

Towards a Self-Sufficient Approach for the
Electronic-Acoustic Clarinetist:
A Resource for Performers and Educators

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Abstract

Electronic-acoustic music combines acoustic instruments with electronics. This music has become prevalent in contemporary classical music, yet many performers lack the knowledge and expertise to study and perform this repertoire. It is unrealistic to expect classically trained musicians to have the necessary skills and knowledge to decipher even the most basic technological requirements for any given piece. There are some institutionally established practices where teams of assistants are active and necessary partners in the creative process. Yet, many musicians have neither the resources, opportunities, nor desire to collaborate with a team of assistants. An increasing number of specialists in the field prefer a degree of technological self-sufficiency.

In this project, I study four works by Ianza, Brockman, Allen, and Boulez that feature a range of performance and electronic requirements. I develop a self-sufficient approach, realizing the constituent elements of a performance involving solo electronic-acoustic music. I deliberately select hardware and software that facilitate independence during practice and performance. With careful experimentation and integration, this self-sufficient approach can strengthen the performance experience, presenting opportunities for creative exploration while maintaining autonomy in the performance. Ultimately, I propose pedagogical approaches for electronic-acoustic music and provide a resource guide for performers and teachers.

Abrégé

La musique électronique-acoustique combine instruments acoustiques et supports électroniques. Bien que cette musique se soit largement répandue, plusieurs interprètes n'ont cependant toujours pas la connaissance et l'expertise pour étudier et interpréter ce répertoire. Il n'est pas réaliste de s'attendre à ce que des musiciens formés de manière traditionnelle aient les compétences et la connaissance nécessaires pour déchiffrer les exigences techniques, même de base, de n'importe quelle oeuvre. Il existe bien certaines pratiques institutionnalisées dans lesquelles des équipes d'assistants agissent comme partenaires actifs et nécessaires dans le processus créateur. Cependant, plusieurs musiciens n'ont ni les ressources, ni les opportunités ou le désir de collaborer avec de telles équipes d'assistants. Dans ce domaine, un nombre croissant de spécialistes préfère plutôt s'en tenir à un certain degré d'autonomie technologique.

Avec ce projet, j'aborde quatre oeuvres de Lanza, Brockman, Allen et Boulez qui comportent une variété d'exigences interprétatives et électroniques. J'y développe une approche autonome tout en me penchant sur l'ensemble des éléments qui constituent l'exécution d'une oeuvre de musique électronique-acoustique solo. Je fais volontairement appel à de l'équipement et à des logiciels qui facilitent l'indépendance durant la pratique et la performance. À travers une expérimentation et une intégration minutieuse, cette approche autonome a le potentiel de renforcer l'expérience d'interprétation, offrant des opportunités pour une exploration créative tout en préservant l'autonomie de l'exécution. Au final, je propose des approches pédagogiques pour la musique électronique-acoustique et je fournis un guide de ressources pour les interprètes et les professeurs.

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and critical thinking.

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Chapter 1

Introduction

*It is the meaning of our work, that we can ever again
discover something new and are fortunate that
we do not stand still, that we do not live in a museum,
but constantly remain on a journey of discovery.*

-Karlheinz Stockhausen¹

1.1 Introduction

In the concluding statement from the 1991 Freiburg Musikhochschule lecture,² electronic music pioneer Karlheinz Stockhausen (1928-2007) emphasized the essential purpose of, “*our work*”; that is, innovation, renewal, exploration, and discovery. Today, musicians have seemingly unlimited opportunities for personal and musical discovery.

This paper is an account of my *journey of discovery* in the field of electronic-acoustic music, a repertory that combines acoustic instruments with electronics such as pre-recorded tape and live electronics. Far from *standing still*, I have tested the limits of my own abilities and have endeavoured to become autonomous and perhaps most importantly, adaptable.

1.2 Terminology

When discussing contemporary classical repertoire that combines acoustic instruments and electronics (such as fixed media/tape, live electronics, etc.), a common term is *musique mixte*, which refers to music that combines acoustic instruments and electronics. This term originated at IRCAM (*Institut de Recherche et Coordination Acoustique/Musique*) in Paris, France. In contrast, a wide variety of terms are used in North America and elsewhere to describe this music: *electroacoustic music*, *electro-acoustic music*, *mixed music*, *live electronic*

¹ Stockhausen, Karlheinz, and Jerome Kohl. “Electroacoustic Performance Practice.” *Perspectives of New Music* 34, No. 1 (1996): 104.

² Stockhausen’s “spontaneous” lecture was translated by Jerome Kohl and revised for publication in 1994.

music, interactive electroacoustic music, and computer music. Upon closer inspection, it is apparent these terms may not sufficiently describe the music I have chosen to study. Curiously, I have used many of these terms over the last decade and have never been corrected by colleagues or mentors who specialize in the field. It is apparent that these terms are used quite loosely in many parts of North America, often depending on the language spoken, thus causing much confusion and debate. To stress the lack of consistency with regard to accepted terminology, Leigh Landy states the following: “We don’t all have to agree, but the current state of affairs is embarrassing.”³

For this research, I have elected to use the term **Electronic-Acoustic Music**. It refers to the electronic (which can be pre-recorded, live, or both) and acoustic (meaning instrumental or vocal) components in the repertoire. Simply, there is musical interaction between a human subject and their technological counterpart.

1.3 Overview of the project

Problems and Rationale

Although electronic-acoustic music has become prevalent in contemporary classical music, many performers lack the knowledge and expertise to study and perform this repertoire. Often, these performers are sought-after teachers who, for many reasons, are unable or reluctant to provide comprehensive instruction for electronic-acoustic music. It is unrealistic to expect classically trained musicians to have the necessary skills and knowledge to decipher even the most basic technological requirements for a given piece. Holistic pedagogical methods⁴ specifically designed for the needs of performers are rare, and formal training for performers and composers is not yet compulsory. Indeed, Cort Lippe states:

³ Landy, Leigh. “Electroacoustic Music Studies and Accepted Terminology: You can’t have one without the other.” *Proceedings of the Electroacoustic Music Studies Network Conference*, Beijing (2006): 2.

⁴ Please refer to page 5 for a definition.

It may come as a surprise to some that presently it is still possible for performers, musicologists, and composers to complete their secondary education through the Ph.D. without ever coming into contact with electronic music.⁵

Concurrently, there are rapid advancements in hardware and software used in the production and performance of electronic-acoustic music. It is not uncommon for technicians and computer programmers, including experts, to experience difficulties with these developments. Without exposure and education, the technology may be beyond the capabilities of most performers.

For this project, I chose four contrasting works that feature a range of electronic requirements. For all works on the program, I developed a self-sufficient, autonomous approach in which I supervise and realize most, if not all, components of a performance involving solo electronic-acoustic music. I selected hardware and software that allowed me to be entirely independent during practice and performance.

My lecture-recital began with a partial performance of Pierre Boulez's *Dialogue de l'ombre double* (1985). For this piece, I performed with my own pre-recorded "double" parts; a practice strongly encouraged by the composer. The second work on the program, Alcides Lanza's *ektenes III* for clarinet, tape and digital signal processing (1995-1), includes both tape and live electronics. To the best of my knowledge, I am the first performer to realize this performance with an entirely performer-controlled Max/MSP patch and foot pedal. The third work, *Tagore Songs*, for Clarinet Solo with Prerecorded Electronics on CD (1997) by American composer Jane Brockman, features pre-recorded and live electronics, again made possible for the occasion due to the creation of a performer-controlled Max/MSP patch. The program concluded with my own arrangement of J. Anthony Allen's *Dry Cell* (2009), originally for soprano

⁵ Lippe, Cort. "Musings on the Status of Electronic Music Today." *Proceedings from The Combined International Computer Music Conference and Sound and Music Computing Conference* (2014): 4.

saxophone and tape, that includes a video component. With permission and encouragement from the composer, I adapted the work for B-flat clarinet.

Primary Objectives

- 1) **Develop** a self-sufficient approach to electronic-acoustic music performance.
- 2) **Identify** and **solve** technical challenges (both instrumental and electronic/technological).
- 3) **Perform** the chosen works on the program and demonstrate effective use of the approaches I have proposed.
- 4) **Propose** pedagogical approaches for electronic-acoustic music by combining traditional techniques with exercises and learning/teaching strategies to meet the specific demands of the repertoire.
- 5) **Create** a resource guide for performers and teachers.

Outcomes and Conclusions

An outcome of this research has been my personal development of a self-sufficient practice for electronic-acoustic repertoire. My lecture-recital served as an integral component of my research, affording me the opportunity to test the limits of this self-sufficient approach in a concert setting. The process of post-recital reflection has exposed some of the benefits and disadvantages of the chosen approach and highlighted areas in need of further exploration.

With careful experimentation and integration, this self-sufficient approach can strengthen the performance experience, provide opportunity for creative exploration, enhance personal investment in the production, and foster collaboration with composers and technicians. I propose new pedagogical approaches are needed in order to address challenges in this field, including but not limited to the following factors: technology, equipment, notation, listening, interaction, intonation, balance, analysis, and musician's health.

Chapter 2

Challenges and Research Processes for Developing Pedagogical Approaches for Electronic-Acoustic Music

*Letting go of one's knowledge of how things have always been
is among the most important techniques for successful paradigm shifting.*

-Alex Shapiro⁶

2.1 Objectives

The pedagogical component of this study is intended as a resource for performers, teachers, and students who have little-to-no experience with electronic-acoustic music. The objectives are as follows:

- Research** established pedagogical methods for teaching electronic-acoustic music.
- Artistic research** involving experimentation, practice and implementation of new performance practices.
- Identify** areas where current pedagogy is inadequate for electronic-acoustic instruction.
- Determine** potential solutions.
- Propose** new approaches for instruction.
- Establish** holistic pedagogical methods.⁷

2.2 Problem Statement

Although electronic-acoustic music has become prevalent in contemporary classical music, many performers lack the knowledge and expertise to study and perform this repertoire.

⁶ Shapiro, Alex. "The e-Frontier: Electroacoustic Music, Multimedia, Education, and Audiences in the Digital World (Part 2)." *WASBE World*. (September 2014): 8.

⁷ For the purposes of this study, the term **holistic** refers to the comprehensive study of electronic-acoustic music. The student is introduced to the constituent elements of electronic-acoustic repertoire in clarinet lessons, studio classes, etc. The instructor is responsible for introducing the student to a wide range of skills, concepts and repertoire. The instructor may need to consult with technicians and other specialists in order to learn how to use the technology or seek advice on teaching strategies; however, they should not relinquish their responsibilities by relying on the specialist to teach the student all skills related to use of technology. Most importantly, the teacher should make every effort to provide the necessary instruction and guidance to the student in all matters related to electronic-acoustic music performance.

Often, these performers are sought-after teachers who are unable or reluctant to provide comprehensive instruction for electronic-acoustic music.⁸ Reasons for this may include:

- 1) Professional musicians have demanding rehearsal and performance schedules, experience psychological stress and physical discomfort or injury, and face financial difficulties related to job security. As such, musicians may have limited time and resources to explore new performance practices and participate in teacher training workshops.⁹
- 2) It is common for teachers to transmit what they were taught. Indeed, it is important to pass on the traditions of the great clarinetists of previous generations. Since electronic-acoustic music is a relatively new area of study, teachers likely received no private or institutional instruction. Therefore, they may exclude it from their own teaching practice.
- 3) There is limited time in private lessons and fundamental skills must be prioritized. One hour per week of instruction, for example, may be insufficient without careful lesson planning and long-term strategies.
- 4) A teacher may want to introduce electronic-acoustic music to their student but they simply don't have experience or skills.
- 5) The teacher may have no interest in electronic-acoustic music and choose to teach their preferred repertoire.
- 6) If electronic-acoustic repertoire is addressed in private lessons, the teacher may focus solely on the instrumental part in the lesson rather than offering holistic instruction.

⁸ Bullock, Jamie. et al. "Live Electronics in Practice: Approaches to training professional performers." *Organised Sound* 18, no. 2 (2013): 171.

⁹ Please see **2.3 Research questions** for details on Bullock et al.'s research in this area.

It is unrealistic to expect classically trained musicians to have the necessary skills and knowledge to decipher even the most basic technological requirements for a piece. Lack of performer-centred hardware and software makes it even more difficult.¹⁰ According to Bullock et al., the practical needs of instrumental performers are rarely factored into the design of new technology.¹¹ The software used to create live electronic music, such as Max/MSP,¹² offers incredible creative freedom for composers; yet, the programming language and skills required to create Max/MSP patches are beyond the capabilities of most performers. Difficulties also arise for performers who receive a faulty Max/MSP patch from the composer¹³ or wish to modify the patch depending on their artistic preferences, access to equipment or concert venue. Composers may be willing to modify the patch; however an experienced technical assistant may need to be hired. According to Bullock, et al.,

Such GUIs [graphical user interfaces], typically designed by composers, are of variable quality and often incomplete, esoteric, confusing and undocumented. This inevitably disempowers performers by forcing them to rely on composers and/or technical assistants who act as intermediaries to the technology. In practical terms this means the changes and adjustments inevitably required in rehearsals tend not to be made by performers, and responsibility for aspects of the musical result are ultimately delegated to someone else.¹⁴

There are established practices that originate from institutions such as IRCAM (*Institut de Recherche et Coordination Acoustique/Musique*)¹⁵ where a team of assistants are active and necessary partners in the creative process. According to Tod Machover, “IRCAM is almost unique in the world in supplying technical assistance that permits composers to realize projects

¹⁰ Bullock, et al., “Live Electronics in Practice: Approaches to training professional performers,” 171.

¹¹ Ibid., 170-171.

¹² <http://www.cycling74.com>

¹³ The patch may have been created on a previous version of the software and is no longer compatible with the newest version.

¹⁴ Bullock, et al., “Live Electronics in Practice: Approaches to training professional performers,” 171.

¹⁵ <http://www.ircam.fr>.

without previous computer expertise.”¹⁶ Performers receive technical support from RIM (i.e. “*Réalisateur en Informatique Musicale*” or computer music designer). Yet, Yiorgos Vassailandonakis describes it as, “a utopian situation... not quite the same as having a complex electronic setup in the real world.”¹⁷ Indeed, many musicians in North America have neither the resources nor the opportunity to collaborate with one or more assistants. There will be many instances when a performer will need to take control of the electronics and equipment. An increasing number of specialists in the field prefer a degree of technological self-sufficiency, as outlined in **Chapter 3 - Equipment**.

Nevertheless, some performers have expressed concerns that electronics may pose a “threat to the live performer”¹⁸ and have a “disruptive”¹⁹ effect. Bullock, et al. further describe the problem as follows:

Teaching live electronic music techniques to instrumental performers presents some interesting challenges. Whilst most higher music education institutions provide opportunities for composers to explore computer-based techniques for live audio processing, it is rare for performers to receive any formal training in live electronic music as part of their study. The first experience of live electronics for many performers is during final preparation for a concert. If a performer is to give a convincing musical interpretation ‘with’ and not simply ‘into’ the electronics, significant insight and preparation are required.²⁰

Accordingly, new holistic educational approaches are necessary in order to provide formal training to performers. A well-rounded education will prepare students for professional performance careers that will increasingly include electronic-acoustic music. Yet, according to Rachel Yoder, “It seems that performers either specialize in interactive music (in which case

¹⁶ Machover, Tod. “A view of music at IRCAM.” *Contemporary Music Review* 1 (1984): 1-10. 2.

