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STEVE REICH'S *VERMONT COUNTERPOINT*: A MUSICAL AND TECHNOLOGICAL GUIDE

BY

ZACHARY JOHN OSINSKI

SCHOLARLY ESSAY

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Musical Arts in Music
with a concentration in Performance and Literature
in the Graduate College of the
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Abstract

Vermont Counterpoint for flute and multi-track was written by American composer Steve Reich in 1982. The piece was commissioned by flutist Ransom Wilson, and premiered in the fall of 1982 at the Brooklyn Academy of Music. *Vermont Counterpoint* is unique among flute repertoire in that it requires the flutist to record and compile an electronic multi-track. At the time of the piece's premiere, performers needed a tape-recording studio, as well as an audio engineer, to produce the multi-track. This presented logistical and financial barriers to performing the piece, and hampered the spread of the piece in the flute community.

The instructions in the score of *Vermont Counterpoint* for creating the multi-track have not been updated since its original publication. Recording technology is now more accessible to musicians than in 1982, making *Vermont Counterpoint* a more viable piece to program than at any moment in its life. However, though written by a significant composer and recorded by several notable flutists, the piece remains less frequently preformed than many of Reich's works, as well as other late 20th century electroacoustic flute works.

In the hopes of reintroducing the flute community to *Vermont Counterpoint*, this paper presents flutists with the musical and technological means necessary to program and perform the piece. First, the paper synthesizes the existing scholarship on *Vermont Counterpoint*, detailing the origins of the piece, and places *Vermont Counterpoint* within the development of Reich's compositional voice up to this moment in his life, analyzing Reich's adoption of conventional musical forms such as counterpoint and canon into his trademark techniques such as tape music and phase shifting. The next section presents a framework for preparing the score, including a method for practicing the piece informed both by Reich's musical philosophy, and the technical demands of the piece, with the goal of efficient and effective practice and recording sessions. Finally, and most significantly, this paper provides a method for creating the multi-track using personal recording technology. Based in the free recording software Audacity, this method utilizes recording technology which is financially and logistically accessible (compared to that found in professional

recording studios). I detail my personal equipment and set-up, and provide set-by-step instructions to programming the multi-track on Audacity.

Vermont Counterpoint is a historically and musically significant piece of flute writing. Through introducing the reader to the history of the piece, and providing practice and recording methods that prioritize efficiency and accessibility, it is my hope that this paper will equip flutists to enjoy *Vermont Counterpoint* for years to come.

Acknowledgements

This paper is the culmination of 13 years in music school, as well as years spent growing up listening to the music my family loved. I wouldn't be here without my parents, Mary and Steve, who have supported me in anything except quitting. To my siblings, Kyra, Trent, and Brianna, thank you for your encouragement in this journey. I love you all.

To my extended family, and especially Aunt Elizabeth and Uncle Jeff, for their loving hospitality on Thanksgiving and spring breaks.

To my roommates, Conrad and Nels, for their brotherhood, help with crosswords, and all the dishes they did for me without complaint while I finished this degree. And to our Benevolent Queen, Madame Puissant the tabby cat.

To Ransom Wilson, for commissioning *Vermont Counterpoint*, and for generously fielding all of my questions throughout my research, and for sharing with me the story of this piece.

To my TCBC family. Thank you for your prayerful support of me always.

To my research committee, thank you for helping me find my topic (Dr. Lund), for your excitement in me and my research (Dr. Taylor), for stewarding me through the world of music technology (Dr. Fieldsteel), and for your abiding encouragement and belief in me (Dr. Keeble).

Table of Contents

Chapter 1: Introduction

Steve Reich's *Vermont Counterpoint*, for flute and pre-recorded electronics, was composed in 1982. Though it has been recorded by several notable flutists, *Vermont Counterpoint* is yet to become a regularly performed piece of flute literature. This is due in part to the assembly needed of a pre-recorded electronic multi-track which accompanies the piece. The instructions included in the score for recording and compiling the multi-track, written by Reich for technology which is now outdated, have not been updated since *Vermont Counterpoint's* original publication. Time, resources, and technological know-how are perennial barriers for performers in creating the multi-track. Further, though there exists substantial scholarship on Reich and much of his life and work, *Vermont Counterpoint,* and the *Counterpoint* series more broadly, have received considerably less scholarly attention. The significance of this piece is three-fold: it is one of few solo works written by Reich, one of the flute's minimalist solo works, and one of several more-oft performed twentieth century electroacoustic flute works (such as *Vox Balaenae,* Crumb [1971], *Narcissus*, Musgrave [1987], and *Lipstick*, ter Veldhuis [1998]).

There are two major components to preparing *Vermont Counterpoint:* musical, and technological. Though classical flutists are trained to perform music in a variety of genres and styles, minimalist works often receive less attention than the standard canon of flute repertoire. The stylistic and technical components of *Vermont Counterpoint,* characterized by repetitive melodic figures and rhythms which contain athletic leaps at fast tempi, present unique challenges to the flutist, particularly in regard to rhythmic precision and phrasing. Further, as *Vermont Counterpoint* comes from an underperformed genre in flute writing, there is little musical reference from which to draw insight into how to prepare and perform the score. Learning *Vermont Counterpoint,* then, involves not only preparation of the score, but also developing a performance practice informed by the demands of the piece, the values of minimalism, and Steve Reich's musical philosophy.

To create the multi-track at the time of *Vermont Counterpoint's* publication, the performer needed to rent a multi-track tape recording studio and hire a recording engineer. I speculate that this investment of time and money, as well as proximity to the

appropriate recording equipment and technicians necessary to record and produce the multi-track, hampered the dissemination of the piece. Thanks to the ubiquity of personal technology such as laptops and smartphones, and open-source recording software such as GarageBand and Audacity, *Vermont Counterpoint* is arguably a more accessible piece to program and perform in the twenty-first century than when it was premiered. Yet, for a flutist to prepare *Vermont Counterpoint* using said technology, the performer needs a certain amount of fluency in the language of music technology and recording techniques.

Given the emphasis on learning standard repertoire in traditional classical flute education, most flutists during their training do not invest in acquiring supplemental skills in music technology. Should a flutist discover *Vermont Counterpoint* and wish to create the multi-track themselves, as is the composer's preference, they will spend considerable time learning about recording techniques, recording software, and other related techniques necessary for preparing the piece. Alternatively, a flutist could rent a recording studio and hire a sound engineer to create the multi-track for them; certainly, this is a sensible and honorable means for preparing *Vermont Counterpoint*. However, given the technology at the disposal of most twenty-first century musicians, is there a more sustainable and musically edifying method to prepare the piece to ensure that *Vermont Counterpoint* not only weathers the test of time, but also becomes a more musically and technologically accessible piece, and therefore disseminates more widely among classical flutists?

The first part of this paper will provide a brief historical background of *Vermont Counterpoint's* inception. This will include reference to Steve Reich's musical background, and the development of his compositional voice into the 1980s. An overview of the piece will follow, examining its structure, and compositional techniques, such as canon, phasing, and rhythmic construction.

The second portion of this paper will provide a method of how to prepare the score. Developed to optimize a performer's time, this method proposes a schedule for how to efficiently prepare the score, as well as practice routines that ensure rhythmically precise performance of the melodies present in the multi-track.

The final section, and most significant of the paper, presents a method for recording the multi-track with financially and logistically accessible technology. Step-by-step instructions for the recording process center around the open-source recording software Audacity, and introduce the performer to the terminology of music technology necessary to record the multi-track. This method also includes considerations for how to choose and purchase recording hardware, and for setting up a consistent recording space.

Vermont Counterpoint is a piece of musical and historical significance for both flutists, and the classical music community. Given its dependence upon technology, which develops and updates over time, the method by which *Vermont Counterpoint* is performed will continue to evolve. By synthesizing the existing scholarship on *Vermont Counterpoint* and creating a method for both preparing the score and creating the multi-track using accessible personal technology, this document will provide flutists the necessary musical and technological tools to confidently program and perform *Vermont Counterpoint*, as well as provide a model upon which future methods may be built.

Chapter 2: Literature Review

Only recently has scholarship begun to develop around the *Counterpoint* series, and Reich's work of the 1980s more broadly. However, the writings which do exist have been significantly helpful in pursuing this research. To provide flutists with musical, historical, and technological insight into *Vermont Counterpoint*, this document will synthesize these writings, which fall into three categories: writings on minimalism, *Vermont Counterpoint/Counterpoint* series scholarship, and technology.

Minimalism

For minimalist music and philosophy I draw primarily from three sources: Kyle Gann's *Thankless Attempts at a Definition of Minimalism* (2004), Wim Mertens' *Basic Concepts of Minimalism* (2004), and Steve Reich's *Music as a Gradual Process* (1968). Each of these sources are succinct and accessible writings for understanding the core tenets and historical roots of American minimalist music. Further, these sources, particularly *Music as a Gradual Process*, illuminate the musical and historical context of Reich's formative years as a composer, as well as his own personal musical beliefs. However, it must be said that Reich's compositional philosophy developed past the writing of *Gradual Process*, as documented in several of the sources collected here on the *Counterpoint* series; I will draw from these sources as well when referencing minimalist music philosophy, and that of Reich's more specifically.

Scholarship on Reich, *Vermont Counterpoint, Counterpoint* series

Twila Bakker, "Counterpoints and Computers: Rethinking the 1980s," in *Rethinking Reich* (2019)

In her chapter *Counterpoints and Computers: Rethinking the 1980s*, musicologist and Reich scholar Twila Bakker illustrates the progression of Reich's compositional voice from his early career into the 1980s, focusing specifically on the compositional and technological

innovations of the *Counterpoint* series. Bakker sheds light on the inception of *Vermont Counterpoint,* and Reich's compositional philosophy, by sharing excerpts from Reich himself on his compositional techniques present in the *Counterpoint* series. Bakker also demonstrates the new musical language present in *Vermont Counterpoint* by referencing it against earlier works by Reich, such as *Violin Phase* (1967). Further, Bakker discusses the technological developments of Reich's 1980s works, such as the use of multi-track, as well as the musical and economic factors that influenced this development (such composing solo/electroacoustic music over chamber music, in the interest of reducing travel expenses). This chapter, which is essentially a condensed version of her dissertation, *Multiples of the Same: A Semiotic Study of Steve Reich's* Counterpoint *Series,* is an excellent brief documentation of both the historical and musicological components of *Vermont Counterpoint*.

Twila Bakker, "Multiples of the Same: A Semiotic Study of Steve Reich's *Counterpoint* Series" (2015)

This dissertation by Twila Bakker is a musically and historically comprehensive study of Reich's *Counterpoint* series. One of the unique and valuable components of this paper is Bakker's intimate knowledge of primary sources related to the *Counterpoints*. Particularly, Bakker has spent time with the Steve Reich Collection at the Paul Sacher Stiftung in Basel, Switzerland, the William W. Austin Papers (one of Reich's professors) at Cornell University, and the Betty Freeman Papers at UCSD, to name a few. The documents from which she draws range from handwritten sketches and manuscripts of *Vermont Counterpoint*, to correspondences between Reich, Ransom Wilson (the flutist who commissioned the piece), and Betty Freeman (a supporter of Reich who funded the piece), to timelines of *Vermont Counterpoint's* composition process. Thanks to this document, *Vermont Counterpoint* can not only be traced back to its very earliest sketches, but Reich's collaborations with musicians and supporters from this project are also well documented. Bakker also articulates the musical philosophy present in *Vermont Counterpoint*, particularly that of Reich's relationship with canon and its development from his early

phase works, and other techniques present in the *Counterpoints* such as rhythmic construction. Bakker illustrates Reich's values as a composer, drawing from Reich's own reflections, as well as interviews with him from this moment in his life. Finally, this paper also includes tables which demonstrate the rhythmic patterns present in *Vermont Counterpoint*, as well as the overall structure for each movement in the piece, detailing which lines enter where throughout the sections.

