Brian. "Analogy versus Identity: The Rejection of Occult Symbolism, 1580-1680." *Occult and Scientific Mentalities in the Renaissance.* Ed. Brian Vickers. Cambridge: Cambridge University Press, 1984. 95-163.

---. "Frances Yates and the Writing of History." *Journal of Modern History* 51 (1979): 289-316.

---. "The Royal Society and English Prose Style: A Reassessment." *Rhetoric and the Pursuit of Truth: Language Change in the Seventeenth and Eighteenth Centuries. Papers read at a Clark Library Seminar 8 March 1980.* By Brian Vickers and Nancy S. Struever. Los Angeles: William Andrews Clark Memorial Library, 1985. 3-76.

Webster, Charles. *The Great Instauration: Science, Medicine and Reform, 1626-1660.* London: Duckworth, 1975.

---. "The Origins of the Royal Society." *History of Science* 6 (1967): 106-28.

Westfall, Richard S. *Force in Newton's Physics: The Science of Dynamics in the Seventeenth Century.* New York: American Elsevier, 1971.

---. "Newton and the Hermetic Tradition." Debus, 183-98.

Wood, P. B. "Methodology and Apologetics: Thomas Sprat's *History of the Royal Society.*" *British Journal for the History of Science* 13 (1980): 1-26.

Yates, Frances. *The Rosicrucian Enlightenment.* London: Routledge, 1972.

Author's Biography

Jennifer O'Meara was born in Dearborn, Michigan, on November 1, 1973. She graduated from the University of Michigan-Dearborn in 1997 with a major in English and minors in History and Chemistry. She completed her Master of Arts degree in English at the University of Illinois in 1999. Following the completion of her Ph.D., O'Meara will serve as Chief Innovation Officer at InnovatorUSA.