¹⁷ Vassailandonakis, Yiorgos, Philippe Leroux. “An Interview with Philippe Leroux.” *Computer Music Journal* 32, No. 3 (2008): 22.

¹⁸ Errante, F. Gerard. “Performing with Tape: Music for Clarinet and Electronics.” *Music Educators Journal* 72, No. 3 (1985): 50.

¹⁹ McNutt, Elizabeth. “Performing electroacoustic music: a wider view of interactivity.” *Organised Sound* 8, No. 3 (2003): 299.

²⁰ Bullock, et al., “Live Electronics in Practice: Approaches to training professional performers,” 170.

they have much experience and little need for a guide) or avoid it completely.”²¹ If performers and educators feel encouraged and empowered to explore this repertoire, it may no longer be reserved for specialist performers. Greater accessibility and demystification can benefit everyone in the field.

2.3 Research questions

From 2010-2012, a significant research study originating in Birmingham, UK, conducted by Bullock, Coccioli, Dooley and Michailidis explored methods for teaching electronics to performers through training workshops and a curriculum pilot project. Known as the Integra project, it revolved around the following research questions:

- How can we most effectively teach live electronics to instrumental performers?
- What should we teach to performers – what should the methods, objectives and outcomes be?
- Is a single approach possible, or a diversity of approaches required?
- What are the best software and hardware setups for teaching instrumental performers?²²

Within the context of case studies and a survey, they concluded that long-term exposure and dedication is required to achieve technological proficiency and transform musicians’ perceptions.²³ The majority of participants indicated that, in addition to the development of technological skills, the training positively impacted their, “standard of performances, openness to new ideas, and use of extended techniques.”²⁴ Ultimately:

It could therefore be concluded that it may be beneficial to incorporate music technology instruction into programmes of study for performers at higher education, regardless of their intention to incorporate technology into their wider practice. That is, the addition of music

²¹ Yoder, Rachel. “Performance Practice of Interactive Music for Clarinet and Computer with an Examination of Five Works by American Composers.” (Doctor of Musical Arts, University of North Texas, 2010): 20.

²² Bullock, et al., “Live Electronics in Practice: Approaches to training professional performers,” 171.

²³ “Like an instrumentalist, who must learn their instrument through hours of practice and performance experience, the discipline of live electronics may need to be approached in a similar manner.” Bullock, et al., “Live Electronics in Practice: Approaches to training professional performers,” 175.

²⁴ Ibid., 176.

technology instruction to performance curricula may be advantageous solely for its potential benefits on general musicianship.²⁵

The researchers recommended that institutions create dedicated practice facilities for instrumentalists for the purpose of practicing electronic-acoustic repertoire.²⁶ It is notable that participants gave positive reviews of the curriculum pilot project, where instruction was offered in one-on-one lessons, compared to group workshops that received slightly lower ratings.²⁷ Thus, quality private instruction is preferable.

I approached this project with many of the same concerns and questions. Indeed, I have personally experienced a lack of formal instruction. Nevertheless, my research questions are applicable to the chosen repertoire and performance practices. They are as follows:

- How should traditional pedagogical approaches be adapted in order to meet the specific needs of the repertoire?
- Are new pedagogical approaches needed?
- How can performers become self-sufficient for select electronic-acoustic repertoire?
- What are the teacher's responsibilities with regards to electronic-acoustic instruction?

2.4 Procedure:

I developed the following procedure to guide my research process:

- Produce** and **implement** a self-sufficient approach with regards to electronic-acoustic performance practice.
- Evaluate** the effectiveness of this approach (including a thorough reflection process following the lecture-recital).
- Identify** ways in which these approaches can be integrated into pedagogy and curriculum development, based on the evaluation process and prior teaching experience.

²⁵ Ibid., 176.

²⁶ Ibid., 177.

²⁷ Ibid., 176.

2.5 Challenges in Electronic-Acoustic Music Performance

Technology

Technology will undoubtedly be the most challenging and time consuming aspect of electronic-acoustic music instruction. Indeed, it will typically be the area in which students have minimal experience. The difficulty is compounded by the fact that the instructor may also have limited experience with technology. Therefore, a basic level of technological proficiency must be achieved in order to sufficiently guide the student.

Technology in electronic-acoustic music often consists of hardware and software. Common hardware requirements include: laptops, audio interfaces, foot pedals, cables, microphones, stage monitors, and loudspeakers. Software such as iTunes may be used for pre-recorded tape playback, while specialized programming software such as Cycling 74's Max/MSP is frequently used for pieces involving live electronics. All hardware and software components must be considered and integrated into rehearsal and performance set-ups, as discussed later in this chapter.

For beginners, I advise choosing pieces that include a basic form of pre-recorded electronics. Likewise, Shapiro offers the following perspective:

The sophistication of what can be achieved with these real-time techniques is unquestionably wonderful. Nonetheless, I have witnessed too many stressful occasions when the programs did not run smoothly, or crashed entirely and rudely truncated a concert. In my own pieces, I continue to opt for straight playback that requires no human counterpart – and I advise my far braver colleagues to create prerecorded backups of their live electronics whenever possible, if only to have a Plan B at the ready, just in case.²⁸

Pre-recorded “tape” tracks allow performers to practice with the electronics at their convenience simply with an iPod and headphones. No additional technological expertise is required for rehearsal purposes; students can learn the necessary steps to be able to connect the playback device to loudspeakers for a performance. Many pieces that only use pre-recorded electronics

²⁸ Shapiro, Alex. “The e-Frontier: Electroacoustic Music, Multimedia, Education, and Audiences in the Digital World (Part 1).” *WASBE World*. (June 2014): 10-11.

can be performed without amplification. Thus, it is cost-effective and convenient for beginners to perform repertoire with minimal technological requirements.

More sophisticated set-ups are required for some repertoire, particularly advanced and virtuosic repertoire that include live electronics. Please refer to **Part 3 - Equipment** for recommendations.

As previously mentioned, composers often use software such as Max/MSP for the creation of pieces involving live electronics. Ivica Ico Bukvic describes the role of software as a “mediator” or “interface” between the live performer and technology.

Interactive multimedia art by definition encompasses any kind of artistic work that requires live interaction between the computer and a live performer.... there is always a mediator, an *interface* whose purpose is to bridge these dramatic differences between the two participants, relaying pertinent information in order to ensure a successful interaction... No matter what the means of communication are, it is obvious that the *interface* is the most important element in the interactive art performance whose flexibility and reliability means the difference between a successful execution and a complete disaster.²⁹

Rachel Yoder conducted a series of informative interviews with clarinetists who perform *interactive music* and discovered that a select group were proficient with software since they were also composers, while, “others had limited knowledge of the software, but expressed a desire to learn more.”³⁰ Ultimately, she concluded that, “Familiarity with the functioning of the software can surely enhance a performer’s understanding and interpretation of an interactive piece, but detailed technical knowledge is not necessary.”³¹ While detailed technical knowledge is not obligatory to be able to perform electronic-acoustic repertoire, musicians’ abilities to independently perform will be hindered in the long-term if they lack this knowledge. Thus, striving for detailed technical knowledge does more than enhance a musician’s performance

²⁹ Bukvic, Ivica Ico. “RTMix — towards a standardized interactive electroacoustic art performance interface.” *Organised Sound* 7 (2002): 275.

³⁰ Yoder, “Performance Practice of Interactive Music for Clarinet and Computer with an Examination of Five Works by American Composers,” 28.

³¹ Ibid., 28.

practice; it becomes crucial. Additionally, when performers take on the responsibility of acquiring technological skills, they can play an important role in the future development of simple, user-friendly technology and accessible repertoire.³²

Bukvic refers to two categories of software used in the creation and performance of electronic-acoustic music: **object-oriented interfaces** and **linear interfaces**.³³ He describes their basic features and functionalities as follows:

Object-oriented interfaces (e.g. Pure Data and Max/MSP): Features graphical objects rather than code; visually based; modular design; creates unique patches for each interactive piece.

Linear interfaces (e.g. Csound and RTcmix): Features lines of code rather than graphical objects; standardized; creates score files/script files rather than patches.

An additional category of live electronics requires, “dedicated hardware rather than built-in CPUs,”³⁴ such as the software Kyma³⁵ that utilizes a piece of external hardware called the Pacarana. In 2011, I studied Kyma with composer Gerhard Ginader (Brandon University, Manitoba). This first-hand experience was invaluable; I enjoyed the creative freedom and possibilities for unrestricted exploration.

When choosing equipment and software for a piece, the performer should refer to the score where composers may provide details on the technological requirements. If no instructions are offered, the performer can refer to the composer’s website, university performance library catalogues, or archived concert programs. Recordings and YouTube videos

³² McNutt, “Performing electroacoustic music: a wider view of interactivity,” 303. See **Chapter 8: Conclusion and Future Considerations** for further insight.

³³ Bukvic, “RTMix — towards a standardized interactive electroacoustic art performance interface,” 277.

³⁴ Ibid., 276.

³⁵ Kyma is “a hardware and software environment for creative sound design, live performance, and scientific exploration.” (<http://kyma.symbolicsound.com>)

can be useful resources when attempting to decipher the technological requirements. General details can be identified such as the type of electronics employed (pre-recorded, live electronics, etc.), methods of interaction (static, fluid, etc.), complexity (e.g. coordination with pre-recorded track), level of instrumental treatment (e.g. heavy reverb), sound environment (e.g. the pre-recorded tape part features bird calls or other identifiable sounds), and balance (instrumental and electronic parts may be well-balanced, yet some repertoire may require that one part is more prominent).

Once the performance materials are acquired, including the score, audio files, equipment, and software applications, a stage map should be created. This exercise will help to identify potential problems in the set-up and draw attention to components that can be simplified. The diagram should be as detailed as possible, with all hardware components clearly labelled in the optimal position on stage.³⁶ While this process may be time consuming, the stage map will be an invaluable resource for efficient set-ups. Thus, it must be neatly drawn and easily comprehended for use by the performer or stage assistants. Additionally, the stage map can serve as a checklist for performers to ensure no equipment is left behind at the studio or concert venue. Self-sufficient musicians must accept the new responsibilities that emerge when planning for the performance and caring for equipment. This recommendation should not be overlooked, since a missing XLR cable or drained laptop battery can seriously impact a performance — or result in a cancelled concert!

With careful planning, preparation, and experience, various forms of technology can be comfortably integrated into a performer's artistic practice. The objective is for the performer to feel confident and in control during rehearsal and performance, while minimizing risk of

³⁶ Examples can be found on pages 46 and 87 of this document.

technological error. Ideally, the concert stage will transform into an aesthetically pleasing and efficiently organized space, inspiring greater exploration and creativity.³⁷

Notation

An increasing amount of contemporary music features unique forms of notation that create challenges for performers. The notation of pre-recorded and live electronic parts poses new challenges. Each piece requires a different approach to notation which in turn necessitates different approaches to analysis. Please see the **Analysis** section of this chapter as well as the descriptions of notation provided in the repertoire chapters.

Listening

From a young age, many musicians are experienced and trained listeners. Yet, even with highly developed listening abilities, musicians must learn to listen in different ways, and understand what they are listening to, when the sound sources are ambiguous (as is often the case in electronic-acoustic music). Teachers can play an important role in this respect as they can guide the student to listen to this repertoire in new ways.

I encourage the teacher to work with the student to strengthen and re-direct their attention to a multitude of unfamiliar sounds and textures, in addition to addressing important concepts such as interaction and balance. Simply listening to other performers' recordings does not always provide the necessary information; for much of this repertoire, the live instrumentalist, tape, and live electronics are tightly interwoven.

The instructor must guide the student so they understand what to listen for and how to listen to it. Students must learn to identify objective “facts” of the work, such as rhythm and tempo, in addition to subjective observations that will be unique to each listener. As Brün states, “the listener alone is competent for the personal experience...the listener is completely and

³⁷ Please refer to **Chapter 8** for further insight.

absolutely free in the matter of personal experience.”³⁸ When asked in a coaching session on J. Anthony Allen’s *Dry Cell* to describe how I knew when to enter (i.e. am I listening for a certain aural cue?), I was unable to clearly describe the sound that I was using as my cue. Yet, I had spent a considerable amount of time studying and practicing with the tape track which enabled me to recognize and naturally respond to the precise musical shape, volume, timbre, and rhythmic qualities of the electronic sound. Therefore, the instructor must understand that it may be difficult for the student to explain their specific approach. Ultimately, with guidance, practice, and experience, the performer finds their own solutions.

It is important that the instructor also teach and guide the student to explore new transcription techniques that specifically address the needs of the performer. In many cases, there is a lack of detail provided in the written score for the tape or live electronic parts. Sounds and cues are described ambiguously, if at all. Thus, there will be instances where the performer must study the tape part or an available recording of the complete work and transcribe certain elements.

Listening skills are integral for study and analysis, yet additional challenges emerge when performing electronic-acoustic music. The performer must have ample opportunity to rehearse with the equipment in a variety of locations so they may adapt their listening attention and gradually develop a heightened awareness of interaction. Shapiro describes this challenge with reference to electronic-acoustic music for wind band:

One of the skills ensemble musicians develop as they become familiar with performing, is the ability to adjust to their surroundings. The sound they hear from their specific locale on the stage translates differently when the entire ensemble is heard from a seat in an auditorium. When we add the presence of integrated music coming through the house speakers that is meant to blend seamlessly with the band, a musician’s listening skill is challenged even further.³⁹

³⁸ Brün, Herbert. “The Listener’s Interpretation of Music: An Experience Between Cause and Effect.” In *When Music Resists Meaning: The Major Writings of Herbert Brün*, ed. by Arun Chandra. (Middletown, CT: Wesleyan University Press, 2004): 53.

³⁹ Shapiro, “The e-Frontier: Electroacoustic Music, Multimedia, Education, and Audiences in the Digital World (Part 1),” 13.

Equipment must be carefully chosen to ensure all necessary cues and other information from the electronics are being transmitted to the performer. Without the sound from a stage monitor, coordination will be impossible and the comfort of the performer will be compromised.

Interaction

The topic of interaction in electronic-acoustic music is controversial. Many composers and performers question whether musical communication with a computer is possible, or if an “intimate”⁴⁰ partnership is simply an illusion⁴¹ created for the benefit of the audience.