Bakker's dissertation is unpublished at the time of writing this document, and I extend my sincerest thanks to her for making her research available to me.

Celina Bordallo Charlier, "The spatiality and temporality of minimalism through the study of 'Vermont Counterpoint' for flute and tape by Steve Reich" (2010)

Celina Bordallo Charlier's dissertation is currently the most expansive writing on *Vermont Counterpoint.* At 300+ pages, her research places *Vermont Counterpoint* within a broader "aesthetic framework" of minimalist art philosophy. A classical flutist herself, she gives ample space to the musical and historical contextualization of the piece, in the context of both minimalism and electroacoustic flute repertoire. Further, Bordallo Charlier investigates the presence of musical and visual minimalist art philosophy within the structure of *Vermont Counterpoint*. She also explores Reich's compositional tools and techniques, using score examples to illuminate the ways in which the piece visualizes Reich's philosophy. Further, she draws attention to the minimalist concepts of temporality and spatiality, and the ways in which these exist in *Vermont Counterpoint* conceptually, and even visually. Bordallo Charlier also briefly documents her own technical considerations for learning and recording the multi-track. Ultimately, Bordallo Charlier's document endeavors to understand *Vermont Counterpoint* with the goal of developing a more artistically informed performance practice.

It must be said that this document addresses similar components to my research of *Vermont Counterpoint*: most notably, the musical and historical context of minimalist music, and technological considerations. However, though Bordallo Charlier's work is certainly of use to my intended audience, I believe our aims differ. First, Bordallo Charlier's

work is primarily one of philosophy, rather than musicology or performance guide, though these components are present in her paper. Though we address similar aspects of *Vermont Counterpoint*, we present our research in different contexts. My intended audience is the flute community, to whom I am presenting a brief document for their equipment to program and perform *Vermont Counterpoint*; Bordallo Charlier also writes to the flute community, but with a presentation which is more musically and philosophically holistic. Secondly, my document intends to be a much shorter and concise document, a "one-stop-shop" to *Vermont Counterpoint*. Further, recent scholarship, like the writings of Twila Bakker, has been published on *Vermont Counterpoint* since Bordallo Charlier's work, and necessitates a revisiting of earlier research.

Denise Von Glahn, "Steve Reich: Vermont Counterpoint, The Desert Music, New York Counterpoint, and City Life" in *The Sounds of Place: Music and the American Cultural Landscape* (2003)

The Sounds of Place is a collection of essays dedicated to pieces of music which allude to American landscapes. The book includes an interview with Steve Reich, in which musicologist Denise Von Glahn and Reich discuss the beginnings of *Vermont Counterpoint* (such as its commissioning, and the origins of its programmatic title), and several of the challenges it presented during composition (such as writing a solo and accompaniment work in the minimalist genre). This chapter also discusses *Vermont Counterpoint* in the context of Reich's larger *Counterpoint* series, of which *Vermont Counterpoint* is the first. Von Glahn's writings on *Vermont Counterpoint* shed light on its inception, Reich's relationship to the piece, and Reich's musical philosophy on composing solo music within the minimalist genre. It is the only existing published scholarship which includes excerpts from a conversation with Reich specifically about *Vermont Counterpoint.*[1]

[1] However, Twila Bakker's unpublished "Multiples of the Same" does include correspondences between Reich and his supporters such as Betty Freeman which also shed light on Reich's relationship with the piece at the time of its inception.

Technology

Ian Corbett, *Mic It!* (2015), Burlington, MA: Focal Press, 2015

Ian Corbett is a professor of music technology and audio recording. The terminology and guidance for the recording method detailed in this paper is largely sourced from his book *Mic It!* The book covers topics pertaining to music technology, from basic audio concepts (such as the anatomy of a soundwave) to recording techniques (such as recording set-ups for a variety of acoustic instruments, including the flute). Corbett's writing is thorough and clear, making *Mic It!* as accessible for studied sound engineers as it is for new students to music technology.

Rachel Yoder, "Steve Reich's *New York Counterpoint*: A Guide to Recording and Performance," *The Clarinet* (2020)

This article documents clarinetist and professor Rachel Yoder's process of compiling a multi-track for Reich's *New York Counterpoint*, successor to *Vermont Counterpoint*, and technological considerations for live performance. She also includes notes on musical style and interpretation. The article includes excerpts from the score, as well as other works by Reich which are similar to *New York Counterpoint.* This article is a condensed form of what I intend part of my research to accomplish, which is a guide to programming *Vermont Counterpoint* in the twenty-first century.

Chapter 3: Project Background

Vermont Counterpoint is the first piece in Steve Reich's *Counterpoint* series. Each iteration[2] in the series is written in the same orchestration: solo player with an electronic multi-track. The multi-track is comprised of multiple lines of music, which (per the composer's preference) are recorded and compiled by the performer.

Vermont Counterpoint's inception began with a phone call from American flutist Ransom Wilson to Steve Reich, asking him to compose a flute concerto.[3] Wilson, a renowned flute performer and conductor, was a recent convert to minimalist music—in the fall of 1976, he attended a performance of Phillip Glass's opera *Einstein on the Beach* (1976), which left him "touched."[4] Reich initially refused Wilson's request, but eventually reconsidered and proposed an alternative format: solo flute, with multi-track accompaniment recorded by the soloist (akin to Reich's earlier *Violin Phase* [1967]). Reich and Wilson collaborated on *Vermont Counterpoint* during the summer of 1982 at Reich's summer home in Vermont. Fittingly, the piece received its title from its place of composition.[5]

Vermont Counterpoint embodies a pivotal shift in Steve Reich's career. Following the 1976 premiere of *Music for Eighteen Musicians,* Reich partnered with publishing company *Boosey & Hawkes.* With this partnership, Reich could receive commissions from specific artists and ensembles outside of his own *Steve Reich Ensemble.* Wilson's commission for *Vermont Counterpoint* was his first. Through his partnership with *Boosey & Hawkes,* Reich's works gained "wider currency"[6] and greater accessibility.

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[2] Following *Vermont Counterpoint*: *New York Counterpoint* (1985), *Electric Counterpoint* (1987), *Cello Counterpoint* (2003), for clarinet, guitar, and cello, respectively.
[3] Twila Bakker, "Counterpoints and Computers: Rethinking the 1980s," in *Rethinking Reich,* ed. Sumanth Gopinath and Pwyll ap Siôn, chapter 11, Oxford University Press, 2019, https://oxford.universitypressscholarship.com/view/10.1093/oso/9780190605285.001.0001/oso-9780190605285-chapter-12
[4] Daniel Cariga, "Peripatetic Musicians: Composer Reich and Flutist Wilson," *Los Angeles Times,* January 15, 1983, H9, https://www.proquest.com/historical-newspapers/peripatetic-musicians/docview/153359502/se-2?accountid=14553
[5] Though the piece was named after Vermont, Steve Reich insists that this is purely anecdotal, and that the geography and culture of Vermont did not have a direct influence on the piece.
[6] Keith Potter, "Review: Reich in Score," *The Musical Times* 131 (1990): 597-598, https://www.jstor.org/stable/966183

Accessibility came, too, through a shift in Reich's compositional voice. Reich's landmark works up to this point (such as *It's Gonna Rain* [1965], *Piano Phase* [1967], *Clapping Music* [1972]) showcased Reich's trademark compositional techniques, such as phase shifting and tape music. Beginning in the late 1970s into the 1980s, Reich's works adopted, in the words of one reviewer, "new harmonic, formal, and timbre material."[7] This can be observed most significantly in *Music for Eighteen Musicians* (1976), and *Variations for Winds, Strings, and Keyboard* (1979). Following this musical trend, *Vermont Counterpoint* adopts a tonal, harmonic musical profile, unlike most of his earlier solo and tape/phase shifting works.

Finally, I speculate that *Vermont Counterpoint* also embodies both a shift and a wrestling within Reich himself, particularly regarding his own musical philosophy (and arguably to minimalist music philosophy and aesthetic more broadly). Reich's initial resistance to Wilson's request for a concerto was one of philosophical disagreement. Denise Von Glahn writes that Reich was "opposed to the concerto form, with its dependence upon established musical structures and the need for extraordinarily large performing forces."[8] Though Reich does not consider himself a "minimalist,"[9] his music has historically aligned with minimalist music philosophy, such as clear sounding processes, repetition, and homogeny of sound. The concerto form, which elevates one voice to greater importance than another, is at odds with this school of thought. Thus, Reich chose instead to create a piece for "soloist" with an "accompaniment" comprised entirely of music recorded by the soloist. In Twila Bakker's words, *Vermont Counterpoint* became "a 'concerto for one,'…allowing Reich to respond, in his own way, to Wilson's request."[10]

Vermont Counterpoint exists in the company of several landmark electroacoustic flute works of the twentieth century. In this researcher's experience, the most significant and visible of these (within the flute community and beyond) are *Vox Balaenae* (Crumb,

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[7] Potter, 597.
[8] Denise Von Glahn, "Steve Reich: Vermont Counterpoint, The Desert Music, New York Counterpoint, and City Life," ch. 6 of *The Sounds of Place: Music and the American Cultural Landscape,* Boston, MA: Northeastern University Press, 2003.
[9] Dimitri Drobatschewsky, "Steve Reich," *Arizona Republic,* November 30th, 1986, 87, https://www.proquest.com/docview/1932188050/59D54A25B4DC413CPQ/32?accountid=14553
[10] Bakker, "Counterpoints"

1971), *Narcissus* (Musgrave, 1987), and *Lipstick* (ter Veldhuis, 1998). Each of these pieces utilize a variant of electroacoustic technology, and, like *Vermont Counterpoint,* have redefined the parameters of the technical and expressive capabilities of the modern flute.

And yet, *Vermont Counterpoint* has yet to garner a comparable visibility and acclaim as its twentieth century companions. The aforementioned pieces, whether due to their relative technological accessibility or to the work of scholarly conservation, have survived into the twenty-first century. Though *Vermont Counterpoint* has been recorded by notable twenty-first century flutists, it is not currently recognized by the flute community as a landmark piece of flute writing. In my estimation, there are several reasons for this: the time required for programming the piece, acquiring the necessary technological resources, knowledge of how to utilize said resources,[11] and relative scholarly obscurity. The score for *Vermont Counterpoint,* as it exists in 2023, includes technological instructions for programming the piece, but these instructions have not been updated since 1982. Also, the flute community is less acquainted with minimalist music than other classical music genres, due to the lack of attention given to minimalist flute repertoire in classical flute education. Finally, given the limited amount of scholarship on Reich's career in the 1980s, and the *Counterpoint* series more specifically, it is perhaps unsurprising that *Vermont Counterpoint* remains a relatively obscure piece both among flute repertoire and Reich's canon.

[11] Alternatively, we could also consider the proximity to a recording studio, recording technicians, and the money required to have the multi-track professionally made.

Chapter 4: *Vermont Counterpoint*: An Overview

The Score

Vermont Counterpoint is written for solo flute and electronic multi-track. The score exists in two parts: a solo flute score for performance, and a score for the multi-track. The multi-track is comprised of 10 lines of music: 3 lines each are written for piccolo, flute, and alto flute, and 1 line (at times 2 lines) for "Tape Solo."[12] The flute solo line, included in the multi-track score, is played in conjunction with these lines in performance.

Organization

The score is divided into four sections, each of which is built upon "tonal centers," rather than keys.[13] Within each section, there are melodic and rhythmic motifs that are constructed and repeated throughout the duration of the section. Rhythmic motifs are often shared between the instrument groupings, with each grouping performing the same rhythm with different melodic material. With this method, Reich creates a homogenous musical body comprised of repetitive canons across each instrument grouping.

The Multi-Track, and "Rhythmic Construction"

The melodic and rhythmic material of *Vermont Counterpoint* is shared between both the multi-track and the flute solo line. To prepare the multi-track, the flutist records each of these lines individually, and compiles them into a single track. Each line plays simultaneously in performance. When *Vermont Counterpoint* is performed, the flutist hits "play" on the multi-track, and plays alongside it.

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[12] The Tape Solo line is utilized four times throughout the piece, and is used to either add musical texture to the multi-track, or substitute the solo line while the soloist changes instruments. Tape Flute sections: section II mm. 161-170 (pg 22-23); section III, mm. 219-238 (pg 33-36); section III-IV mm. 237-247 (pg. 36-37) [Tape Picc]; section IV, mm. 320-340.

[13] For analysis of the tonal centers and harmonic progressions of *Vermont Counterpoint,* see:

- Twilla Bakker, "Multiples of the Same: A Semiotic Study of Steve Reich's *Counterpoint* Series" (unpublished manuscript, November 2015, last modified 2015).
- Celina Bordallo Charlier, "The spatiality and temporality of minimalism through the study of 'Vermont Counterpoint' for flute and tape by Steve Reich" (PhD diss., New York University, 2010), 89, https://www.proquest.com/dissertations-theses/spatiality-temporality-minimalism-through-study/docview/527843574/se-2?accountid=14553

The multi-track consists of a series of canons that are shared between each instrument grouping. Reich's canons are unique in that each voice is comprised of repetitions of similar, if not identical musical material. In the canon between Fls. 1-3 in section I, for example (Fig. 1), each flute plays the same melody. When Reich introduces each voice, the melody begins 3 sixteenth notes later in the measure than the previous voice. The rhythmic displacement of the melody across the three voices creates new harmonic, melodic, and rhythmic material between the voices when played together.

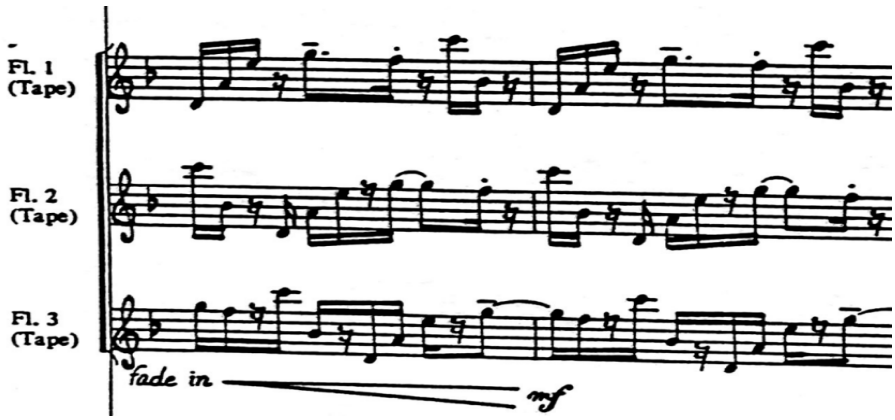

Figure 1: Section I, Fls. 1-3, playing the same melody in canon, each displaced by three 16th notes.

To write the melodic material for each voice, Reich employs a technique known as "rhythmic construction." This is a process by which melodies are gradually revealed, rather than stated immediately in their complete form. Often, Reich spreads this process over several groups of repeated measures, adding new notes into each group, until the melody is completely revealed (Fig. 2). In Bakker's words, rhythmic construction is Reich's method of "gradually building up a canon" by "substitut[ing] notes for rests – sound for silence – until a canon is constructed."[14]

[14] Bakker, "Multiples of the Same," 15.

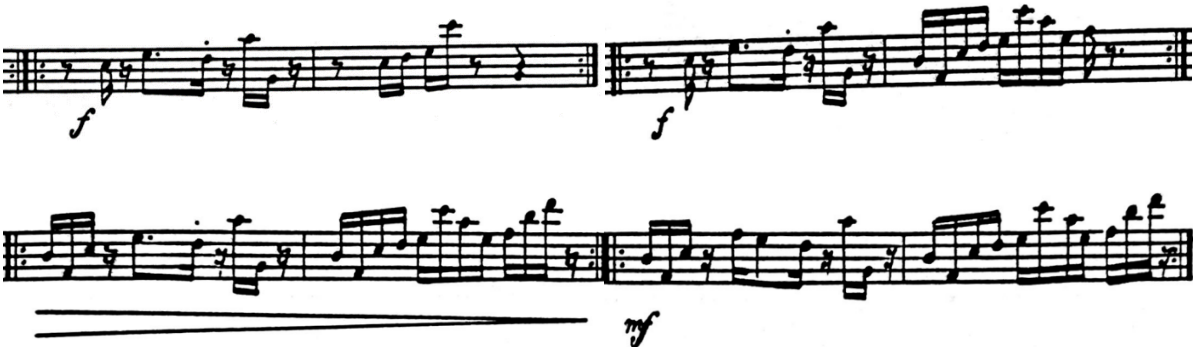

Figure 2: A melody revealed by rhythmic construction; Piccolo I, section I.

Reich's treatment of canon, in tandem with rhythmic construction, is reminiscent of his earlier "phasing" technique, in which two identical musical lines gradually shift apart from one another, resulting in new contrapuntal material between the two lines. In *Vermont Counterpoint*, phasing adopts more "conventional" harmonic and rhythmic language, with identical musical lines shifting apart more instantaneously than Reich's earlier phase works such as *Its Gonna Rain* (1965) and *Piano Phase* (1967).[15]

Reflection on "Solo/Accompaniment" Terminology

When discussing *Vermont Counterpoint,* it's tempting to describe the multi-track as "accompaniment," underneath the solo line, given the role it plays in forming and sustaining the musical foundation of the work in performance. However, Reich distinguishes in his program notes for the piece that the soloist plays in "ongoing counterpoint" with the multi-track, and that the piece is intended as a piece for "solo *with* tape" (emphasis mine).[16] Put another way, Celina Bordallo Charlier describes *Vermont Counterpoint* as a "counterpoint of a flutist with [them]self."[17]

[15] Further words from Twila Bakker on rhythmic construction: "Although rhythmic construction does not actually construct canons, in the *Counterpoints* Reich employs it simultaneously with canon – in the most basic arrangement the patterns are set in canon with each other, but the patterns are not heard in their full canonic form until the process of rhythmic construction is completed for all of the patterns being utilized in the canon." Bakker, "Multiples of the Same," 252.
[16] Steve Reich, *Vermont Counterpoint* (Boosey & Hawkes, 1982), Program Note.
[17] Bordallo Charlier, "Spatiality," 1.

We can consider the solo flute line in a similar vein. It is distinct from the multi-track in that it is performed live by one player, as well as being the only line in *Vermont Counterpoint* that features instrument changes. However, Reich subverts the conventional role of a solo line, and perhaps that of the "soloist," by deriving all of the solo musical material from the multi-track. This musical cohesion in all voices of a piece (in this case, between "solo" and "accompaniment") is consistent with minimalist thought, as well as with Reich's desire to create pieces in which his compositional process is the fundamental sounding result. The solo line can perhaps be considered a "microcosm" of the multi-track, in that it contains each instrument present in the multi-track, as well as the rhythmic and melodic materials that span the piece, and the technique of rhythmic construction by which Reich conceived them.

Chapter 5: Methodology: Practicing and Preparing the Score

Vermont Counterpoint has distinct musical and technical demands. The piece features repeating melodies that contain athletic leaps ranging from fifths to ninths, and rapidly traverse multiple octaves. Also, each line of music must be prepared with consideration to the other lines with which it will simultaneously play in the multi-track. Thus, rhythmic precision, though a desirable quality for most pieces of classical music, is particularly consequential for the musical and structural integrity of *Vermont Counterpoint*.

If a performer records a melody which is rhythmically imprecise, it will not align with the rest of the lines in the multi-track. Melodies which are practiced imprecisely are difficult to adjust in the moment of recording, and will likely necessitate re-practicing. As time is already a significant investment in programming *Vermont Counterpoint*, practicing to ensure rhythmic precision is in the performer's best interests.

A clear method for preparing the score will optimize the performer's time both while practicing and recording. The method detailed here will demonstrate how to practice to ensure a rhythmically precise performance, and can be implemented to each line of the piece.

Planning Stage

This method encourages an incremental approach to learning and recording the material for the multi-track. As money is not being invested into renting a studio and hiring a sound technician, a flutist may find themselves with more time that can be dedicated to practicing and recording. This will allow each line to receive an equal amount of attention, and for recording sessions to be focused on a limited amount of material.

To begin preparations, I recommend laying out a tentative schedule for practicing and recording, based on the time at the performer's disposal. For example, a time frame of 12 weeks, with each week devoted to a particular instrument and section of the piece, will allow for each line of the multi-track to receive at least a week of attention.

In this schedule, each instrument will receive 4 weeks of practicing and recording,[18] with each group of four weeks devoted to one instrument. Since the flute receives the most playing time in the multi-track, a performer may consider recording these lines first, as this will provide a foundation upon which to record the piccolo and alto flute lines.

Given the habitual nature of this schedule, it is beneficial to have a dedicated day of the week on which to record. This provides a regular benchmark for planning practice sessions. I recorded on Saturdays, which allowed Monday through Friday to be used to prepare that week's recording material.

Practicing the Material

As will be covered in greater depth in Chapter 6 (page 21), the recording methodology proposed in this paper involves recording one statement of each melody[19] in the multi-track (normally two measures), rather than the entirety of each line. Once recorded, these segments will be copied and pasted for the entirety of the line. Thus, the performer needs only to practice the singular melodies upon which each line is built, rather than the entire repeated series of melodies.

To begin practicing, choose a tempo at which the melody can be comfortably played. Each day leading up to the recording session, increase the tempo incrementally until reaching the performance tempo. Aim to reach the performance tempo the day before recording.

For example, the performance tempo for sections I, II, and IV is ♪=232 (section III, ♪=155). To begin preparing the flute material for Section I, consider a starting tempo on Monday of ♪=190. By increasing the tempo each day by 10 clicks, the melody will be ready to record by Saturday of that week.