Sergi Jorda provides the following definition: “‘Interaction’ involves the existence of a mutual or reciprocal action or influence between two or more systems.”⁴² A general definition is also offered by flautist Elizabeth McNutt:

For most electroacoustic composers, ‘interactivity’ refers to technology which responds to input from a performer. For performers, in contrast, performance may be described as ‘interactive’ on many levels: interacting with acoustic musical interfaces (their instruments), communicating with composers and audiences, mediating the data of a score, negotiating prosthetic devices (microphones, loudspeakers, pedals, sensors), and interacting with invisible chamber music partners (whether backing tracks or responsive computer programs).⁴³

There are various models of interaction, often characterized by the type of electronics used (such as pre-recorded or live electronics). Fixed, or rigid interaction,⁴⁴ involves static pre-recorded tape. Many performers dismiss the tape as an interactive partner and complain of the constraints it places on them. Violinist Mari Kimura suggests, “Basically, if you regard the tape

⁴⁰ Lippe, Cort. “Real-Time Interaction Among Composers, Performers and Computer Systems,” in *The Information Processing Society of Japan SIG Notes* 2002, No. 123: 1-6, 2002. 4.

⁴¹ McNutt, “Performing electroacoustic music: a wider view of interactivity,” 299.

⁴² Jones, Pamela. “The Soles of the Feet: alcides lanza Reconnects with his Roots.” In *Compositional Crossroads: Music, McGill, Montreal*. Ed. by Eleanor Stublely (Montreal: McGill-Queen’s University Press, 2008): 90.

⁴³ McNutt, “Performing electroacoustic music: a wider view of interactivity,” 297.

⁴⁴ Ibid., 300.

part as ‘another performer’ you are in for trouble, since the tape is just going to be a very bad performer.”⁴⁵

Yet, with regards to the static nature of the tape, Marco Stroppa offers a contrasting perspective. Referring to his memorable collaboration with Ensemble Intercontemporain for Karlheinz Stockhausen’s *Kontakte*, Stroppa states:

In no moment did the instrumentalists or I feel constrained by the presence of a tape running uninterruptedly from the beginning to the end. Yet, one of the first and most imperious criticisms toward tapes is precisely their temporal rigidity. Though there is no doubt concerning the crucial importance of time in music, this is a far subtler problem than dealing only with temporal fluctuations. A performer at ease with a click track will find other ways to express his or her interpretive choices. If the composition is done in a certain way, nobody in the audience will perceive any temporal awkwardness and the performance will be judged as free as usual.⁴⁶

Similarly, I do not feel constrained when performing with pre-recorded tape parts. In fact, the experience of performing tape pieces is comparable to ensemble performance in which most parameters, including tempo and pitch, are dictated by the conductor or fellow musicians. Certainly, different approaches are needed when preparing, rehearsing, and performing this repertoire, but I have never felt that the tape is a bad performer.⁴⁷

In the previous quote, Stroppa refers to a click track which is somewhat like a metronome, assisting the performer with precise synchronization. Generally, it is transmitted to the performer through earphones and is often necessary for pieces where the pre-recorded electronics are static. Please refer to **Chapter 8 - Conclusion and Future Considerations** for information on recent technological developments with regards to click tracks.

Some pieces with pre-recorded tape parts may be described as fluid interaction⁴⁸ where the coordination with electronics is flexible. For example, in several movements of *Tagore*

⁴⁵ Kimura, Mari. “Performance Practice in Computer Music.” *Computer Music Journal* 19 (Spring, 1995): 71.

⁴⁶ Stroppa, Marco. “Live electronics or...live music? Towards a critique of interaction.” *Contemporary Music Review* 18, Part 3 (1999): 43.

⁴⁷ In fact, depending on the criteria used to judge performers, the tape could be considered the best “performer,” since it is consistent and dependable.

⁴⁸ McNutt, “Performing electroacoustic music: a wider view of interactivity,” 299.

Songs, composer Jane Brockman encourages an improvisatory approach in contrast to the fixed or strict interaction that is necessary in mvt. 4 (*Where roads are made, I lose my way...*).

Coordination with fixed tape parts can be difficult for students, since they may be unable to play at the required tempo. Nevertheless, they can experiment with software and various applications that adjust the tempo of the tape part for practice,⁴⁹ allowing the student to gradually progress to the required performance tempo.

The presence of live electronics often permits greater interaction with the computer partner. Brian Belet refers to this approach as, “meaningful real-time performance interaction.”⁵⁰ Marco Stroppa identifies three categories within the sphere of “interactive systems”: *immediate reaction*, *score following*, and *tempo tracking*.⁵¹ The interactive works in this study fall under the category of *immediate reaction*, which refers to, “the ability to start something... at will and have the system react with no perceivable delay.”⁵² Live electronics often require more sophisticated technology which may not be suitable for some performers unless a degree of technical expertise is attained.

While each type of interaction poses unique challenges, McNutt provides the following perspective, “I want the machine to respond to me and challenge me in ways I could not have imagined, and to nourish my creative expression in performance.”⁵³ There are endless possibilities for exploration and artistic expression. Yoder suggests:

⁴⁹ At present, a number of smartphone apps are available for download such as *Anytune* (iPhone) and *Music Speed Changer* (Android).

⁵⁰ Belet, Brian. “Live performance interaction for humans and machines in the early twenty-first century: one composer’s aesthetics for composition and performance practice.” *Organised Sound* 8, no. 3 (2003): 305-312: 305.

⁵¹ Stroppa, “Live electronics or...live music? Towards a critique of interaction,” 43.

⁵² *Ibid.*, 43

⁵³ McNutt, “Performing electroacoustic music: a wider view of interactivity,” 303.

Because the roles of the performer and computer are so flexible in interactive music, it is important that the roles and responsibilities of the performer are clearly explained by the composer and understood by the performer in any given piece.⁵⁴

Intonation

Musicians will always strive for perfection in intonation. While the challenges are unique to each instrument and each performer, the understanding and control of intonation is fundamental to mastery of the instrument. Simple tools like tuners should be used frequently by all musicians. In fact, the drone function that is available on most tuners may prove to be more beneficial for electronic-acoustic musicians. It encourages the instrumentalist to blend with the purely electronic sound and make adjustments based on what they are hearing; an important skill when performing electronic-acoustic music.

A difficulty with pitch may arise when performing with electronics, especially fixed tape. As with piano and many percussion instruments, the pitches in the tape are fixed.⁵⁵ Whereas many clarinetists will be accustomed to fluctuations in pitch when performing with other instrumentalists, performers now must learn to adapt to the tape.

Instrumentalists are also accustomed to specific tuning standards. A=440 is considered the standard tuning pitch frequency and is widely used in North America, whereas A=442⁵⁶ is used in European countries. A=442 is frequently used in Montreal. Yet, composers often fail to indicate the tuning information in their scores. This simple detail may seem nonessential, yet for the performer it is crucial. Knowing the pitch level will save them time and stress when adjusting to the tape part, especially when specific pitches must be in tune.

⁵⁴ Yoder, "Performance Practice of Interactive Music for Clarinet and Computer with an Examination of Five Works by American Composers," 12.

⁵⁵ However, even piano pitch fluctuates frequently.

⁵⁶ Or as high as A=445.

The student should study the score with the recording, and as they practice with the tape they must indicate specific notes that need to be adjusted in order to match the electronic pitch. The teacher can also help the student identify the tuning standard for the piece, which should then be noted at the beginning of the score so the student will be reminded to adjust their instrument (i.e. tune up or down) before performing the work, or use another length of clarinet barrel.

Balance

From the onset of my study, I anticipated challenges with regards to balance and EQ (equalization)⁵⁷. While sound engineers or technicians are experienced with the techniques for achieving optimal balance and EQ in a variety of settings, performers are often unaware of these challenges, requiring others to control these parameters. Performers should strive to understand the challenges that exist in this area. As Shapiro states:

As with all music, there's going to be a vast difference between the acoustics in a band rehearsal room, and those of the hall where the concert will take place. It's wise to mentally prepare for this during rehearsal, because this difference will be magnified when presenting a piece that includes an audio track. Balances (is the band, or the track, too overpowering?), and basic equalization (is there too much low-end, or any distortion, coming over the speakers?), will always require some attention."⁵⁸

The dress rehearsal is an important occasion to establish optimal balance and ensure all electronics are functioning as expected. If a sound engineer is present, they will ask the musician to perform the softest and loudest moments repeatedly in order to adjust the mix levels, change the placement of the loudspeakers, or experiment with microphone placement.

For a performance of electronic-acoustic music, the dress rehearsal will often take place on the day of the performance due to the set-up of equipment. This is undesirable for many

⁵⁷ Adjustment of volume frequency of bass, treble, etc.

⁵⁸ Shapiro, "The e-Frontier: Electroacoustic Music, Multimedia, Education, and Audiences in the Digital World (Part 1)," 13.

clarinetists who prefer to “save their chops” for the concert.⁵⁹ Like many musicians, performing requires considerable energy and endurance. Thus, a dress rehearsal involving electronic-acoustic music can be stressful and strenuous for the musician due to the close proximity to the concert, fatigue from repetitions of difficult soft and loud passages, and problems with hardware and software.

To save time and avoid frustration, performers should identify the softest and loudest moment in each movement of the piece prior to the dress rehearsal and indicate it in the score for quick reference. They must be ready to perform these passages for their teacher or colleague to receive feedback. The performer must offer a clear but brief description of the ideal balance that is required in the piece so the observer can offer constructive feedback. For pieces that involve pre-recorded electronics, the performer should listen to the tape from the audience vantage point during the soundcheck by walking to different areas of the hall and adjusting the levels of the electronics as needed.

The topic of balance requires further consideration when a performer adopts a self-sufficient approach. In this approach, the difficult task for sound engineers becomes considerably more complicated for the performer. There are several concerns that must be considered:

- From the stage, it is generally difficult, if not impossible, for the performer to discern the balance and EQ as experienced in the audience.
- If the performer recognizes adjustments need to be made, it may be physically impossible to execute the change while performing.

⁵⁹ Elizabeth McNutt suggests that performers often “mark” during the dress rehearsal rather than giving a full performance. She adds, “This can lead the unsuspecting composer to become quite agitated and make potentially disastrous changes to levels at the last minute. The performer and composer must communicate their needs clearly to one another, and should trust one another’s intentions and judgement.” (299) Fortunately, performers who adopt a self-sufficient performance practice, as per my recommendations, can plan the dress rehearsal according to their own needs.

Shapiro likens the experience of performing electronic-acoustic music to an actor performing in front of a green-screen during the filming of a movie.⁶⁰ The actor must be imaginative in order to authentically perform the scene, despite the lack of environmental cues or visual background with which to interact. They must also have an idea of the work that will be completed in post-production in order to act the scene. Performers of electronic-acoustic music are faced with similar challenges because the sound and balance onstage is often considerably different than in the audience. They must use their imagination in order to confidently perform.

Ultimately, the most important skill the performer must learn is to trust their instincts. With experience, the performer will learn to trust their preparation and planning. Crucially, they must gain expertise in the use of hardware and software that will instill the confidence the audience is hearing the piece as intended despite the sound levels experienced onstage.

Simon Emmerson asserts that the performer must have greater awareness of timbral nuance, level sensitivity, and inter-performer balance.⁶¹ In fact, these are concepts familiar to clarinetists, since they are all skills required for good ensemble playing. Thus, playing with loudspeakers may be comparable to performing with chamber musicians. He asserts that, “Loudspeakers, like acoustic instruments, are directional and a similar set of skills to those developed by members of a string quartet but adapted to local electroacoustic projection needs to be developed.”⁶² Emmerson suggests loudspeakers must be closer to the performer to enable greater “local control” and help the performer achieve ideal balance.

Once the self-sufficient musician understands balance, has grown accustomed to performing with loudspeakers, and learns to set the fader levels prior to the performance, they must also have the opportunity to adjust balance during the performance. Instrumental parts

⁶⁰ Shapiro, “The e-Frontier: Electroacoustic Music, Multimedia, Education, and Audiences in the Digital World (Part 1),” 13.

⁶¹ Emmerson, Simon. *Living Electronic Music*. (Aldershot: Ashgate Publishing, 2007): 95.

⁶² Ibid., 96.

may leave little-to-no room for the performer to execute emergency volume adjustments. The choice of equipment plays an important role in permitting efficient on-stage adjustments. For instance, use of a desktop audio interface such as the RME Babyface Pro can be beneficial for stage use as it allows the musician to quickly adjust the inputs and outputs. Performers can also experiment with integrating an expression (volume) pedal into their set-up.⁶³ Composers are encouraged to include more rests in solo electronic-acoustic pieces in order for a self-sufficient performer to make adjustments during the performance in a relaxed manner.

Analysis

Due to growing frustrations by composers and musicologists who lack a traditional score when studying and analyzing this music, several pieces of software have been developed that enable the user to create graphic representations of pieces. One such programme is called *EAnalysis*, produced by Pierre Couprie, Simon Emmerson and Leigh Landy (**Figure 2.1**).⁶⁴ This program is ideal for performers, teachers and students due to its user-friendly design.

Landon Morrison concluded that, “There is no complex system of symbols that must be learned in order to understand the descriptive score, and thus *EAnalysis* seems ideally suited for broad pedagogical applications.”⁶⁵ The “pictorial approach” is certainly a useful tool for performers, and I recommend it to teachers who are seeking new approaches to pedagogy. The software also includes a “loop” function which allows the musician to efficiently practice isolated sections of the tape and video track.

⁶³ The use of additional pedals will need to be programmed into a Max/MSP patch for live electronics pieces. It is important to choose equipment far in advance of the performance so the Max/MSP patch can be programmed accordingly.

⁶⁴ <http://logiciels.pierrecouprie.fr>

⁶⁵ Morrison, Landon. “Graphical Music Representations: A Comparative Study Based on the Aural Analysis of Philippe Leroux’s *M.É.*” *Proceedings of the Electroacoustic Music Studies Network Conference*, Berlin, June 2014: 7.

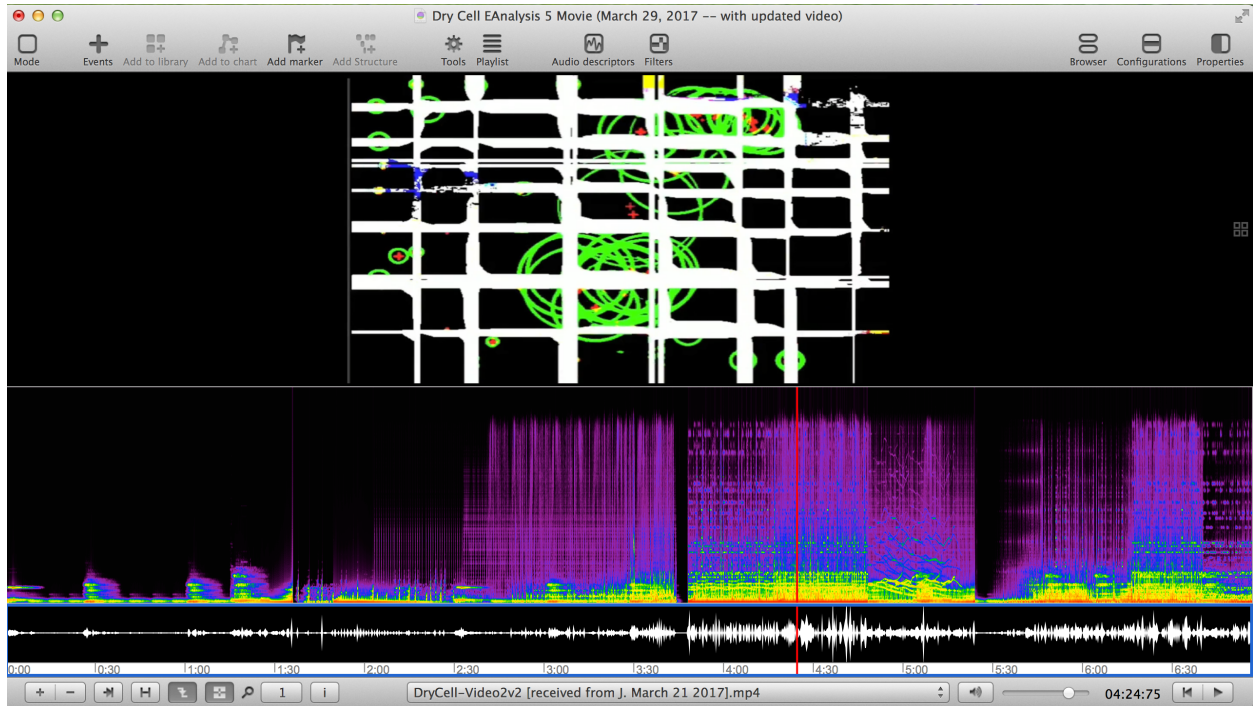


Figure 2.1: Graphical representation of *Dry Cell*, generated with *EAnalysis* software.
Created by Suzu Enns.

Musician's health

Many musicians struggle with injury and health concerns related to performing. This is a topic that should be addressed with students of all ages and abilities, regardless of the type of music being studied. Nevertheless, there are additional problems with possible injury that may emerge when electronic-acoustic music is introduced.

There is greater risk of injury to musicians who perform with clip-on microphones due to the increased weight to the instrument. A neckstrap is highly recommended for clarinetists who perform with microphones like the AMT double clarinet microphone. Another solution is to perform with a microphone on a stand. However, the musician must stand quite still when using this set-up for live electronics, which can result in discomfort and tension.

Musicians who choose to perform with their own equipment may be surprised at the amount of effort and planning involved in transportation. It is common for musicians to suffer

from muscle strain and injury when carrying heavy equipment. Clarinetists can choose more compact clarinet cases and may benefit from the use of a single clarinet case for the B-flat clarinet. I advise clarinetists to carefully consider instrumentation when selecting repertoire for a recital program; if they must also transport electronic equipment, it can prove difficult to carry the Bass clarinet in addition to soprano clarinets. A multi-instrumentalist may choose to present separate recitals on each instrument rather than programming all electronic-acoustic repertoire into one recital.

The risk of hearing damage, already a concern for many clarinetists, increases for electronic-acoustic musicians. Loud blasts from loudspeakers and monitors are common, especially with inexperienced sound technicians. Self-sufficient performers must be extremely careful during rehearsal and performance to ensure they are following the established procedure for changing levels, turning on amplification, and avoiding feedback. It is recommended that musicians have a pair of earplugs in their clarinet case for emergency situations. Attenuating Musician's Earplugs™⁶⁶ can be used regularly, especially during the soundcheck process when establishing the volume levels.

⁶⁶ <https://www.etymotic.com/consumer/hearing-protection/erme.html>.

Chapter 3

Equipment

*You know that everyone is surrounded in private life
with all the gadgets of modern electronic technology,
and therefore with electroacoustics...
However, when someone plays the contrabass,
he says: "Keep away from me with this modern stuff of
microphone amplification, sound transformation, spatial projection."
I think that this is a wrong-headed attitude.*

-Karlheinz Stockhausen, from the 1991 Lecture
at the Freiburg Musikhochschule

3.1 Objectives

An objective for this project was to perform the chosen repertoire with all necessary electronics for my lecture-recital on April 12, 2017. I developed an autonomous approach in which I control every aspect of the performance from set-up of equipment to real-time volume adjustments.

A performer should have sufficient knowledge and skill to: 1) Execute set-ups for their own practice and performance; 2) Operate electronics, such as Max/MSP patches that are designed for performer-control, during the performance; 3) Teach students basic hardware and software set-ups so they can play this repertoire; and 4) Engage in collaborative discourse with composers and technicians.

I call this the **self-sufficient approach**. The principle behind this approach is that the performer oversees and realizes most, if not all, components of a performance involving solo electronic-acoustic music. Performers often assume a passive role in the collaborative process, and I have found that this passivity can result in disappointment and frustration. Indeed, a performer should never stand on stage and feel completely powerless during a concert when the electronics malfunction. The self-sufficient approach by no means removes the need for collaboration, but emphasizes collaboration during the preparation process and a more

independent, autonomous approach for the performer on-stage. Since developing and integrating this approach into my artistic practice, I feel more empowered as an artist, collaborator, and teacher, and appreciate this newfound autonomy.

3.2 Context

Rachel Yoder's 2010 dissertation concerning interactive music features interviews with several prominent clarinetists who specialize in this repertoire. Many of these performers have achieved varying degrees of technological expertise and provide details regarding their chosen equipment and performance practices. One of America's pre-eminent electronic-acoustic artists, clarinetist and composer F. Gerard Errante, describes his practice as follows:

Generally I prefer to control everything myself... In most cases, the composition can be started and stopped by means of a foot pedal. That being said, it is often comforting to have the composer on hand to run things. Of course this is not always possible, especially with touring, so I think it essential that the performer be able to handle all aspects of the presentation.⁶⁷

Errante also states, "I prefer to be self-sufficient, though on occasion the use of interfaces and foot pedals can possibly distract from the music making. In all instances, I believe the attention should be on the music and not the technology."⁶⁸

Bass clarinetist and composer Michael Lowenstern prefers, "self-containment,"⁶⁹ which similarly involves a performer-controlled approach. He adds, "I am quite versed in Max having used it for 20 years."⁷⁰

Clarinetist and composer Laura Carmichael offers an additional perspective:

If there is someone to trust, ideally my own engineer which travels with me, then this is a great help. Sound engineering is an art to itself, and a good one is worth the price. Several times composers of the pieces are quite adept at assisting, but not always, and they may not be able to

⁶⁷ Yoder, "Performance Practice of Interactive Music for Clarinet and Computer with an Examination of Five Works by American Composers," 92.

⁶⁸ Ibid., 90.

⁶⁹ Ibid., 110.

⁷⁰ Ibid., 109.

help with pieces besides their own. Ultimately, I feel I am responsible for making it work. You do need someone with ears in the hall though, there is no way you can check the sound and play at the same time. So try to find people you can trust, and organize this in advance.⁷¹

Likewise, Yoder states the following:

It may be beneficial in some ways to have such total control over the performance, but some performers might prefer a technical assistant to take responsibility for correcting cue errors and mixing output levels. After all, the assistant in the hall is in a much better position to hear the balance and is not preoccupied with performing the solo part.⁷²

As addressed in **Chapter 2**, balance is one of the most challenging aspects of a self-sufficient approach. It is common to have an assistant in the hall who will adjust the balance and EQ in real-time. Yet, the presence of a live sound technician does not always guarantee a successful performance. As an audience member, I have witnessed many performances where the balance is problematic despite the presence of an assistant at the mixer. In many of my own performances where assistants were present, I have been dissatisfied with aspects of the performance including: 1) Balance in the hall⁷³; 2) Onstage monitor levels; 3) Success of the live electronics; and 4) Time-consuming set-up and soundcheck process. Thus, I inferred that with the necessary skills, equipment, and performer-driven software, it may be possible to be autonomous and ensure smooth operation.

Yoder's research indicates that some specialists in the field of live electronics (i.e. electronic-acoustic music) have achieved a degree of self-sufficiency in their practice. Yet, it is also apparent that many of these musicians are also composers, as evidenced by the above-mentioned clarinetists. Thus, their specialized knowledge is to be expected, as Yoder states,

⁷¹ Ibid., 85.

⁷² Ibid., 59.

⁷³ As relayed to me by members of the audience as well as my study of recordings.

“Many of the clarinetists interviewed were also composers who primarily perform their own works, so they described themselves as very proficient with the software.”⁷⁴

3.3 Problem statement

In my performance practice, a growing concern has been the lack of access to basic equipment and instruction that considers the needs of performers. Despite my growing interest and experience with this repertoire, I have continued to feel disempowered and disengaged due to my lack of knowledge in the software and hardware domains. Therefore, a crucial step of my research and artistic practice has been to overcome these obstacles.

Currently, many instrumental instructors are ill-equipped to help their students with software or hardware requirements in electronic-acoustic repertoire. Therefore, the student must seek help elsewhere. Essentially, the majority of students will not play this repertoire at all due to a number of factors: 1) Lack of exposure; 2) There are seemingly impossible limitations with regards to the electronics; and 3) Their teachers don't have any experience with the repertoire or required technology.

3.4 Research questions

I developed the following research questions that guided my investigation and experimentation with regards to equipment:

- What equipment is required for the performance of the chosen repertoire?
- Can this equipment be used for a broad range of electronic-acoustic pieces?
- Is the equipment performer-friendly?
- Can the novice performer learn how to use the equipment with some basic instruction and practice?
- What equipment can be integrated into the teaching studio?
- What equipment is appropriate for use by students?

⁷⁴ Yoder, “Performance Practice of Interactive Music for Clarinet and Computer with an Examination of Five Works by American Composers,” 27-28.

- Is the equipment portable?
- Is the equipment readily available in local stores and/or online?
- Can the performer integrate the equipment into a self-sufficient performance practice?

3.5 Procedure

Regarding the equipment, I adopted the following procedure for my research:

- Identify** the basic equipment needed for live electronic-acoustic performance.
- Gain** a basic knowledge of the purpose and function of the equipment.
- Consider** my personal performance needs and the needs of the repertoire.
- Research** the various options on the market by reviewing company websites and seeking advice.
- Purchase or borrow** equipment as needed.
- Acquire skill** in the basic use and function of the equipment and **practice**.
- During the post-recital reflection, **evaluate** the effectiveness of the chosen equipment and my ability to integrate it into my performance practice.

3.6 Purchasing equipment

Throughout my research, I had access to a wide variety of equipment and software at McGill University's Digital Composition Studios (DCS). However, I chose to purchase most of my own equipment as a result of several factors, notably the limited access for practice purposes. Essentially, I found that in order to adequately practice and experiment with the electronics for each of my pieces, I required unlimited access to the equipment. An additional consideration is that upon graduation, I will no longer have access to institutional equipment. Further, much of the equipment I chose for my set-up was unavailable at the DCS, thus my only option was to purchase.

When performers own their own equipment, they establish independence and can practice at any time and learn to become self-sufficient. The performer can take full responsibility to ensure that all equipment is functioning properly, thus minimizing the risk of

complication in rehearsal and performance. The performer can also incorporate the equipment into their teaching practice.

3.7 Summary

I concluded that a self-sufficient approach to performance was ideal for my purposes as a performer and pedagogue. I have identified that a performer should have sufficient knowledge and skill to be able to execute set-ups for their own practice and performance. Furthermore, performers and instructors must teach students basic hardware and software set-ups so they can play this repertoire. Additionally, musicians have a responsibility to engage in a collaborative dialogue with composers and technicians. Please refer to the final chapter of this document for more conclusions and future considerations.

List of equipment

In **Appendix B**, you will find detailed information on the equipment that should be integrated into the musician's basic set-up. My recommendations are based on personal experience (i.e. repertoire requirements, rehearsal needs, logistical planning, and accessibility of equipment), collaboration (i.e. feedback, advice from experts, and discussions with my collaborative computer music designer, Takuto Fukuda), and research (i.e. websites, product manual, and choices of other musicians in the field).

Detailed stage set-ups are provided for each piece. The layout was suitable for the repertoire, equipment, venue, and personal preferences (e.g. since I am right-handed, I prefer to situate the laptop, audio interface, and pedals on my right).



Figure 3.1: A selection of equipment used for the recital. *Clockwise from top left:* Logidy UM13 Parametric USB MIDI Foot Controller; USB expander hub; RME Babyface Pro audio interface (with USB cable); Digiflex XLR cable; AMT Clarinet double-microphone (with cable and belt pack); Roland EV-5 Expression Pedal. *Middle:* Macbook Pro 13 inch.

Chapter 4

***ektenes III* for clarinet, tape and digital signal processing (1995-1)**

By alcides lanza

“Fire” very much describes lanza’s passionate music and energetic personality, but I also think that one could equally choose “water” — the element associated with life, growth, and above all, endurance.

-Pamela Jones, *Compositional Crossroads*⁷⁵

4.1 Composer Biography

alcides lanza (b. 1929) began his musical studies in Buenos Aires at the Di Tella Institute where he studied with Alberto Ginastera, Luigi Dallapiccola, Olivier Messiaen and Bruno Maderna.⁷⁶ Later, he moved to New York City and from 1965-1971 he worked at the Columbia-Princeton Electronic Music Centre.⁷⁷ In 1971 he was invited by Bruce Mather to join the Faculty of Music at McGill University (Montreal). He was a Professor of Composition and Director of the Contemporary Music Ensemble. Additionally, for more than 30 years he served as Director of the McGill Electronic Music Studio (EMS), today known as the Digital Composition Studios (DCS).⁷⁸

4.2 Introduction to *ektenes III*

ektenes III was composed in 1995⁷⁹ and published by lanza’s publishing company, éditions shelan publications.⁸⁰ The work was commissioned by, and dedicated to, Canadian

⁷⁵ Jones, “The Soles of the Feet: alcides lanza Reconnects with his Roots,” 224.

⁷⁶ Ibid., 56.

⁷⁷ Ibid., 56.

⁷⁸ Since 1968, the EMS/DCS has been a prominent educational institute within McGill and recognized nationally as “a leader in promoting the integration of electronics and live performance.” (Jones, “The Soles of the Feet: alcides lanza Reconnects with his Roots,” 62) For more information, please visit <http://www.music.mcgill.ca/dcs/>.

⁷⁹ 1995-1 means this was the first work he composed that year. Please note that this is lanza’s third work to bear the name *ektenes*; he composed *ektenes I* for columbine and amaranth with optional tape (1985-III), and *ektenes II* for oboe and percussion (1987-IV).

⁸⁰ *shelan* is a combination of two family names: “she” for the singer Meg Sheppard, lanza’s wife, and “lan” as in lanza.