[18] The exception to this is Section III, as Piccolo 1-3 becomes Flute 4-6. This material may be given its own week, or practiced together with the material in Flute 1-3. Note that the piccolo does appear in the last five measures of Section III, beginning at measure 235/reh. 69, as Tape Picc.
[19] As well as each iteration in the rhythmic construction process.

The most important component in preparing the score is subdividing. Practice each line by subdividing articulated 16th notes through the melodies, including the rests.[20] This process will train the body, both physically and mentally, to play each note exactly in the bar where they are meant to go, rather than approximating the placement of notes.

In each practice session, apply this method to preparing the melody.

1. Set your metronome to subdivide 16th notes at the tempo of the day. Playing articulated subdivided 16th notes throughout, play through the melody first in half time; this will be as if the melody were written in 8th notes, rather than 16th notes. Play in this fashion until the melody can be played comfortably and clearly throughout.

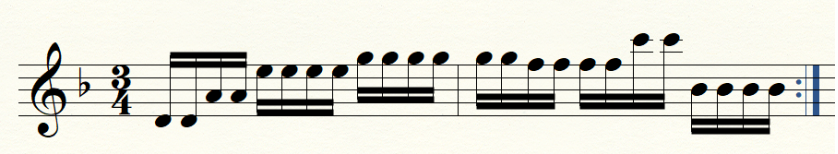

Figure 3: Section I, Fl. 1, measure 1, subdivided in half time.

2. Next, still subdividing articulated 16th notes with the metronome, play through the melody as written.

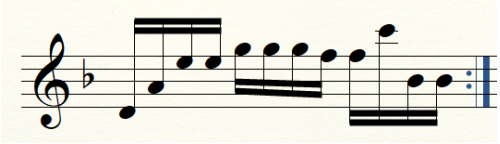

Figure 4: Section I, Fl. 1, measure 1, subdivided as written.

In the interest of ensuring the rhythm is learned precisely, I recommend waiting until the melody is 10-20 clicks under the performance tempo before playing through as it is written on the page, without articulated subdivided 16th notes.

[20] When subdividing through rests, subdivide on the note which directly precedes the rest.

3. A beneficial variation on this method is to sing through the melody on a "TA" syllable, subdividing 16th notes with the metronome. With the physical component of flute playing absent, this allows more mental focus on the melody.

The amount of material to prepare in a given week will depend on the instrument and section of the piece. The flute material for Section I comprises two measures of music. However, the piccolo material for Section I involves three lines of rhythmic construction, resulting in more material to prepare.[21] The decision of how much material to prepare per week is up to the performer's discretion.[22]

This is an incremental practice method, which allows for the gradual absorption of the melodies into the performer's muscle memory. The "slow" nature of this method ensures that the melodies will be learned precisely, ultimately saving time in the recording process by decreasing the possibility of learning an imprecise rhythm.

Additional Considerations

Common Rhythmic Pitfalls

Each melody in *Vermont Counterpoint* contains leaps greater than a third, and almost all contain dotted 8th-16th ()/16th-dotted 8th () figures.[23] Given the fast tempo at which these are played, give special care to the rhythmic placement of these figures while practicing. Leaps are prone to lag behind the beat. Dotted 8th notes tend to linger beyond their written value, causing a delayed placement of the 16th note. This will cause

[21] The piccolo and alto flute material involve rhythmic construction in each section. The flute is the only instrument whose canons are presented in their completed state from their beginnings (section I, II, III [aside from Fl. 4-6]); in section IV, the melodies in each group undergo rhythmic construction.

[22] Be aware also of the presence of the "Tape Flute/Piccolo" lines within each section when planning out practice/recording sessions.

[23] The only fully constructed melodies that don't contain dotted 8th-16th/16th-dotted 8th figures are:

- Section I, Piccolo 1, beginning at Reh. 18.
- Section II, Tape Flute, beginning at Reh. 45.
- Section IV, Flute 3, beginning at Reh. 75.

the proceeding notes to rush in order to compensate for the delay.[24] For both cases, practicing the melodies with subdivisions both in half-time and at tempo will train the body and mind to place these figures precisely.

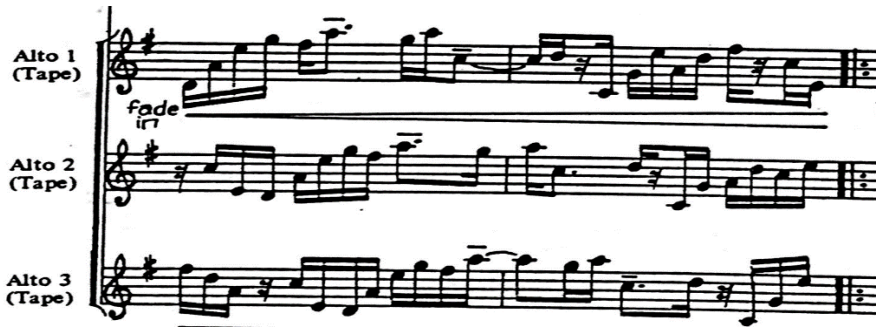

Figure 5: Section IV, fully constructed alto flute canon. The first measure features a 16th-dotted 8th (♪.) in Alto 1, and a dotted 8th-16th (♪. 𝅘𝅥𝅯) in Alto 2. Note that though Alto 3 contains neither of these figures explicitly in measure 1, either could be read into the rhythm as the melody crosses into the second measure.

Subtle Differences Between Canon Voices

In some canons, such as Fl. Section I and Picc. Section II, each line voices the same material once the melodies arrive in their fully constructed state. However, canons such as Fl. Section III, Alto Section IV, comprise similar, but not completely identical melodies. In these cases, material from each line of the canon must be prepared.[25] When making a practice routine, factor these subtle melodic differences into preparations.

[24] In the case of a 16th-dotted 8th (♪.), the tendency of the dotted eighth to linger over the beat remains the same.

[25] Rather than preparing material from one line which can be recorded and used for each voice of the canon, such as in Fl. 1 Section I.

Chapter 6: Methodology: Technology, and the Recording Process

Introduction

For the sake of transparency, it is important to note that I am not a music technology specialist. Though I enjoy performing electroacoustic music and collaborating with composers of this medium, I have no official training in music technology or recording techniques. Most of my familiarity and understanding of music technology has come through learning and programming *Vermont Counterpoint*. Throughout the process of creating the multi-track, I also consulted with my committee member Dr. Eli Fieldsteel, a music technology specialist and director of the Experimental Music Studios at the University of Illinois Urbana-Champaign. Dr. Fieldsteel's guidance was invaluable while programming *Vermont Counterpoint* and creating this methodology.

It is my hope that this document is sufficiently clear and concise to be used on its own by flutists who have limited exposure to music technology, while directing readers who wish to delve deeper into this topic to appropriate resources. I also encourage readers to seek out the guidance of music technology specialists when possible.

As previously mentioned, programming *Vermont Counterpoint* involves the recording and assembly of a 10-line multi-track. This makes it unique not only amongst classical flute repertoire, but solo electroacoustic repertoire as well. Historically, the multi-track has been created through collaboration between the soloist and a recording engineer. The flutist prepares the musical material for the multi-track, rents a recording studio, and records the lines with the help of a recording engineer. The multi-track is then produced by the engineer, and presented to the flutist.

At the time of *Vermont Counterpoint's* publication in 1982, this collaboration was essentially the only option for creating the multi-track and performing the piece. Today, technology such as recording software and microphones are now widely accessible to musicians. Given the contemporary ubiquity of personal technology, *Vermont Counterpoint* is arguably now a more accessible piece for flutists to program and perform than it was for the first thirty years of its life.

Though most classical flutists are sufficiently proficient in their craft to play the piece, fluency in the language of music technology is often considered a supplementary skill. Should a flutist discover *Vermont Counterpoint* and desire to play it, they have two options for creating the multi-track: invest money into renting a recording space and hiring a recording engineer, or invest time into learning how to use personal recording technology. Notably, either of these options involves a more significant investment of finances or time from the performer than is common for most pieces in classical flute repertoire.

According to Bakker, *Vermont Counterpoint* was the third most performed work[26] of the four pieces in the *Counterpoint* series between 2001-2013, behind *Electric Counterpoint* and *New York Counterpoint* (which received nearly twice as many performances). Though this statistic is nearly a decade old at the time of this document, it is notable that *Vermont Counterpoint*, as the oldest of the *Counterpoints*, has received considerably fewer performances than two of its younger companion works.

Following the piece's premiere, the options for how to program *Vermont Counterpoint* began to diversify as music and recording technology continued to evolve through the end of the twentieth century, leaving no one clear method for creating the multi-track. Without a clear or accessible method for programming the piece, *Vermont Counterpoint* has perhaps been considered by flutists a financially and logistically unviable piece for most of its life.

However, classical musicians in the twenty-first century are increasingly dependent upon personal technology such as smartphones, headphones/earbuds, and laptops. Though recording technology may have been exclusive to studios and specialists in the past, the technology necessary to program *Vermont Counterpoint* is now at the disposal of most classical musicians. Given clear guidance on how to use said technology, I believe *Vermont*

[26] Further, in the data provided by Bakker, arrangements of *Vermont Counterpoint* for other instruments, such as *Tokyo Counterpoint* (mallet percussion) are counted towards performances of *Vermont Counterpoint*; thus, this data does not constitute performances just by flutists. See Bakker, "Multiples of the Same," Figure 3.5, 271.

Counterpoint can become a piece which contemporary flutists can confidently program and enjoy.

This portion of the paper provides a succinct guide to recording and compiling the multi-track for *Vermont Counterpoint* using financially and logistically accessible technology. This will include a description of my personal set-up for recording, and an introduction to the open-source recording software Audacity. I will also document my process of recording with Audacity, providing a step-by-step tutorial specifically for using the software to record and compile a multi-track. Throughout, I will provide definitions for the terminology and language of music/recording technology. My hope in proposing a method for programming *Vermont Counterpoint* using personal technology is to enable flutists to confidently navigate the demands of the piece while simultaneously removing the financial and time-sensitive restrictions which have historically discouraged flutists from performing *Vermont Counterpoint*.

Step 1: Gather Your Materials

In his book "Mic It!," audio engineer Ian Corbett states that "Lower quality equipment used well, will always sound better than great quality equipment used poorly."[27] The primary concerns when choosing the technology for this project were financial and logistical accessibility. Compared to professional grade technology, the equipment detailed here is easier to use, more financially accessible, and can produce a higher quality product than the built-in features of most personal technology (i.e., built-in microphones and speakers on smartphones and laptops). These items are worthwhile investments that will likely serve the performer beyond this specific project.

At minimum, three pieces of hardware are needed to record the multi-track: a laptop, microphone, and headphones.

[27] Ian Corbett, *Mic It!* (Burlington, MA: Focal Press, 2015), 2.

Laptop:

Since Audacity runs on Windows, macOS, and other operating systems, practically any sufficiently modern laptop will suffice for this project.

My laptop is a **Microsoft Surface Pro** running Windows 10. This was purchased well before I began programming *Vermont Counterpoint,* with no intention of using it for music production or recording purposes; it has to be proved an easy to use platform for this project.