Figure 4.1: lanza (pictured right), with Kevin Austin, McGill University EMS (now DCS).
Photo credit: alcides lanza.

clarinetist Jean-Guy Boisvert, who collaborated with lanza to prepare the pre-recorded clarinet sounds on the tape part. It was premiered on October 18, 1995 in Pollack Hall, McGill University.

lanza offers the following program notes for *ektenes III*:

***ektenes III** is an invocation for the man alone, surrounded by the myriad events of the cosmos... a contemporary **aulos** or **imbubu player** whose litany is answered via electronic or digital events/sounds.*

Conveniently, lanza also provides definitions for those words that may be unfamiliar to the performer or audience:

ektene: also 'ectene', 'synapte' [Gr. *ektenés*: abundant, extended, to prolong]

synapte: Eastern China: a litany

litany: a ceremonial, liturgical form of prayer consisting of a series of invocations or supplications, with responses which are repeated a number of times.

imbubu: instrument of ancient Babylon mentioned in texts from ca. 800 B.C. It may have denoted a conical double-reed instrument.

In *The History of Musical Instruments*, Curt Sachs refers to the *imbubu* as well as the related *ambubaiae*, the, “Syrian girls of ill fame who resided in the basement of the Roman circus and earned their living by pipe playing and a less honorable trade.”⁸¹ Since the *ambubaiae* were female musicians,⁸² it is unclear whether lanza has envisioned this invocation specifically for a man or used the male pronoun in a neutral context. Therefore, it may be suitable for the modern performer to modify lanza’s program notes in order to reflect their own gender or sexual orientation.⁸³

4.3 Relevance to my study

This piece presents many unique challenges for the performer, teacher, and student. The score is graphically notated, with the tape part represented in rhythmic approximation.⁸⁴ Thus, it was necessary to consider pedagogical approaches that address these elements of the score in addition to the interaction and coordination between clarinet and electronics. Additionally, I was able to consider new possibilities for a self-sufficient approach to performance through the integration of a stand-alone Max/MSP patch and foot pedals.

4.4 Interpretation of the written score

Provided in the score are three pages of performance and technical instructions. The musical score is also three pages in length. The performance score is 11 x 17, landscape format. The score is also available for reference in 8 1/2 x 14, landscape format. I acquired copies of both versions; I chose to perform from the latter for practical and aesthetic reasons. Practically, it is more convenient to transport a smaller score in a compact clarinet case.

⁸¹ Sachs, Curt. *The History of Musical Instruments*. (New York: Dover Publications, 2006): 119.

⁸² <http://www.perseus.tufts.edu/hopper/text?doc=Perseus:text:1999.04.0063:entry=ambubaiae-cn>

⁸³ For example, “*ektenes III* is an invocation for the woman alone...” is suitable for a female clarinetist. This modification, or clarification, may be particularly useful when providing written or spoken program notes for a concert.

⁸⁴ In the technical instructions, lanza explains that, “pitch areas and timbral mixtures [are] only roughly suggested.”

Additionally, it is possible to perform the work using one music stand, whereas the 11 x 17 score necessitates the use of two music stands which I have found creates a greater physical barrier between the performer and audience. However, since the music is scaled down for the 8 1/2 x 14 score, it may be difficult to read all details (such as small notes) during a performance. The performer may need to rely on memorization of small details since the score is dense.

Hybrid Notation

On the score, the staff is divided into three parts. The top line provides information regarding the electronic extensions, which first appear in m. 6 where **FOOT PEDAL** is indicated. Each number that appears in the diamond shape is a cue for the performer to press the pedal or for the computer assistant to advance the live electronic effect.

The middle line is reserved for the clarinet part. It features several of lanza's innovative forms of notation which he originally explored in the 1960's. In *ektenes III*, he has utilized a method of notation which Pamela Jones refers to as *hybrid notation*.⁸⁵ As the name suggests, lanza combines several forms of notation, a method he adopted later in his career.

The most recognizable form of notation in *ektenes III* is *conventional notation*, commonly identified as *traditional notation*,⁸⁶ as seen in **Figure 4.2**.



Figure 4.2: mm. 26-27 of *ektenes III*, demonstrating lanza's use of *conventional notation*. Note the x2 indications, signalling to the performer to repeat the musical material within the box.

⁸⁵ Jones, "The Soles of the Feet: alcides lanza Reconnects with his Roots," 91.

⁸⁶ Ibid., 91.

Another form of notation is the *trigram*, having three horizontal lines representing extreme high, middle, and low ranges.⁸⁷ Notes within the specified range can be freely chosen by the performer. An example of the *trigram* is provided in **Figure 4.3**.

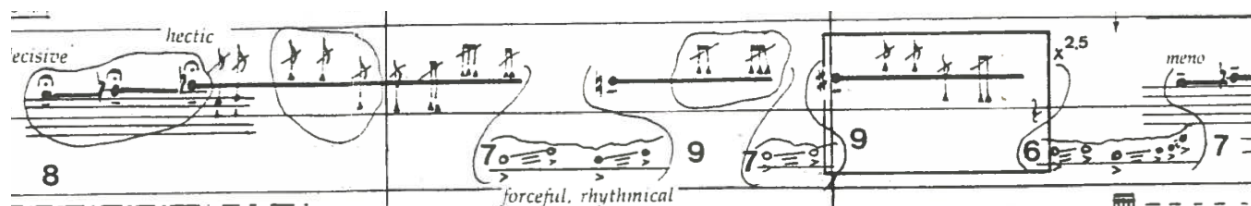


Figure 4.3: mm. 18-20 of *ektenes III*, demonstrating lanza's use of the *trigram*. Note that the excerpt begins and ends with conventional notation.

The third category that comprises lanza's *hybrid notation* is *graphic notation*. While lanza has written a number of works that include *pure graphic notation*,⁸⁸ *ektenes III* features more basic graphic notations, particularly in the notated tape part.⁸⁹

Combinations of these forms of notation can be identified throughout the piece, as demonstrated in the following example (**Figure 4.4**).

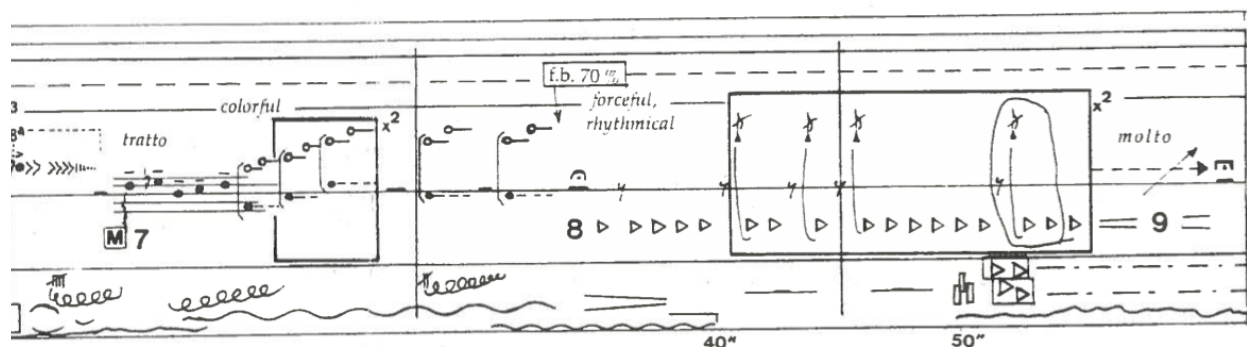


Figure 4.4: mm. 18-20 of *ektenes III*, demonstrating lanza's use of *hybrid notation*.

⁸⁷ Ibid., 86.

⁸⁸ According to Jones, lanza incorporated *pure graphic notation* into his scores in the years 1967-1971. These "abstract graphic designs" (Jones, 89) are reminiscent of graphic scores by such composers as John Cage or Tom Phillips.

⁸⁹ As described under "graphic representation of the tape part" in the performance notes.

The excerpt in **Figure 4.4** begins with an extreme altissimo note (freely chosen based on the *trigram* notation), followed by accent shapes that lanza describes as a “*phony feedback effect [strong initial attack, then repeated echoes with diminishing dynamic levels]*”. Following a rest,⁹⁰ the “M” indicates “*mumbling, shouting incoherently through/around the mouthpiece*” followed by an ascending “squiggly” line, suggesting fluctuating pitch or intensity of the voice while mumbling.⁹¹ This simple shape is a form of *graphic notation* and each iteration offers an opportunity for the performer to freely experiment and choose an approach that suits their preferences, vocal type and abilities. Next, five notes marked with *tenutos* are notated in *conventional notation*, albeit without vertical note stems, followed by a vertical bracket indicating that the clarinetist should play the “*real notes together with harmonic sounds.*”⁹² It is recommended that the clarinetist choose strong multiphonic fingerings that follow the upward progression that is graphically represented, concluding in the middle of m. 19. Following another rest (marked with a *fermata*), the performer is required to perform “*forceful, rhythmical*” low-pitched tones, notated in a *trigram* using *graphical representation* in the form of a sideways triangular shape⁹³ (described by lanza as the “*lowest possible forceful tone, pedal tone*”). The performer must adhere to the rhythmical patterns and precise repetitions, and the altissimo grace notes (notated with a “slash”) should be played crisply (perhaps even stridently) followed by an immediate return to the low, forceful E. Throughout this section in m. 20, the energy and volume increase in conjunction with the tape part and the clarinetist must continue to *crescendo* and *accelerando* until the release at the rest.

⁹⁰ The rest is placed over the staff and suggests the general length of a half rest (two beats) rather than a whole rest.

⁹¹ Naturally, the performer may interpret this ascending line as a rising pitch or intensity of the voice.

⁹² Here, the “real notes” refer to the lower, black notes which are roughly notated as F, A, and C in m. 18.

⁹³ This shape is commonly associated with a “play” button.

At the end of each staff of the score, lanza indicates the time in minutes. This indication is an important marker that can be used to improve coordination with the tape, especially during rehearsal. Each staff lasts 1 minute, as indicated by the numbers at the end of the staves. However, the third staff on page 2 lasts twice as long as the other staves, as indicated by the 6 minute mark (which occurs during the “free” part) and the 7 minute mark at the end of the same line.

With regards to lanza’s methods of notation, Jones offers the following general remarks:

To those who take the trouble to understand its mechanisms, lanza’s notation is remarkably clear. He wants to give the performers certain liberties but at the same time, to retain important creative decisions. He controls the overall scenario — the general sequence of music and text — and specifies when and for how long each event occurs within the drama, but leaves many of the moment-to-moment details up to the performer.⁹⁴

The first and most crucial step to interpretation requires careful study of the information provided on the first three pages of the score. lanza divides the introductory guidelines into three sections: **performance indications**, **electronic extensions**, and **graphic representation of the tape part**. Jones notes the importance of studying these detailed guidelines, suggesting that, “Since many of these signs appear in a number of lanza’s works, performers who have mastered one of his pieces will have a much easier time learning a second or third work.”⁹⁵

4.5 Available recordings

Jean-Guy Boisvert released a studio recording of *ektenes III* on his CD *Amours* (2003).⁹⁶

Boisvert’s interpretation of the first section is steady and deliberate.⁹⁷ In mm. 6 and 7 (marked “*edgy*”), he continues to perform in a slow and deliberate style, which emphasizes the

⁹⁴ Jones, “The Soles of the Feet: alcides lanza Reconnects with his Roots,” 88.

⁹⁵ Ibid., 93.

⁹⁶ Available from the Canadian Music Centre website, <https://www.musiccentre.ca/node/30905>.

⁹⁷ Performed with intention; precise and direct.

repeat effect. The “*mumbling*” effect is audible throughout the piece, first demonstrated in m. 7. Curiously, there appears to be a post-production decision in m. 10, since there are audible differences in the timbre of some tremolos. At m. 13, Boisvert plays with a softer and gentler dynamic than we may expect for *forte*, leading into the dramatic entrance of the tape in m. 14. It is notable that, due to Boisvert’s overall relaxed pacing, he necessarily omits some of the written repeats (e.g. the first box in m. 16 should be played 2.5 times). He effectively executes the “*forceful, rhythmical*” indication in mm. 19-20; he plays the low note patiently and steadily, contrasting it with a crisp altissimo note. With regards to the “*mumbling*” effect at m. 23, he incorporates active vocalizations, then pauses to leave room for the feedback effect in the electronics. Overall, Boisvert performs at a slow, relaxed pace and refrains from exaggerating the tempo of certain passages. By taking time for the electronics to be audible, he demonstrates that he is sensitive to the interaction with tape and live electronics. At the end, he abruptly stops on E-flat during the repeated quintuplet figure rather than repeating the pattern to *niente*.

Simon Aldrich is featured on *Canadian Composers Portrait: Alcides Lanza*, released in 2007.⁹⁸ For this live recording from February 2002, Luc Maltais is listed as the DSP (digital signal processor) engineer.

Aldrich performs in a more energized and erratic manner from the start; this interpretation is noticeably different from Boisvert’s approach. His pacing and careful coordination with the tape demonstrates careful study of the tape part. In particular, he matches the shape of the phrases as they appear in the tape part. Throughout, he plays very precisely, with a clear, vibrant tone. While his “*mumbling*” effect is less vocal than Boisvert’s, his balance of vocalization and clarinet pitch is impressive. His transition into m. 14 is an outstanding feature of this performance; he maintains a powerful, loud sound that blends with the tape. During the

⁹⁸ Available from the Canadian Music Centre website, <https://www.musiccentre.ca/node/40834>.

trigram section in mm. 14-16, he chooses a variety of altissimo notes; this interpretation is effective yet is also a unique choice. Since the notes appear in the same location on the staff above the line, it may be assumed that the chosen altissimo note should be repeated. He has also chosen strong multiphonics for mm. 17 and 18. In comparison to Boisvert's recording, the live electronics at the conclusion of the "*mumbling*" ascending run (m. 23) are de-emphasized. However, he accentuates the "tender melody" in mm. 26-27. At the end of the piece he performs the quintuplet motive multiple times and, similar to Boisvert, ends the pattern on E-flat.

Susan Strunc has a live concert recording available online through the Canadian Music Centre's *Centrestreams* service.⁹⁹ However, please note that at this time, there are several errors in the online catalogue information.¹⁰⁰ Nevertheless, this is the most accessible recording of the work since it can be streamed online free of charge.

Strunc's timbre is warm and round, yet lacks some of the vibrancy that was achieved by the other performers. Strunc lingers on some melodies, choosing a patient and relaxed pacing for her performance. The "*mumbling*" effect is less prominent than in the other recordings. Additionally, it is significant to hear how the "*mumbling*" effects can differ for men and women. I would have liked to hear more of the effect in the high female tessitura, and I think it is a compelling notion to have recordings available that reflect a variety of vocal tessituras rather than exclusively male tessituras.

It is also notable in this recording that the live electronics are slightly quieter than in previous examples. This could be a result of the recording techniques for the performance and may not reflect the live experience.

⁹⁹ Available at <https://www.musiccentre.ca/node/31341>. Please note that in order to listen to archival recordings on the CMC website, a free account must be created at <https://www.musiccentre.ca/user/register>.

¹⁰⁰ For example, the performer is identified as as *Susan Strum, flute*, rather than *Susan Strunc, clarinet*.

4.6 Technological requirements

To perform *ektenes III*, there are three fundamental technological requirements:

amplification, tape, and digital signal processing.

Amplification: In the performance notes, lanza indicates that, “the clarinet should be slightly amplified, at all times.” He suggests the use of a contact microphone designed for the clarinet. As described in **Appendix 2 - List of Equipment**, contact microphones attach directly to the body of the instrument (i.e. they make direct contact with the instrument). For this piece, contact microphones are preferable in order to ensure successful integration of the live electronics. As with the other works in this study, I perform with the AMT double clarinet microphone. Additional recommendations for microphones can be found in the **Appendix 2**.

Tape: It was necessary to contact the composer directly in order to obtain the performance materials. For rehearsal purposes, lanza sent me an email with the mp3 (9.3 MB) version of the tape part, and later provided the higher quality WAV. audio file (105.8 MB) which is preferable for live performance.

Live electronics (i.e. digital signal processing): The live electronic effects were originally programmed using analog, multi-effects units that the performer controlled with a foot pedal. The composer and myself are unaware of any performers except for Boisvert who have adopted this system. Instead, other performances have been made possible using a Max/MSP patch controlled by a technician. For my performance, I adopted a self-sufficient approach whereby I controlled a reconstructed Max/MSP patch, foot pedals and live sound.¹⁰¹

¹⁰¹ On March 24, 2017, a *Celebration of alcides lanza*, which included a concert and panel discussion, was presented at the *43rd Annual Conference of The Society for American Music* in Montreal (Le Caf Conc, Marriott Château Champlain). alcides lanza and Meg Sheppard performed several works for voice and/or piano and electronics, several of which require both tape and live electronics. However, during this performance, no live electronics were used. As evidenced by this approach, I suggest that a clarinetist can perform *ektenes III* with tape if it proves impossible to incorporate live electronics.

4.7 Creation of Max/MSP patch

The composer provided a basic Max/MSP patch that was originally created for a concert in Venezuela. With the help of McGill Doctoral student Takuto Fukuda, this patch has been reconstructed to enable the advancement of the programs with a foot pedal.¹⁰²

When I received the basic Max/MSP patch from Ianza, I visited the Digital Composition Studio at McGill in order to test the file. Richard McKenzie, the Technical Director of the DCS, provided assistance for deciphering the patch. I took detailed notes on the functions of the patch. This patch was created for use by a technician, who was responsible for closely following the score during performance and activating the electronic effects in real-time.

In the score, Ianza originally envisioned 16 pedal cues. He omits pedal indications for the 3rd and 4th electronic effects. In order to identify the pedal cues for my performer-controlled realization, I collaborated with McKenzie and Fukuda. We closely examined the score and discussed various options for the cues, in addition to the practicality of performing them with a pedal. It was necessary to identify the precise number of cues in order to program the sequence of cues into the new Max/MSP patch, in addition to notating them into my score for practice.

For our adapted approach, there are a total of 33 pedal cues. The detailed cue sheet can be found in **Appendix C**. This chart documents my method for performing the piece. The comprehensive sequence of instructions can serve as a model for other performers to replicate or adapt.

To the best of my knowledge, I am the first performer to utilize an adapted stand-alone Max/MSP patch for this piece that is performer-controlled and allows me to pedal to advance each effect (**Figure 4.5** shows a screen-shot of the final performance patch). The use of this patch ensures that the self-sufficient performer or student can practice and perform the piece at

¹⁰² Fukuda also noted several problems in the basic patch we received that were inconsistent with the Ianza's instructions in the score. Therefore, he maintained the same framework of the basic patch but restored the effects to Ianza's original specifications.

their convenience without the need for technical support. The performer is also empowered by the freedom to trigger each effect, thus improving the coordination and opportunity for interaction between all components.

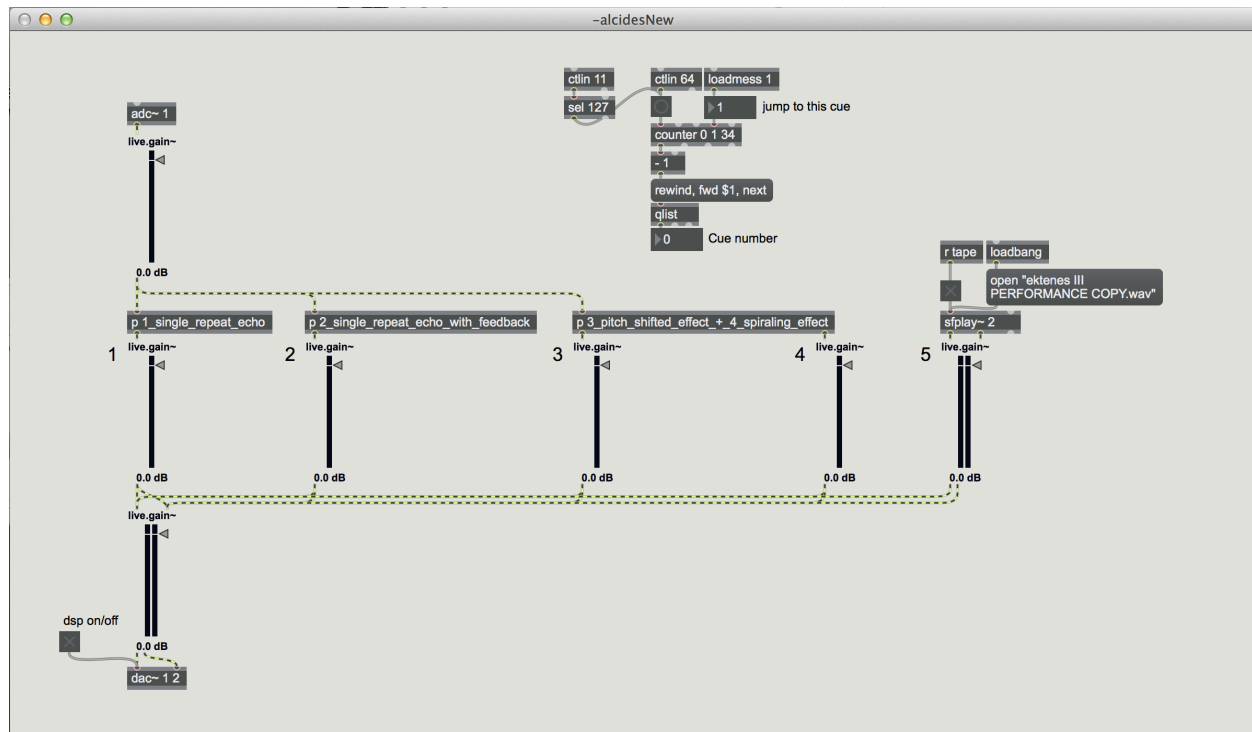


Figure 4.5: Stand-alone Max/MSP patch for *ektenes III*.
Created by Takuto Fukuda.

4.8 Stage set-up

As discussed in **Chapter 2**, stage maps are an invaluable resource for efficient set-ups. While creating the stage maps for the chosen repertoire, I prioritized certain features such as clarity, tidiness, attention to detail, and optimal positioning of the equipment in relation to the central component — the performer. The stage maps are computer-generated and contrasting colours have been randomly selected to permit quick and easy assimilation. Conveniently, the map in **Figure 4.6** can be used for *ektenes III*, *Tagore Songs*, and *Dry Cell*.

The process for learning a piece cannot begin without acquiring the score; certainly the most critical component for the performer. Fortunately, I already had a copy of the score in my personal library. I later acquired the tape track from the composer; the Max/MSP patch was finalized closer to the performance. I recommend that performers and teachers acquire all necessary materials as early as possible, preferably at the same time, so they can integrate all components of the piece into their preparation and ensure that changes can be made to the software or hardware, if necessary.

My process began in the practice studio with a comprehensive overview of the score. I familiarized myself with the score layout, timings, and overall sequence of musical events. This preliminary study allowed me to identify the technological requirements and plan accordingly.

The score is dense and required slow and careful practice of each measure. I found it useful to write traditional dynamics alongside the number system in addition to *accel.* and *rit.* indications in the corresponding locations. As previously addressed, it is crucial for the performer to become familiar with Ianza's notation by studying the performance indications at the beginning of the score. Although I typically practice larger sections of a work at this preliminary stage, it was necessary to concentrate on one or two measures during each practice session. Due to the complexity of the clarinet part, I prioritized accuracy from the preliminary stage to the performance.

At first glance, a prominent feature of the score is the extended techniques. I identified the techniques on a scale ranging from least complex, which are essentially extensions of traditional techniques (e.g. extended altissimo range) to most complex, requiring experimentation and research (e.g. multiphonics). I used this basic identification system to develop a practice plan, thus ensuring that I addressed these extended techniques early in the process so I could execute them as comfortably as possible.

Before I received the practice tape part from the composer, I spent significant time listening to available recordings. I also practiced along with the recordings, which enabled me to practice coordination by playing along with the performer, a technique I call *shadowing*. I primarily utilized Simon Aldrich's recording for this exercise because it was the first one I acquired. In addition, his interpretation is precise and clear, thus making it easy to follow.

As with the other works on the program, it soon became apparent that a considerable amount of time must be spent on technological requirements. As proposed in **Chapter 2**, this work is imperative to the preparation process. Indeed, when studying electronic-acoustic music, time spent listening to the tape part, creating Max/MSP patches, practicing the hardware set-ups, etc. must be considered practice time. This is a fundamental concept that must be understood and accepted by any performer who wishes to adopt the self-sufficient performance approach. This approach is an extension of "practicing away from instrument" of which many performers and teachers are proponents. The experimentation and learning process included:

- Collaborating with colleagues on the adaptation/creation of the Max/MSP patch.
- Testing the patch on various computers.
- Addressing problems by making detailed notes and reporting back to Takuto Fukuda.
- Practicing with the patch to ensure smooth operation.
- Incorporating the patch and pedal into my instrumental practice.

4.10 Pedagogical recommendations

a. Creation of study scores: Provide the student with an example (for this piece or another piece). Two parts should be created; one part should isolate the electronic extensions and clarinet, and the second part should be for tape alone. The student can use *Photoshop* or utilize tools in *Adobe Reader/Preview*, or they can manually cut and paste from a photocopy of the score (reproductions by permission of the composer). The student should utilize the segregated scores during practice and listening exercises.

b. Study of graphic notation: Introduce the student to non-traditional forms of notation. Discuss principles and purposes of graphic notation. Present a few examples of scores and brainstorm approaches to interpreting the scores (simple and general). Have the student compose a short piece that includes non-traditional forms of notation. There are no right or wrong approaches! The student should be encouraged to be creative and “think outside the box.”

c. Practice strategies:

-Write in the dynamics: Students are accustomed to reading traditional dynamic markings and may not respond as quickly to Lanza’s system of numbered dynamics. The student will certainly have improved success if they indicate the traditional dynamic markings alongside Lanza’s numbered dynamics.

-Multiphonics: Introduce the student to a number of clarinet multiphonic fingering charts. With these resources, the student will have access to a wide selection of multiphonics with which to experiment and identify some “go-to” fingerings (that they will be able to integrate into additional repertoire!).

-Vocalization (“mumbling”): Encourage the student to explore the full range of their voice. If the student is new to vocalization techniques (grunting, etc.), instruct them to pick a note on the clarinet (mid-range). They will play the note for several seconds, then attempt to sing the same note. Next, they can progress to gradually ascending and descending the sung pitch, so they begin to hear the fluctuating “beats” and feel the air pressure and vibrational changes in the mouth (especially the throat). After the student has time to practice these initial exercises, the teacher must determine the student’s particular strengths and weaknesses, vocal range, etc. and continue to explore personalized solutions for performing this effect.

-Choose notes and tremolos: There are many sections of the piece where the clarinetist is required to decide on a variety of parameters. Encourage the student to experiment with various notes and explore the full range of the clarinet. For the tremolos, the student should experiment with different pitch and interval combinations. Ultimately, the student should make final decisions based on musical factors as well as their personal preferences and abilities. The student should also be able to explain their

reasoning to the teacher. Throughout the process, the student must record all notes, fingering choices, and other important details in their score.

-Practice with recordings: The student should practice with an available recording. The student will play along with the clarinetist in the recording, allowing them to practice coordination, pacing, dynamics, phrasing, etc. However, the recording is to be used as a model only; the teacher must discourage the student from copying all aspects of the recording. It is recommended that the student plays along with the recording and tape alone in equal amounts. They should start to hear where problems arise and make adjustments accordingly. Once they are comfortable with the coordination, musical phrasing, etc., they should avoid playing along with the recordings.

Chapter 5

Tagore Songs for Clarinet in Bb with Prerecorded Digital Sounds on CD **By Jane Brockman**

*Listen...and find yourself in the exotic realm of imagination.
Let your ears soar to music of expansion, spaciousness, and dissolution.*

-Jane Brockman¹⁰³

5.1 Composer biography

American composer Jane Brockman (b. 1949) earned a Doctorate in Music Composition from the University of Michigan, Ann Arbor.¹⁰⁴ During her studies, she experimented and gained technical expertise in the electronic music studio.¹⁰⁵ She also received Fullbright/Alliance Française and Rackham fellowships to pursue studies in Paris and Vienna.

Brockman has been on the faculties of several universities across the United States. Notably, Brockman was an Associate Professor of Music Theory and Composition at the University of Connecticut-Storrs,¹⁰⁶ where she successfully founded the Computer Music Studio in 1981.¹⁰⁷ She has enjoyed a career as a composer for concert music, dance, and film. Brockman is currently based in Santa Monica, California and devotes her time to composing and freelancing.

¹⁰³ Composer's website. <http://www.janebrockman.org>.

¹⁰⁴ Incredibly, she was the first woman to earn a Doctorate in Music Composition from the University of Michigan, Ann Arbor.

¹⁰⁵ Hinkle-Turner, Elizabeth. *Women Composers and Music Technology in the United States: Crossing the Line*. (Aldershot: Ashgate Publishing, 2006): 103.

¹⁰⁶ http://www.music.umich.edu/alumni_donors/alumni/documents/2009SMTDALumniBoardBios.pdf

¹⁰⁷ Hinkle-Turner, *Women Composers and Music Technology in the United States: Crossing the Line*, 104.

5.2 Introduction to *Tagore Songs*

Tagore Songs was composed in 1997 and dedicated to two prominent American clarinetists, William Powell and F. Gerard Errante, with whom Brockman has collaborated with on many occasions.¹⁰⁸

William Powell, a former clarinet faculty member at the California Institute of the Arts (CalArts),¹⁰⁹ is highly regarded as an expert in the performance of Indian music.¹¹⁰ Thus, Brockman was inspired to incorporate elements of Indian music. In the clarinet and pre-recorded electronic parts, she incorporates timbres, rhythms, and instruments¹¹¹ that are reminiscent of Indian music and may be familiar to Western audiences. However, she maintains that she did not attempt to “produce a faux imitation” of Indian music. Thus, *Tagore Songs* should not be regarded as authentic Indian classical music.