Microphone:

For this project, I chose to use a USB microphone. The main advantage of a USB microphone, aside from the affordability, is the ease of use. The microphone simply plugs into the laptop's USB drive, and comes with no extra hardware or sound functions. Other microphones, such as XLR microphones, require an intermediary device between the mic and the computer to transfer the analog audio signal to the computer. This function is built into USB microphones.[28]

At the time of writing this document, the **Snowball USB** microphone manufactured by *Blue* is a relatively popular and high quality USB microphone. In addition to its technological and financial accessibility, it produced clear sounding recordings for my multi-track.

Headphones/earbuds:

Given that many musicians already own a pair of headphones/earbuds, this may not be a necessary investment. The most important quality to consider is the clarity of sound, given the complex interweaving melodies in the multi-track. For those looking for potentially higher-quality sound options, these are my recommendations.

My wired headphones are the **HD 280 Pro** model manufactured by *Sennheiser.* These provide great clarity of sound, and come with multiple adaptors, allowing for use

[28] That said, XLR microphones do have more sophisticated features than USB microphones, such as gain knobs, which will yield more options for determining the quality of your recordings' sounds.

across various types of devices. These headphones are also available both wired and Bluetooth.

For earbuds, I have enjoyed a pair of the **EarFun Free 2** model by *EarFun*. These are easier to transport, and slightly more affordable than a pair of headphones, yet still provide clear audio.

In the interest of being disconnected from my laptop while recording, I have preferred to record using my earbuds. If choosing this method, bear in mind the degree of latency[29] which occurs when using Bluetooth technology. If recording along with a previously recorded track using Bluetooth headphones, latency can result in the new recording and previous recording not immediately aligning. However, this can be resolved by manually aligning the tracks after recording.

Step 2: Download Audacity

Audacity is free, open-source recording software with a relatively user-friendly interface, which can be downloaded and installed on most operating systems.[30] New users to Audacity, aside from following the steps detailed in this document, can also learn how to navigate the software through consulting the Audacity Manual,[31] as well as online forums and instructional videos. Audacity is equipped for many types of audio production. This document will detail exactly which functions concern the compilation of the multi-track.

Step 3: Find a Recording Space

I recorded my multi-track in the Experimental Music Studios at the University of Illinois Urbana-Champaign School of Music. This provided a fairly "dead" acoustic space, which minimized acoustic reverberation and allowed for a clear and mostly echo-less

[29] Latency is the delayed transfer of sound data, in this case between the laptop and Bluetooth headphones/earbuds. Wired headphones, by nature of being connected directly to the laptop, do not suffer from latency.
[30] Audacity can be downloaded at: https://www.audacityteam.org/
[31] The Audacity Manual can be accessed here: https://manual.audacityteam.org/

recording. Bordallo Charlier describes the ideal acoustics for recording the multi-track as having "...the minimum reverberation possible but bigger than zero."[32]

To assess if a space is acoustically suitable for recording the tracks, choose a room and record a melody from the piece (following the instructions for equipment set-up detailed below in Step 4). When listening back to the melody through headphones or earbuds, make note of the reverberant quality of the flute sound. A "live" sound will diminish the clarity of tone and articulation in the flute, and obscure the melodic and rhythmic components of the multi-track. Variables such as microphone placement and distance can be adjusted to reduce the degree of reverberation in a recording (which will be covered in greater depth in "Audacity: Preparing the Recording," page 27).

As previously mentioned, most musicians do not have access to a recording studio. However, aside from minimum reverberation, the most important quality for the recording space is that it is consistent. Recording each session in the same space, be it a bedroom or a practice room, will allow for a cohesive sound across the lines of the multi-track.

Step 4: Set Up the Equipment

To further ensure uniform sound quality across multiple tracks, the technology set-up must also be consistent across multiple recording sessions. Below are three parameters to consider when setting up your recording space, as well as notes on my specific set-up.

1. **Laptop**

Place your laptop on a stable surface; ideally, it will be within reach, and visible while playing. I placed my laptop on a desk to my left.

If using wired headphones, consider the amount of space necessary to comfortably play and record while being connected to the laptop.

[32] Bordallo Charlier, "Spatiliaty," 109; more notes on Bordallo Charlier's recording process can be found on pgs. 109-114.

2. **Microphone**

Connect your microphone to your laptop.[33] Place the microphone approximately six feet in front of you, and as high as possible. As sound emanates from all over the flute, rather than one particular point, Ian Corbett suggests placing the microphone above the performer's head.[34] However, simply placing the microphone on a stable surface as high as you're able will suffice. I placed my microphone on a music stand, raised as high as it could go (~5 feet).

3. **Score**

If playing from the score while recording, ensure that the sheet music is not placed between the flute and the microphone (to avoid obstructing the flute sound). Consider placing the score to your side, or slightly underneath your instrument. My score was placed on a music stand directly underneath the stand which held my microphone.

In most cases, the method for recording the tracks, detailed in "Recording and Aligning the Tracks: Flute 1-3, section I" (page 31), involves recording one or two measures at a time. It is feasible that a performer could record without the score, depending on their comfort and familiarity with the material.

Audacity: Preparing the Recording

Once Audacity has been downloaded and installed, you are ready to begin the recording process. This section will detail the functions for setting up to record in Audacity, including creating rhythm and monophonic (mono) audio tracks, and testing audio levels.

Similar to the recording instructions in the program notes of *Vermont Counterpoint*, this document will become slightly inaccurate, if not outdated over time. As technology develops over the lifetime of a piece, it stands to reason that the method by which it is performed must be revisited. Though the specific recording instructions detailed here are

[33] If using a laptop with a fan, orient the microphone so that it will pick up the sound from the flute, and maximally reject noise from the laptop.
[34] Corbett, *Mic It!*, 244-245.

subject to obsolescence, this document will aid in conserving *Vermont Counterpoint* by documenting the recording method possible in 2023.

Step 1: Create a Click Track

A click track (labelled in Audacity as "rhythm tracks"), is crucial to the structural integrity of the multi-track. To ensure a rhythmically precise track, record each line with a click track playing in your headphones/earbuds. Click tracks will also assist in vertically aligning the tracks across each line of music, which will be covered in "Recording and Aligning the Tracks…" (page 31)

To create a click track, select **Generate → Rhythm Track...** A box will appear where you will input the tempo, and the length of the click track (in measures). I recommend a click track with at least 100 measures, which will allow for multiple takes during recording without running out of clicks.

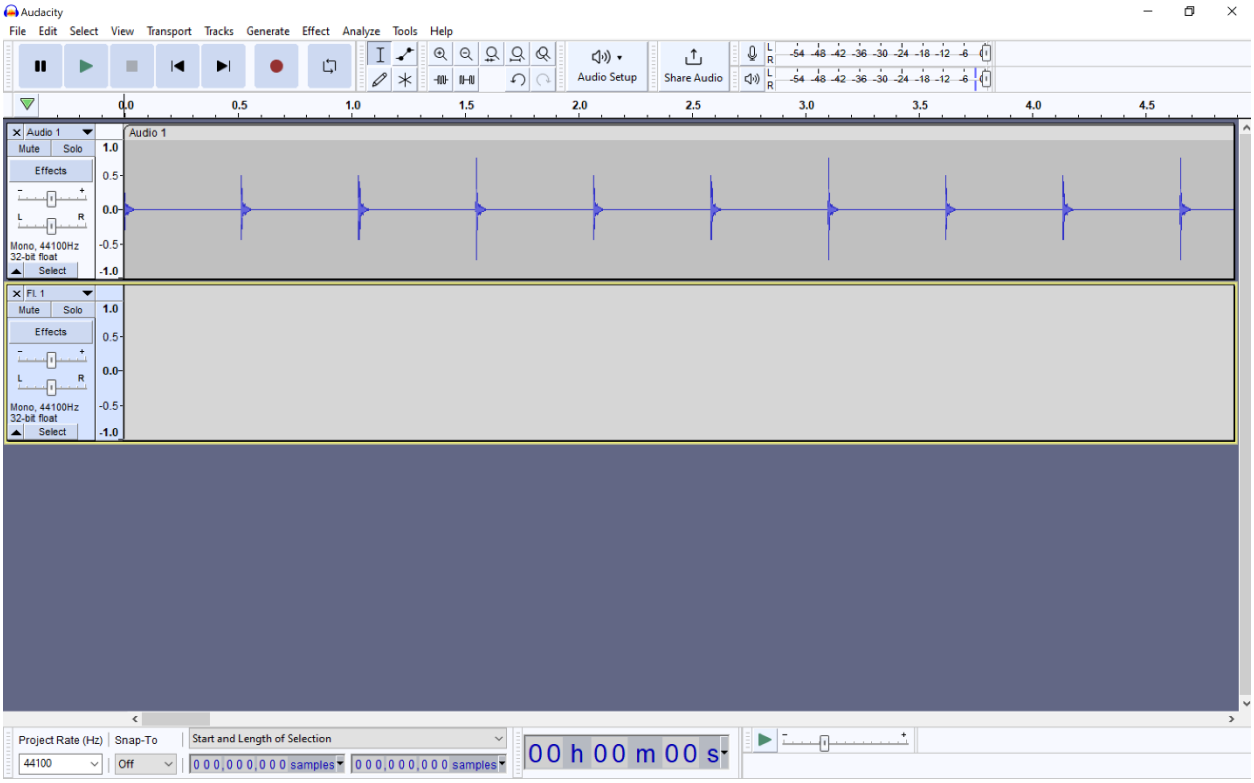

Figure 6: Rhythm track (set to 116BPM), and mono audio track in Audacity.

Step 2: Create a Mono Audio track

In Audacity, audio can be recorded into a mono track or a stereo track. Mono tracks have one playback channel, while stereo tracks have two. The tracks in the example above are both mono tracks. I chose to record in mono for the sake of the ease of visually navigating the multi-track.[35] Additionally, since this document recommends recording with a single microphone (rather than two microphones arranged in a stereophonic pattern), a monophonic track is the more sensible choice.

As you record into each track, you will see a horizontal figure appear in the track. This is a **waveform**, which is a visual representation of the sound. At the time of writing this document, the waveform will appear blue.

To create a mono track, select **Tracks → Add New → Mono Track**. This track can be labeled with a name that corresponds to its line in the multi-track. To do this, find the drop-down menu which reads "Audio 1" at the top left corner of the track. Click this menu, and select **Name...** You may now label this track Fl. 1, for example.

Repeat this process each time you wish to add a new track to your multi-track.

Step 3: Test Recording Levels

To ensure your recording will not "clip,"[36] it is important to test the recording levels before each session.

First, confirm that Audacity is using your microphone to record. To do this, select the **Audio Setup** icon at the top of the screen. In the dropdown menu, hover over **Recording Device** and select your microphone (**Snowball,** for example). If your microphone does not appear, close Audacity and reload the program. Follow this same process for playback devices, such as headphones/earbuds, and speakers.

[35] Further, since I recorded with only one microphone (which produces only one audio signal), recording in stereo was unnecessary for this project.
[36] "Clipping" is a type of sound distortion that occurs when the volume of an audio input signal exceeds the level a recording platform can accommodate.

Next, click on the microphone icon at the top right of the screen, and select **Start Monitoring**. A green horizontal bar[37] will appear whose amplitude corresponds to the live volume the sound picked up by the microphone. During testing, the bar will remain green unless the audio input reaches the maximum recording level, at which point it will turn red. A red horizontal bar indicates clipping occurred.