The title of the work may be examined in order to identify an additional source of inspiration for Brockman. *Tagore* refers to Rabindranath Tagore, the prolific Bengali poet, philosopher, mystic, painter, and musician. Brockman chose fragments of Tagore’s short stories and poetry for the titles of the four movements:

- I. A lurid glow waxes and wanes on the horizon... what was sorrow has now become peace.
- II. ...Swept by the mad cadence of the storm
- III. ...Reflected... from a far off world... and vanished!
- IV. Where roads are made, I lose my way

Excerpts of three poems are included in the score: “*The Child*,” “*The Fugitive*, and *Other Poems*,” and “*Fruit Gathering*”. Brockman does not indicate the sources of all fragments. Thus, it was beneficial to acquire a copy of *A Tagore Reader*¹¹² that Brockman used for her own study.

¹⁰⁸ Brockman’s other works for clarinet include *Circles in the Sun*, *Tenacious Turns*, and *Ningana*.

¹⁰⁹ <http://blog.calarts.edu/2014/11/04/revered-clarinet-faculty-william-powell-gives-farewell-concert/>

¹¹⁰ He studied and lived in India from 1993-1994 (<http://www.williamepowell.com/bio.html>).

¹¹¹ For example, tabla can be heard in the tape part of mvt. 3.

¹¹² Tagore, Rabindranath. *A Tagore Reader*, ed. by Amiya Chakravarty (Basingstoke, UK: The Macmillan Company, 1961).

With this resource, I was able to find additional poems and short stories in their complete form by searching for the fragments. For example, I discovered the fragment for mvt. 2. in *The Fugitive, and Other Poems*, the same poem in which Brockman excerpted a fragment for mvt. 1.¹¹³ Tagore's poem reflects the vigorous and "stormy" characteristic of the clarinet part. At the beginning of the movement, the "gusts of wind" can be perceived in the ascending and descending passages; the sextuplet chromatic runs push the momentum forward and evoke powerful gusts of wind and heavy showers, while the sixteenth note descending runs on beat 2 and 4 provide a brief moment of respite ("fitful pauses") before the gusts return (**Figure 5.1**).

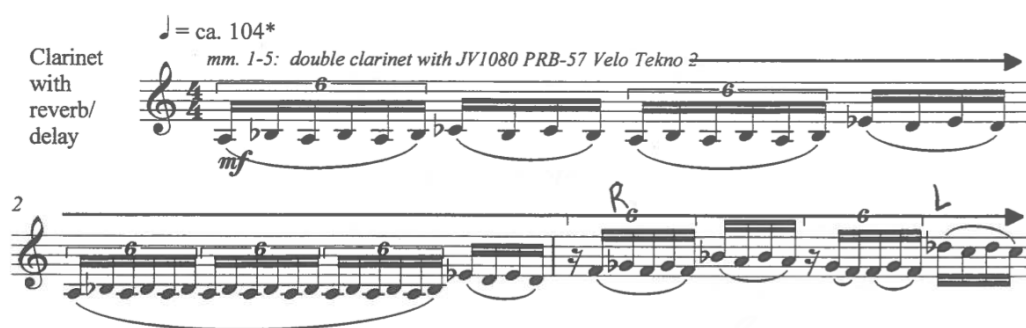


Figure 5.1: *Tagore Songs*, mvt. 2, mm. 1-3.
Used by permission. Markings provided by the author (S.E.).

With regards to the mvt. 3 title fragment, I was unable to identify the source of the poem or short story. Therefore, I chose to explore other writings from Tagore. I was able to locate the title of the short story, *The Hungry Stones*, by simply conducting an online search. Although I was unable to locate the precise fragment of this short story in *The Tagore Reader*, several other stories resonated with me and inspired my imagination and interpretation of Brockman's work.

The work is published by *Diaphanous Music*. I acquired the score and corresponding CD by contacting the composer directly.¹¹⁴

¹¹³ Please note that there are small differences between the original poem and Brockman's version.

¹¹⁴ The composer can be contacted through her website, <http://www.janebrockman.org>.

5.3 Relevance to my study

This work was selected based on a number of musical and technological elements. The musical material, although technically challenging for the clarinetist in some sections, is uncomplicated. Traditional notation is employed and descriptive cues are provided to aid in coordination and study. Among the works that have been selected for this project, this is the most accessible piece for students. The additional programmatic element of the poetry is effective and can be incorporated into the pedagogical approach. The references to Indian music in the clarinet and pre-recorded parts can add variety to a recital program. Elizabeth Hinkle-Turner writes, “Brockman has written several interesting commissioned works for the clarinetist F. Gerard Errante which illustrate her ability to compose work that is intricate and intellectually intriguing yet completely accessible to any audience member.”¹¹⁵

This was an important selection for my lecture-recital with regards to the technological requirements. It is an excellent choice for clarinetists who wish to delve into electronic-acoustic music for the first time. From a pedagogical perspective, the four movements of this piece offer considerable flexibility depending on students’ playing level, repertoire needs (e.g. lyrical vs. technical study), desired length, level of technological ability, and availability of equipment. Any clarinetist who is performing with electronics for the first time can study the movements that require a simple set-up, such as pre-recorded electronics as in mvts. 1, 3, and 4. When the clarinetist has grown accustomed to performing with fixed media, they can progress to more complicated set-ups and performance requirements.

¹¹⁵ Hinkle-Turner. *Women Composers and Music Technology in the United States: Crossing the Line*, 104.

5.4 Program notes

In the program notes, Brockman describes the sources of inspiration for the piece, as previously mentioned. She also offers the following insight into her compositional process:

In India, a young performer learns his instrument by studying with a singer — so the music will always have a vocal foundation. I've tried to emulate this, and the improvisatory spirit of the music, although the piece is fully notated.

The clarinetist should incorporate the vocal and improvisatory styles into their practice.

Please refer to sections **5.9** and **5.10** for approaches to performance practice and pedagogical recommendations.

5.5 Available recordings

One of the dedicatees, **F. Gerard Errante**, recorded mvts. 1 and 4 of *Tagore Songs* for his CD *Beyond Noend with Errante*.¹¹⁶ Fortunately, Brockman includes Errante's recordings on the CD that accompanies the score (Tracks 4 and 5).

Errante performs with a clear, vibrant sound. He effectively incorporates vibrato, bends (glissandos) and relaxed articulation in mvt. 1 that are reminiscent of jazz playing styles. In mvt. 1, entrances are delicate and precise; he effortlessly joins the pre-recorded electronics as though interacting with a live musician. Errante performs mvt. 4 with high energy and drives the momentum forward, effectively taking the lead rather than following the strict pre-recorded part. Overall, the recording is an excellent example of effective blend (including reverb) and coordination with electronics.

The Australian clarinetist and ethnomusicologist **Roslyn Dunlop** has also recorded *Tagore Songs*. Mvts. 1, 2, and 4 are included on her contemporary classical CD entitled *X*.¹¹⁷

¹¹⁶ Errante, F. Gerard, performer. *Beyond Noend with Errante*. Drimala Records, 2000. Compact disc.

¹¹⁷ Dunlop, Roslyn, performer. *X*. Great White Noise, GWN 004. 2001. A possible source for the CD is the National Library of Australia (<http://trove.nla.gov.au/work/22989141?selectedversion=NBD24539539>).

Brockman makes reference to this recording in the program notes, but, unfortunately, it is comparatively difficult to acquire a copy.

5.6 Interpretation of the written score

The score is 21 pages in length, printed in booklet format on page size 8.5 x 11. Page 13 is “blank,” thus eliminating the need for a page turn between mvts. 2 and 3. Throughout the piece, Brockman provides cues for the electronics on a staff below the clarinet part.

The first movement is marked *espressivo*, with a beginning tempo marking of quarter note = 92 (**Figure 5.2**). By closely observing the electronic cues, it is apparent that the “*Electronic Sounds*” play for two measures before the clarinet enters (on the pickup to m. 3).



Figure 5.2: *Tagore Songs*, mvt. 1, mm. 1-4.
Used by permission. Markings provided by the author (S.E.).

A notable feature of the first movement is the large, sweeping gestures that span the range of the clarinet. Careful attention should be paid to the shaping of phrases and performing in a *legato* style.

At m. 33, the tempo changes abruptly to quarter note = 140. Electronic cues are provided to assist in coordination, however it still proves to be a difficult transition. The performer should listen for the “*gong*” cue in m. 35 so they may comfortably enter on F-sharp.

Some electronic cues are omitted or incorrect in this movement, which I determined after isolated listening to the tape part and careful study of the score. The “*claves*” are first heard in

m. 38 rather than m. 39 as indicated in the score. Additionally, the rhythm is in 8th notes, not 16th notes. (**Figure 5.3**).



Figure 5.3: *Tagore Songs*, mvt. 1, mm. 36-44.
Used by permission. Markings provided by the author (S.E).

In m. 77, a rhythmic cue is shown for the “clave” sound. Yet, the “clave” appears one measure earlier, m. 76.



Figure 5.4: *Tagore Songs*, mvt. 1, mm. 76-78.
Used by permission. Markings provided by the author (S.E.).

The movement concludes with a freely interpreted section. Coordination with the pre-recorded track becomes relaxed as the electronic sounds transform into an other-worldly “cybersound,” and there is no audible pulse with which to coordinate. In m. 132, Brockman provides the following directive: “*Exact location of these notes not important.*”

Mvt. 2 begins with a lengthy description of the technological requirements that differ considerably from the other movements. These requirements are explored in greater detail in section 5.7.

Brockman provides a tempo marking of quarter note = 104. Unlike the other movements in *Tagore Songs*, there is an opportunity here for flexibility with this tempo. In lieu of a static, pre-recorded track, the electronics react to input from the clarinet (made possible with the pitch-to-MIDI converter) and the synthesizer sounds “shadow” or “double” the live performer.

At first glance, this movement may resemble a repetitive technical study. In fact, the clarinetist must attend to a number of technical and rhythmical challenges. Many passages contain repetitive ascending and descending semitone intervals that may be interpreted as precisely notated trills. The time signature changes often, contributing to the feeling of unease as described by the title, “...*Swept by the mad cadence of the storm.*”

The third movement begins with solo clarinet and is marked “*freely*”, with a tempo marking of quarter note = 72. Rapid fluctuations in tempo, as notated by the composer, contribute to an improvised cadenza style. At m. 11, the performer must prepare to be joined by the tape in m. 12. A *fermata* is added to the last note of m. 11, allowing the entrance of the electronic part to merge with the held note of the live clarinet. Brockman provides electronic cues for mm. 12-14 and indicates that this accompaniment “*continues to m. 50.*” The *tabla*-inspired accompaniment is notated in transposed pitch, F and C, rather than concert pitch (Figure 5.5).

Dynamics and articulations are precisely notated and should be adhered to. However, given the vocal and improvisatory spirit of this movement, I experimented with some additional dynamics and incorporated *rubato* where I deemed it appropriate.

Figure 5.5: *Tagore Songs*, mvt. 3, mm. 11-16.
Used by permission. Markings provided by the author (S.E.).

As in mvt. 2, mvt. 4 exhibits characteristics of a technical study. The tempo is quarter note = 223,¹¹⁸ which makes the rapid, controlled articulation an impressive feature of this movement.

The pre-recorded track begins the movement, with the clarinet entering in m. 3. The two measure introduction of the electronics establishes the tempo and therefore the clarinetist must carefully count and anticipate their *mezzo forte* entrance.

Brockman includes a number of *bends* in this movement. The interval should be a quarter tone lower. This can be achieved by relaxing the embouchure and adding fingers where possible. A *forte* dynamic should be maintained through these passages.

The movement concludes with another freely interpreted section. Two “*crystal ping*” cues are provided in the tape to assist the performer with pacing. The conclusion should be quiet, delicate and un-hurried. The final note, an altissimo D, should *diminuendo* to *niente* and release with the electronics. The clarinetist should consider the “long” fingering to aid in stability of this fragile note. (See section 5.9 Practice and Study)

¹¹⁸ I recommend setting the metronome to half note = 112.

5.7 Technological requirements

Movement 1: This movement requires amplified clarinet with reverb in addition to a pre-recorded track (provided on the accompanying CD).

Movement 2: On pg. 7 of the score, Brockman provides detailed information on the original set-up requirements that utilize a pitch-to-MIDI converter and synthesizer. The recommended synthesizer is a Roland JV-1080, and the required patches are specified.

Movement 3: This movement requires amplified clarinet with reverb in addition to a pre-recorded CD track. If the performer is using a foot pedal to advance the electronics in the patch, I recommend starting the track at the beginning of m. 11 rather than m. 12 in order to compensate for the delay of the electronic sounds.

Movement 4: This movement requires reverb in addition to a pre-recorded CD track.

Brockman does not specify the need for amplification in mvts. 2, 3, and 4. However, I concluded that some amplification is preferable, as Brockman recommends in mvt. 1.

5.8 Creation of Max/MSP patch

In order to perform the work in its entirety, it was necessary to consider a multitude of options regarding the implementation of electronics. Due to the complexity of mvt. 2, it was necessary to adapt the entire piece so I could perform the complete work.

Mvts. 1, 3, and 4 are seemingly simple, since they only require amplification of the clarinet and optional reverb or delay. On the other hand, mvt. 2 is more complex. The instructions are as follows: "This movement includes a pitch-to-MIDI converter plus a synthesizer. Or it can simply be played by itself as a clarinet solo with reverb/delay." I have not found this approach effective since the live electronics are the essential appeal from the perspective of performer and listener.

Brockman's original instructions for the synthesizer are included in the score. A Roland JV-1080 synthesizer is specified, and she provides details regarding the necessary patch configuration. She also suggests that, “if this synthesizer is not available, simply try to replicate the approximate sounds on the accompanying CD.”

Since this equipment is virtually obsolete, I considered other synthesizers in addition to pitch tracking software to serve the function of the pitch-to-MIDI converter. I met with Richard McKenzie (DCS) on many occasions to seek advice and discuss potential solutions to be able to perform this movement. We ultimately decided that a Max/MSP patch would be the best solution. As I am not fluent in the programming language of Max/MSP, it was necessary to collaborate with my colleague Takuto Fukuda.

The basic procedure for the creation of the Max/MSP patch was:

- 1) Experiment with the pitch tracking *sigmund~* object that Fukuda recommended.¹¹⁹
- 2) Find synthesizers within Logic Pro.¹²⁰ Through careful listening to the demonstration track on the accompanying CD, as well as a process of trial and error, we attempted to replicate the specified synthesizer sounds for the Roland JV-1080.
- 3) Once we selected the synthesizers and modified the settings to achieve the desired timbre, Fukuda created the Max/MSP patch according to the information provided in the score and my requests. Throughout this process, we continued to collaborate to address problems and find solutions.
- 4) Fukuda provided stand-alone patches so I could practice on my own.¹²¹ I was then able to identify additional problems in the patch such as *latency*, which caused a delayed reaction time between my clarinet input (through the microphone) and the live electronics (from the output, i.e.