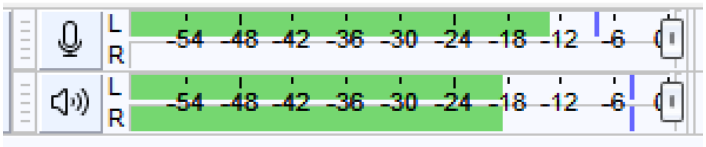

Figure 7: Recording Level Toolbar (top), Playback Meter Toolbar (bottom); the numbers represent the decibel levels being input and output at any given moment.

The default maximum recording level on Audacity is 0 decibels.[38] The number line in the recording level bar measures the decibels (dB) being produced at any moment. To create a clean recording without clipping, it is recommended[39] that the loudest volume produced remains 6-12 dB below zero. In this case, the loudest dynamics recorded should exhibit a peak level somewhere between –12 and –6 dB.

Test your recording levels by playing the loudest moment from the material which you will record. Consider playing a melody which features the third octave, such as measures 27-30 from Flute 1 on page 5 of the multi-track score. The articulations, paired with the high frequency of the third octave, will produce a louder dynamic than if simply sustaining a note in the third octave.

If the recording begins to clip, gradually increase the distance between yourself and the microphone.[40] Adjust until the peaks of the recording levels remain consistently between -12 and -6dB. Repeat this process of testing levels whenever switching instruments.

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[37] This is the **Recording Level Toolbar**. For further reading, see the Audacity manual at https://manual.audacityteam.org/man/meter_toolbar.html

[38] Decibels are a measurement of a sound's "amplitude," which Ian Corbett describes as the "amount of" a sound's energy at any given moment; Corbett, *Mic It!,* 5.

[39] Corbett, *Mic It!,* 25.

[40] The more distance between the flute and microphone, the less clear the recorded flute sound will be. Ideally, the goal is a healthy decibel level while capturing the desired sound quality of the flute.

Recording and Aligning the Tracks: Flute 1-3, section I

Given that the multi-track involves the alignment of eleven lines of music, the most important quality of the recordings used for the multi-track is rhythmic accuracy. Variation in a melody's rhythm can result in a destabilization of the multi-track's structural integrity.

My method for practicing (covered in "Methodology: Practicing and Preparing the Score [pg ___]) and recording the multi-track was developed in the interest of ensuring rhythmic accuracy in the recording and compilation process, as well as minimizing the performer's investment of time and energy into creating the multi-track.

In this section, I will detail the process for recording and compiling flutes 1-3 in section 1, mm. 1-25. This process will follow setting up your recording space and Audacity, and testing the recording levels.

Step 1: Recording and Selecting a Take

As instructed in previous sections, create a rhythm track, set to 116BPM. Next, create a mono track, and label it "Fl. 1." To begin recording, click the **Record** button, which has a red circle in its center. The click track will begin to play, and recording will begin in the Fl. 1 track.

Play several takes of measure 1 from the Flute 1 line in the multi-track score. To stop the recording, press the **space** bar.

To listen back, click the **Skip to Start** button at the top of the screen. Press the space bar again to listen back to your recording, which will play simultaneously with the click track.[41]

[41] This will aid not only in determining which track is most rhythmically precise, but also provide a visual aid for selecting and copying the take.

Identify the take which clearest[42] and most rhythmically precise. To select this take, left click and hold at the beginning or end of the take. A vertical black line[43] will appear, from which you can drag your cursor left or right to highlight the take.

To further ensure a rhythmically precise take, the highlighted section must be measured out in **samples**.[44] To find out the number of samples in your take, find the two boxes on the bottom left of the screen in Audacity; one is labeled "samples," and the other "seconds." Change the second bar to Samples by clicking the word "seconds" and selecting the word "samples." The left bar will record the total amount of samples in the mono track, while the second bar will record the amount of samples in the selected clip.

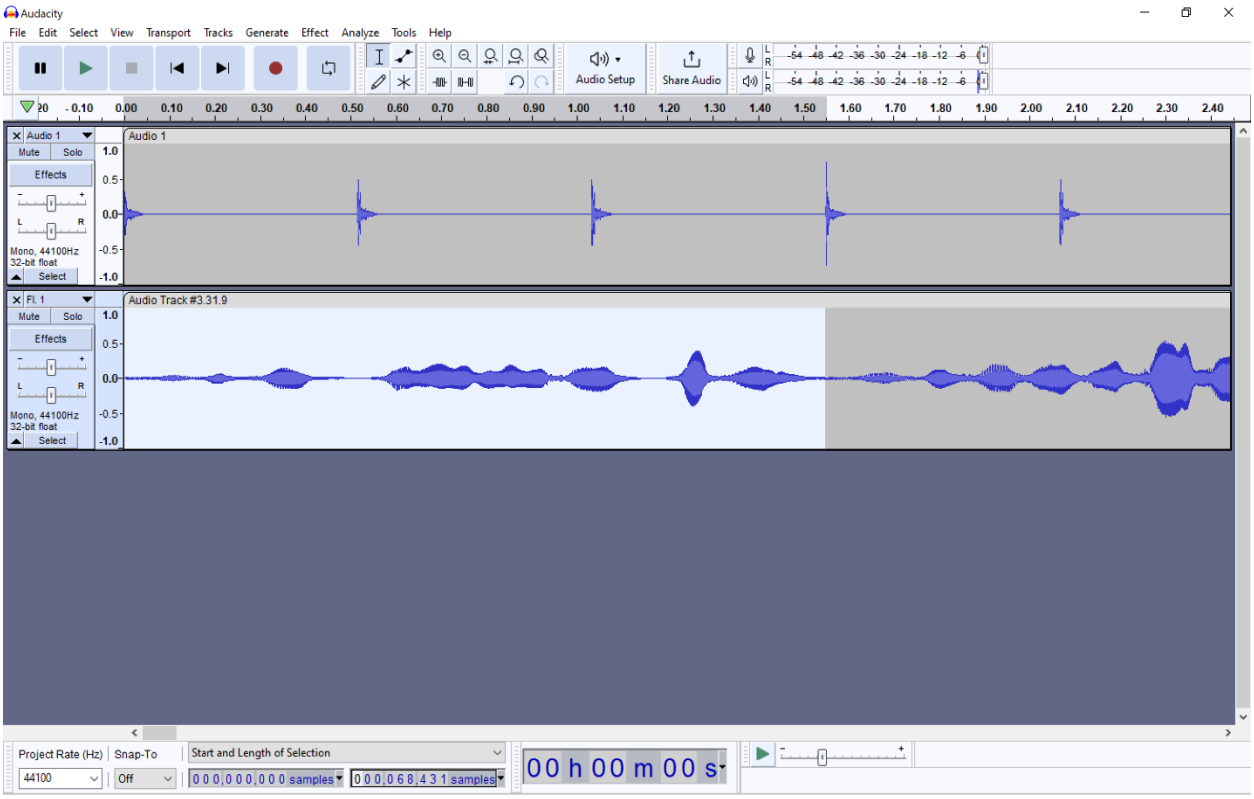

Figure 8: Highlighted take of measure 1 from Fl. 1, Section I. The sample readers are found on the bottom left of this figure.

[42] Though a rhythmically precise take is the priority, a clear sound is crucial to the musical effect of the piece.
[43] This is known as a **clip line**, which distinguishes the various sections of the recording.
[44] A **sample** is a single digital value measure that represents the amplitude of a sound; essentially, it is equivalent to a frame of a moving picture. If takes aren't measured out in samples, you risk the alignment of the multi-track gradually unraveling over time.

One measure of ¾ at 116 BPM contains 68,431 samples.[45] To measure out your take in samples, highlight your desired take. Then, input the sample numbers for the given take into the sample bar. The length of the take will be adjusted at the right end of the highlighted selection.

Copy this selection by clicking **Edit → Copy** in the dropdown menu at the top left of the screen.[46] Highlight the entirety of the track by clicking the grey bar at the top of the track, and press **backspace/delete** to clear the track. Select **Edit → Paste** to paste your take into the track. To paste multiple times in succession, highlight the take and press **→+Ctrl+V** (→+⌘+V, if using a Mac).[47]

Step 2: Vertically Aligning Takes

Continue pasting your take of measure 1 until you have 25 takes in the Fl. 1 track. Next, create a new mono track, and label it Fl. 2

Find the 13th take in the Fl. 1 track. This equivalent to measure 13 in the score, and it is at this point that Fl. 2 enters. As Fl. 2 begins with the final 3 sixteenths of the Fl. 1 take (see Figure 9, page 34), begin by selecting these notes, and entering their sample length (17,108).[48] Copy this selection, and paste it directly underneath the beginning of the 13th take of Fl. 1. A vertical yellow line will appear between the two tracks, allowing you to

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[45] This assumes Audacity is set to record at 44100 *Hz*, or 44100 samples per second. The equation below will determine the number of samples in a measure, and can be adjusted for the sample rate (*Hz*) at which you record.

$$\frac{\text{Seconds in a minute } (60)}{\text{Beats per minute } (116)} * \text{Beats per measure } (3) * \text{Samples per second } (44100\ Hz)$$

[46] To **cut** the take, select **Edit → Cut**.

[47] In the interest of efficiency while programming the multi-track, I strongly recommend using keyboard shortcuts (or "hotkeys") for functions such as copy, paste, etc. These can be accessed in the Audacity Manual here: https://manual.audacityteam.org/man/keyboard_shortcut_reference.html

[48] To do this, select the entire take. Select the text box above the sample boxes which reads **Start and Length of Selections**, and click **Length and End of Selections**. When you input your desired sample size, the final three 16th notes will be automatically selected (unlike the former default setting, which would select the *first* three 16th notes of the take). Note that the sample input bar will switch from the right side to the left.

precisely align the beginnings of each take. Next, copy the Fl. 1 take, and paste it into the Fl. 2 line. Paste the Fl. 1 take until the Fl. 2 line is the same length as the Fl. 1 line.[49]

Press **Play** (or hit the space bar) to listen back to the two lines play simultaneously. Listen for clarity of articulation, and precise placement of the sixteenths between each voice.

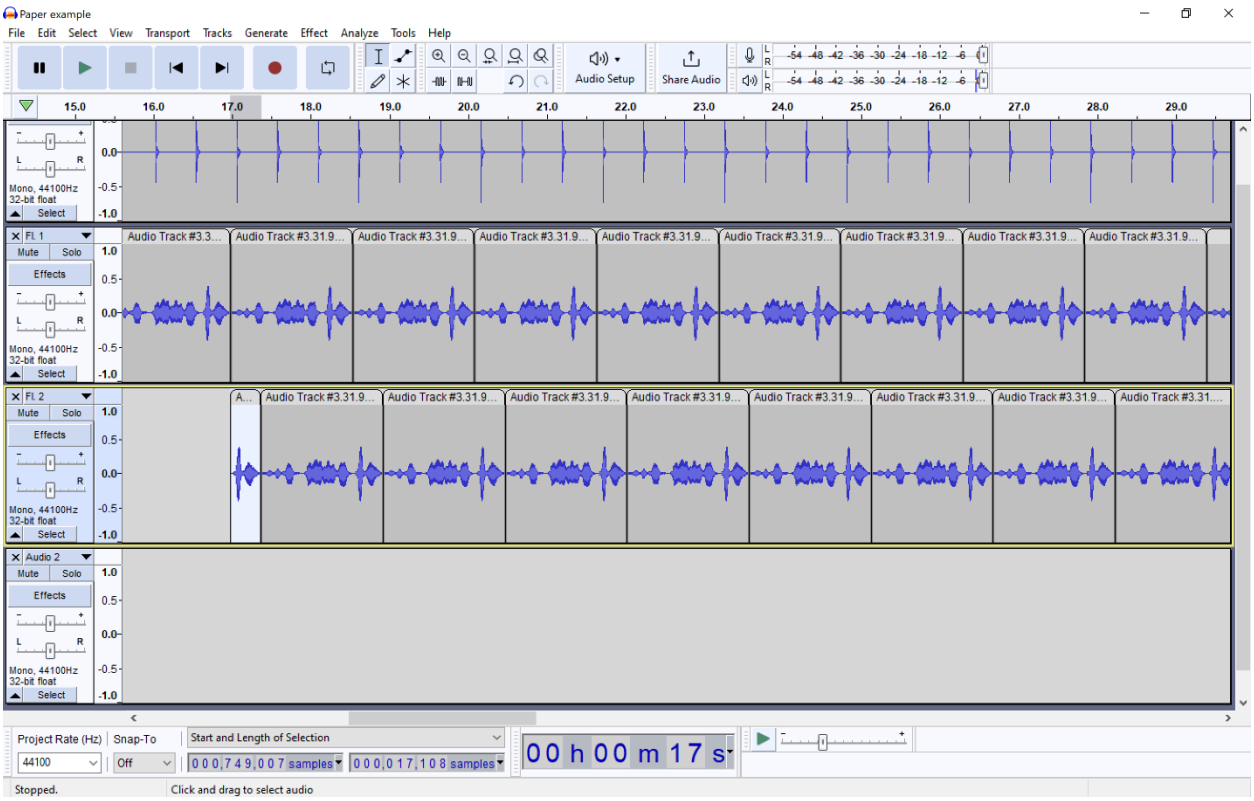

Figure 9: Section I, Fl. 1 and Fl. 2 tracks, vertically aligned. The highlighted take at the beginning of the Fl. 2 line represents the final three 16th notes from the original take in the Fl. 1 line.

Next, create a mono track for Fl. 3. This line begins with the last 6 sixteenths of the Fl. 1 take. Select these notes, and enter their sample length (34,216). Copy and paste this into the Fl. 3 track, below the start of the third to last take in the Fl. 1 line (*not* Fl. 2). Copy the Fl. 1 take, and paste into the Fl. 3 track until you reach the length of Fl. 1 and 2. Press play, and listen back.

[49] Note that the Fl. 2 line will be three 16th notes longer than the Fl. 1 line.

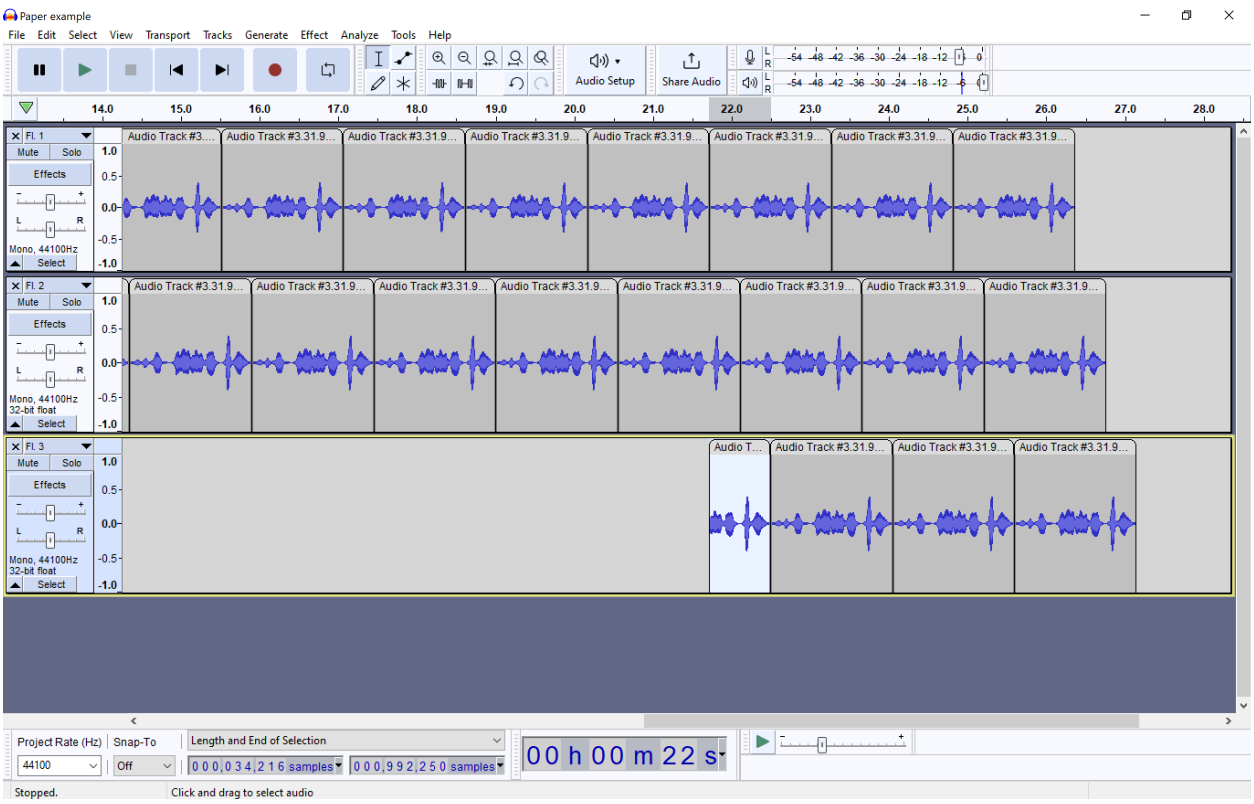

Figure 10: Section I, Fl. 1-3 tracks, vertically aligned. The highlighted take at the beginning of the Fl. 3 line represents the final six 16th notes from the original take in the Fl. 1 line.

To add on the figure which begins at measure 26 and complete the Section I flute canon, first record measure 26. Once the take has been measured out in samples, paste it onto the ends of each flute line. Measures 25 and 26 can now be copied and pasted into each flute line through the end of Section I.[50]

[50] Section I is 104 measures in total.

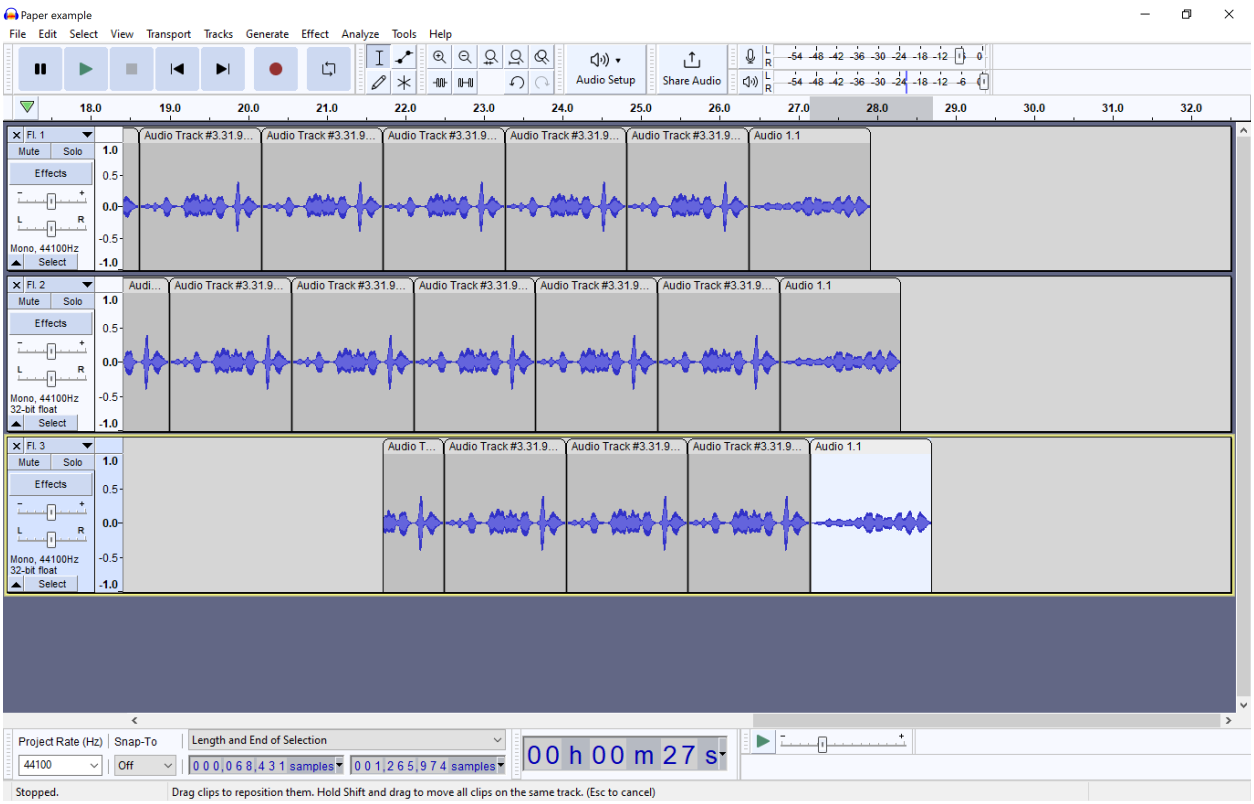

Figure 11: Section I, Fl. 1-3 tracks. The highlighted take represents the recording of measure 26, which has been pasted into each flute line.

This section detailed the steps for recording and compiling the material for the flute lines in Section I of *Vermont Counterpoint*. Though each section of the piece features its own nuances (such as sections of rhythmic construction, slight rhythmic differences between canon voices), the functions and procedures here are applicable to compiling the remainder of the multi-track.

Additional Considerations

Adjusting Audio Levels, "Loudness Normalization"

The audio levels for each line in the multi-track will ideally peak between -12 and -6 decibels. However, as voices are compiled and played simultaneously, the audio will likely begin to clip. To adjust the audio level, select the desired lines, and click **Effect →**

Loudness Normalization… A window will appear where the audio levels may be adjusted in LUFS,[51] the default of which is -23 in Audacity. Values smaller than -23 (-24, -25, etc.) will decrease the loudness of the audio. Adjust the value in small increments (3-5) until the audio peaks between -12 and -6 dB.

Track Markers

To aid in visually navigating and organizing the multi-track, consider placing **track markers** throughout the recording. These can be added by selecting the take you wish to label, and clicking **Edit -> Labels -> Add Label at Selection**. Track markers appear beneath the audio tracks and can be labelled with information such as measure numbers. I recommend inserting track markers at the beginnings of new sections, and when new voices enter in a canon, noting the measure number in each instance.

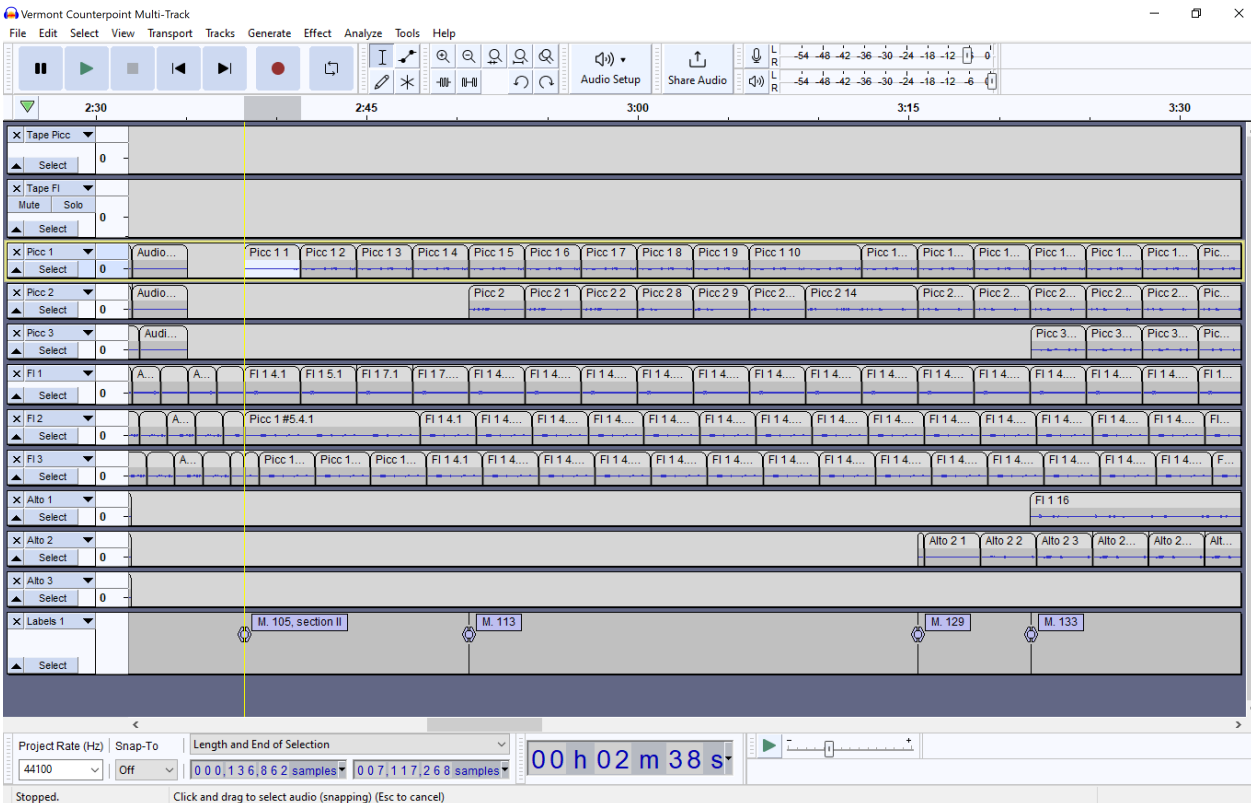

Figure 12: Multi-track, beginning of Section II, with track markers.

[51] LUFS stands for Loudness Units Full Scale, and is a means for measuring loudness.

Fade In/Fade Out

When introducing canon voices in the multi-track, Reich often instructs the performer to "fade in" the line. This effect is created on Audacity by selecting the necessary take(s),[52] and clicking **Effect → Fade In.** The selected audio will automatically adjust to fade in. The same process may be repeated on the selected audio if a more pronounced fade in effect is desired. To fade a canon voice out, follow the same steps and choose **Effect → Fade Out**.

Managing "Dropouts"

As the size of the multi-track grows, tracks may begin to experience "dropouts" while recording. Dropouts are small fragments of missing audio that appear in the waveform when writing data cannot keep up with recording. When played back, dropouts sound like "pops" in the audio. Dropouts may be alleviated by adjusting the **buffer length**. To do this, select **Edit → Preferences → Devices**, and input a buffer length greater than the default of 100 milliseconds. In my own multi-track, a buffer length of 1000 milliseconds prevented dropouts from occurring while recording.[53]

Recording and Compiling the Multi-Track: Deciding on a Methodology

As mentioned in "*Vermont Counterpoint:* An Overview" (page 12), *Vermont Counterpoint's* canons are comprised of 3 voices which voice the same or nearly identical melodies, which are themselves comprised of repetitions of two-bar phrases. To determine a method for recording and compiling the canons, a performer may consider parameters such as time, musical aesthetic, and Reich's compositional philosophy.

Given that the canons are largely comprised of the same musical material across multiple voices, I chose to record one phrase (two measures), and copy and paste it into

[52] In each fade in/fade out, select the amount of measures over which the effect occurs in the score.
[53] Note that increasing the buffer length will result in the playback line not syncing up with the waveform when playing back recordings. For more information on dropouts, and potential solutions, see:

- https://wiki.audacityteam.org/wiki/Dropouts
- https://manual.audacityteam.org/man/faq_recording_troubleshooting.html

each voice for the entirety of the canon. [54] In addition to saving time and energy, this method also further ensures rhythmic accuracy for the duration of the canon. This method is possible thanks to digital recording technology such as Audacity.

Yet, compiling the multi-track with this method was not always an option. When creating the original recording[55] of *Vermont Counterpoint*, flutist Ransom Wilson recorded ten measures at a time. Since the recordings were made with analog tape recording technology, Wilson recorded each line individually. With Steve Reich listening in the recording booth, Wilson recalls three days of recording sessions where rhythmic precision and "perfection" were top priorities.

In Wilson's method, rhythmic accuracy is particularly challenging to accomplish. Though each line in a given canon plays the same or similar melodic material, the rhythmic placement of the melody in each line varies (such as by three sixteenth notes between each voice in Section I). Since the points of emphasis and lengths of rests will vary given their placement within the measure, each line when played individually will have its own subtleties and nuances. Aside from requiring more preparation time from the performer, this method creates the potential for rhythmic discrepancies between the voices of the multi-track.

However, though Ransom Wilson's method for recording is more physically and musically demanding, and a greater investment of time than a copy/paste method, there is a distinctly "human" quality to his recording. "Part of what makes [Reich's] music exciting" said Wilson in a conversation, "is the human imperfection." As a result of Wilson's method, his recording maintains rhythmic precision while also containing nuances in the phrasing and a variety of articulations, resulting in a musically dynamic performance of *Vermont Counterpoint*.

This quality may even have been in line with Reich's desires for his music at this moment in his career. In addition to Wilson's comment about the desirable human

[54] Some canons, such as flutes 4-6 in section III, may have two lines that share the same material, and a third line with a slight variation in the melody. Other canons, such as those of section IV, are comprised of melodies that are nearly identical, but not exact copies.
[55] Recorded in Los Angeles in an "extremely dry concert hall," according to Ransom Wilson.

component present in Reich's works, Reich has been quoted as desiring to create music which was beautiful.[56] Yet, just as often, if not more so, Reich has been quoted denouncing any meaning in his music beyond "what notes" are written "in what rhythmic order." In the case of his decision to write melodies using rhythmic construction, Reich shared that this was an aesthetic decision which was important to him. [57] Reich's early compositional interests were writing music which was itself an aural, perceptible process;[58] the ends to Reich's musical desires, and perhaps the beauty to which he once alluded, is found simply in his compositional process.

If Reich values most the process with which the music was written, a copy/paste method for compiling the multi-track may be most closely aligned with Reich's philosophy. Though this method may yield a less dynamic product in regard to phrasing and nuance, it allows the performer greater assurance of a rhythmically sound multi-track, while reducing the amount of time required to prepare the musical material.

Ultimately, though Ransom Wilson's recording is my personal favorite because of the musicality that his recording method produces, I chose to pursue and document the copy/paste method. As mentioned throughout this paper, accessibility has historically been a barrier to the dissemination of *Vermont Counterpoint* among flutists. Since the technology featured in this paper prioritized logistical viability, it stood to reason that the method for learning, recording, and compiling the multi-track should be as well. By reducing the amount of time a performer needs to prepare and record the material, as well as ensuring the material produces a rhythmically precise multi-track, my hope is that the methods provided here will allow performers to comfortably and confidently program and perform *Vermont Counterpoint*.

[56] Sumanth Gopinath and Pwyll ap Siôn, "Introduction: Reich in Context," in *Rethinking Reich,* ed. Sumanth Gopinath and Pwyll ap Siôn (Oxford: Oxford University Press, 2019), 1-16.
[57] Bakker, "Multiples of the Same," 148.
[58] Steve Reich, "Music as a Gradual Process," in *Audio Culture*, ed. Cristoph Cox and Daniel Warner (New York, NY: The Continuum International Publishing Press, 2019), 1-16.

Chapter 7: Conclusion

In August of 2022, *Vermont Counterpoint* celebrated its 40th birthday. Since its premiere, the technology with which musicians record and compose, and society's collective familiarity with and dependence upon personal technology, have developed significantly. Simultaneously, Reich's status as an influential American composer also grew, making him one of the most recognized names in contemporary classical music.

Vermont Counterpoint embodies a pivotal moment in Reich's life, concerning both his compositional voice, and his renown as a composer. By melding his trademark compositional techniques (such as phasing, rhythmic construction, tape music) with conventional musical idioms (such as tonality, metered rhythm, canon), Reich's artistic voice became more "accessible" to the general public than his earlier tape and phasing works. *Vermont Counterpoint* was also the first of many commissions the composer would receive in his career, taking his music to worldwide acclaim, and establishing him as one of the most sought-after American composers of the twentieth and twenty-first centuries.

Given the acclaim that Reich accrued into the '80s and '90s, it is significant that *Vermont Counterpoint* has yet to receive the attention one might expect, both in scholarship and in performance. However, thanks to the work of the scholars referenced in this document, and the prevalence of technology in our everyday lives, I believe that *Vermont Counterpoint* may now be more accessible to perform than at any moment in its life.

The commitment to performing *Vermont Counterpoint* involves a number of parameters: learning the score, navigating recording technology learning relevant terminology and techniques, and creating the multi-track. Truly, it is a significant investment of one's time and energy. However, in this author's opinion, it is also a tremendously rewarding one.

The flute community is fortunate to have in its possession a piece as musically and historically significant as *Vermont Counterpoint*. Through the writing of this document (and performing the work), it is my hope that *Vermont Counterpoint* will be enjoyed by many generations of flutists to come.

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Doctor of Musical Arts Lecture Recital

Zack Osinski, *flute*
Aaron Ames, *piano*
Laura Gaynon, *cello*
Xavier Davenport, *electronics*

Music Building Auditorium
Wednesday March 8, 2023
7:30PM-9:30PM

JACOB "TV" TER VELDHUIS (b.1951) — **Lipstick** ***for flute/alto flute and tape*** **(1998)**

STEVE REICH (b.1936) — **Vermont Counterpoint** ***for flute/alto flute/piccolo and tape*** **(1982)**

- brief pause-

THEA MUSGRAVE (b.1928) — **Narcissus** ***for flute and digital delay*** **(1987)**

GEORGE CRUMB (1929-2022) — **Vox Balaenae** ***for electric flute, piano and cello*** **(1971)**

This recital is given in partial fulfillment of the requirements for the Doctor of Musical Arts Degree in flute performance and literature. Zack Osinski is a student of Self-Proclaimed Master of the Universe, Dr. Jonathan Keeble.