¹¹⁹ Fukuda also considered the *fzero~* and *fiddle~* objects for pitch tracking, but he suggested that the *sigmund~* object tracks the pitch more precisely.

¹²⁰ <https://www.apple.com/ca/logic-pro/>. This software was recommended by Fukuda. Logic Pro was ideal for my purposes since I had previous experience using it for composing and editing.

¹²¹ Stand-alone patches can be opened on any laptop and do not require the full Max/MSP software to function.

altered. Since this problem had not occurred previously in rehearsal or the dress rehearsal, it was likely a problem with pitch tracking *sigmund*~ object or the result of performer error (e.g. pressing the pedal too many or too few times).¹²²

5.9 Stage set-up

An objective of my lecture-recital was to create a simple set-up that would fulfill the needs of the entire program. With the exception of essential hardware components used solely for *Dialogue de l'ombre double* (Boulez) as well as the video component in *Dry Cell* (Allen), the set-up remained the same throughout the concert. Please refer to the stage map for *ektenes III* on page 46 that can be utilized for *Tagore Songs*.

5.10 Practice and study

Movement 1

The performer should be attentive to intonation throughout this piece but especially at the beginning of mvt. 1. The pre-recorded tape is tuned to A=440, therefore the clarinetist must adjust their instrument accordingly before performing the piece. As always, precise adjustments to embouchure and voicing influence tuning.

Particular attention should be paid to the following interactive moments with tape:

- m. 18: Coordinate with the tape on beat 3. Carefully subdivide, be patient and take a relaxing breath before playing the note.
- m. 31 and mm. 94-95: An illusion of the clarinet “triggering” the explosion of electronic sounds. Crescendo through the note and release after the electronics have entered.
- m. 33: The coordination is difficult in this transition. Carefully subdivide and listen closely to the tape part alone.
- Please see section 5.6 for more suggestions.

¹²² It's important to note that if a computer music assistant was present (i.e. if I was not self-sufficient), they would have watched the patch and attempted to identify the problem while it occurred in real-time (thus providing details to facilitate further refinements). However, it would have been very risky, if not impossible, to solve the problem by changing parameters in the patch while I'm performing. Thus, in this scenario it is of little consequence if I am self-sufficient or supported by a technician.

Movement 2

It is beneficial to practice with a metronome, but once the pulse is even and control of the fingers has been achieved, the metronome should only be used occasionally. I found that ongoing use of the metronome caused me to retain the static, metronomic style, thus restricting the freedom of larger phrases and gestures.

Incorporate alternate fingerings, as shown in **Figure 5.7**. Examples: Altissimo D-flat for mm. 5 and 10; C-flat for m. 6 (the pitch will necessarily be compromised, since this fingering causes the C-flat to be quite flat. Therefore, every effort should be made to bring the pitch up with embouchure and voicing); E-flat for mm. 33-34 (again, keep the pitch raised).

When practicing with the live electronics, isolate each effect to experiment with how it reacts to your input. With practice and trial-and-error, it will become easier to “control” the electronics so they react according to your preferences. Incorporate *rubato* and extra pauses, which is a subtle way to allow overly active and loud electronic effects to “settle down” before resuming.

Movement 3

The solo cadenza at the beginning should be performed freely and vocally. Again, it is necessary to prepare for A=440 before performing this movement.

When using a foot pedal, the clarinetist (or an assistant at the computer) should start the tape track at the beginning of m. 11 instead of m. 12 (as indicated in the score) since there is a five second delay before the first note of the tape. Also note that the tempo of the tape at m. 12 is quarter note = 74 rather than quarter note = 90.

In m. 38, I recommend an alternative “thumb” fingering for the altissimo D (**Figure 5.7**).

Rubato and dynamics should be freely exaggerated throughout. A dramatic moment of the movement occurs in mm. 44-45; the tension gradually increases to low G-flat, and in combination with the written *crescendo*, a *ritardando* can emphasize this key moment.

The movement ends unexpectedly with the clarinet and electronics trailing off (“lift”). A *tenuto* should be added to the final note (altissimo E-flat) to soften the timbre and avoid a “choked” release.

Movement 4

The musical material in this movement is quite straight-forward and the tempo remains the same throughout. Slow practice with a metronome, while gradually increasing the speed, will help achieve the required tempo and emphasis on larger musical phrases and gestures.

Bends can be performed by adding fingers (m. 91), altering the embouchure (m. 84) or a combination of these techniques. Avoid bending fully to the lower note that follows the bend. Instead play two distinct notes with a slight break inserted.

Perform the concluding altissimo D’s at the end using the alternate “long” fingering, as in

Figure 5.7.

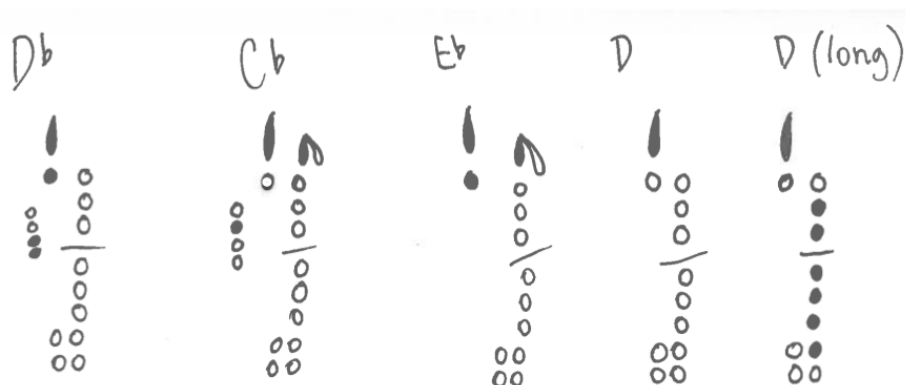


Figure 5.7: Alternate fingering recommendations for *Tagore Songs*.

5.11 Pedagogical recommendations

a. Study of poetry or short stories: Encourage the student to choose their own Tagore poetry or short stories. Students can study *The Tagore Reader* or alternate resources. The student should be able to explain why they chose the poem/short story, such as musical connections (e.g. the writing reminds them of something in the piece) and personal reflection (e.g. the writing made them feel serene or calm). The student can incorporate their chosen poetry/short stories into their performance through program notes or live readings (e.g. they can recite the poetry before each movement or collaborate with a friend).

b. Introduce Indian classical music to the student: Provide a brief introduction, including basic terminology (e.g. raga), instruments (e.g. tabla) and performance practices (e.g. stage set-up). Access recordings from the library or internet and instruct the student to listen to one or two recordings. The student should make note of the musician/ensemble they listened to and describe various characteristics that they heard (e.g. instruments, rhythms, timbres). Instruct the student to listen to a recording of *Tagore Songs* and ask them to describe similarities and differences between this piece and the traditional Indian music they listened to. Encourage the student to identify ways in which they can incorporate Indian performance practices into their interpretation of *Tagore Songs* (e.g. singing quality and “improvisatory spirit,” as described by the composer).

c. Incorporate software that modifies the tempo of the pre-recorded CD track: The teacher should research available apps and software (at the time of this publication, popular apps include *Anytune* and *Music Speed Changer*). Become familiar with apps that can be used on different operating systems (e.g. software for Mac and PC; apps for iPhone and Android smartphones) and read user reviews. Choose free/inexpensive options, if available, and experiment by incorporating them into your own practice. Then, introduce an app to the student and instruct them on its use. Discuss practice techniques and encourage students to incorporate the app into their daily practice. The student can download an app or software that is compatible with their phone/iPad/laptop. Note that, due to rapid changes in software, students and teachers should regularly check for software updates and maintain an up-to-date list of available apps.

d. Identify the softest and loudest moment in each movement of the piece: The student can first examine the written score to identify the softest and loudest dynamics written for each movement. Have the student consider the written tessitura (range) of the clarinet, as this provides additional feedback regarding dynamic levels (e.g. the loudest moment in mvt. 1 is at mm. 31-32). Once the student identifies the softest and loudest moments, they may indicate it in the written score. It is highly recommended that the student also study the pre-recorded CD tracks alone. For each movement, they must identify the softest and loudest moments and use high-quality headphones or loudspeakers for careful listening. Once the student identifies the softest and loudest moments of the pre-recorded tape part, they should indicate it in the written score (making sure to specify that the marking corresponds to the tape part). Finally, the student should consider the clarinet and tape parts together to identify the softest and loudest moments. They should study Errante's recordings and record their own playing for review. The student may indicate softest and loudest moments for the combined version. The student should be ready to perform the chosen excerpts in the soundcheck (with required amplification and reverb) so their teacher or friend can provide advice on the balance and EQ (equalization). Crucially, the student should also listen to the tape part from the audience vantage point during the soundcheck and adjust the levels of the pre-recorded tape as needed.

Chapter 6

***Dry Cell* for soprano saxophone, tape, and video (2009)**

By J. Anthony Allen

*I've always been interested in the collisions of art forms...
I dare you to find me a successful musician that has survived in an artistic bubble.*

-J. Anthony Allen¹²³

6.1 Composer biography

American composer J. Anthony Allen (b. 1978) has developed a hybrid compositional style that combines his traditional academic background with various forms of electronic music. Allen earned a Bachelor of Arts in Music from Grand Valley State University, Masters Degrees in Electronic Music and Music Composition from the Peabody Conservatory and a PhD in Music Composition from the University of Minnesota. He has composed works for orchestra and chamber ensembles in addition to multimedia, tape, and electronic-acoustic works. Furthermore, he has released two albums dedicated to purely electronic music and remixes, titled *Aniscorcia* (2015) and *Comic Arias* (2016). Allen currently teaches music composition and music technology at the University of St. Thomas in St. Paul, Minnesota. He also founded the Slam Academy¹²⁴ that offers courses in composition, production, and Ableton Live.¹²⁵

6.2 Introduction to *Dry Cell*

Dry Cell was commissioned by Michael Strauss and an international consortium of musicians through the *What are you looking at? Commissioning Fund*. The score is 7 pages in length, received by email as a .pdf and printed on 8.5 x 11 paper. The video file was received

¹²³ Comerchero, Dan. "Artist Spotlight: Dr. J. Anthony Allen," accessed December 3, 2016, <https://theproaudiofiles.com/mcnally-smith-faculty-interview-dr-j-anthony-allen/>. "Artist Spotlight: Dr. J. Anthony Allen." 2012.

¹²⁴ <https://www.slamacademy.com>

¹²⁵ Allen is a Certified Trainer for Ableton Live, a popular music production, creation and performance software (www.ableton.com).

through a Dropbox link.¹²⁶ The timing of *Dry Cell* is precisely 6'57", corresponding exactly to the full length of the tape and video files.

The work was composed for soprano saxophone; I have successfully adapted it for the B-flat clarinet. On my lecture-recital program, I indicated this detail as follows: *Adapted for clarinet, tape and video by Suzu Enns*.

In *Dry Cell*, Allen has incorporated his unique hybrid compositional style, combining his interests in EDM (Electronic Dance Music) with his mastery of traditional instrumental composition.

6.3 Influence of EDM (Electronic Dance Music)

Electronic Dance Music is a broad category of electronic music that encompasses *house, techno, rave, acid house, trance, dubstep, IDM (Intelligent Dance Music), ambient and lounge*, among other genres. These genres are typically associated with nightclubs or raves. In many of the above mentioned genres, the audience members are active participants. According to Pedro Peixoto Ferreira, the audience is a necessary component of the genre since, "EDM is made, above all, for non-stop dancing."¹²⁷ He adds, "EDM is seen to perform a transductive mediation between machine sounds and human movement."¹²⁸

Prior to composing electronic music, Allen notes that he was a fan of EDM. Yet, like many musicians and composers, he thought that it was impossible for a classically trained composer to create music that resembled the music that held his fascination. However, he recalls a particular moment that had a great impact on his life and creative aspirations:

¹²⁶ The video file is 281.6 MB, and too large to transfer over email.

¹²⁷ Ferreira, Pedro Peixoto. "When Sound Meets Movement: Performance in Electronic Dance Music." *Leonardo Music Journal* 18 (2008): 18.

¹²⁸ Ibid., 17. An associated term, *electronica*, is "used to refer to all types of popular electronics music." Taken from Neill, Ben. "Pleasure Beats: Rhythm and the Aesthetics of Current Electronic Music." *Leonardo Music Journal* 12 (2002): 6. To better understand the relationships and origins of the sub-genres of EDM, refer to Magnetic Magazine's 2015 article "Stop Calling EDM EDM - Here is a proper definition" (<https://www.magneticmag.com/2015/10/stop-calling-edm-edm-here-is-a-proper-definition/>).

I used to go and sit in just coffee shops and just write music, you know, with pencil and paper and work. And I was there once and this kid came up to me and was like, “Oh, you’re writing music, blah blah blah”... And he was telling me about this album by *The Art of Noise* called *The Seduction of Claude Debussy*. He was telling me it was basically remixes of Debussy. And as, like, a classical snob, I thought “Well, that’s just the dumbest thing I’ve ever heard.” But, like a week later, I saw that album in some record store, and so on a whim I picked it up, and that album is what flipped the switch.¹²⁹ [sic]

Certainly, there has been much debate related to the album *The Seduction of Claude Debussy* and some may be perplexed by Allen’s particular fascination with the record.¹³⁰ Nevertheless, Allen’s interest in a hybrid approach is not uncommon among composers and musicians. Simon Emmerson provides the following insight into the often complex relationship between popular electronic music and high art:

There remains a certain antagonism between ‘art music’ and ‘experimental/club electroacoustics’... This is, of course, no barrier to the creative and eclectic musicians from any background and bridges will appear in unexpected places... I sense that there has been an assumption (deemed a ‘fear’ by some) that the removal of barriers might somehow lead to a ‘greying out’ of styles and approaches. From the ‘art’ side this has sometimes been perceived as a threat which might lead to ‘dumbing down’. But such hybridization may mean the creation of new identities, not necessarily the loss of established ones — and in any case all genres were originally hybrids of previous strains.¹³¹

In *Dry Cell*, the influence of popular electronic music is apparent throughout the tape part, which has certainly resulted in a unique aesthetic. At the beginning of the piece, characteristics of *ambient* electronic music can be observed. There is no discernible pulse or rhythm, adding to the sense of weightlessness.

¹²⁹ Diliberto, John. “J. Anthony Allen in the Echoes Podcast: From Academics to Ambience with J. Anthony Allen.” Podcast audio. January 28, 2016. (<http://echoes.org/2016/01/28/j-anthony-allen-in-the-echoes-podcast/>)

¹³⁰ He discusses this experience in length in Darwin Grosse’s *Art + Music + Technology* podcast. I recommend this album to anyone who wishes to explore a unique hybrid musical aesthetic. After frequent listenings over the period of several months, the record has slowly become one of my personal favourites.

¹³¹ Emmerson, *Living Electronic Music*, 81. Composer and trumpeter Ben Neill also reflects on the division between art music and popular electronic music. He states: “In the past 10 years, a new breed of composers, with no regard for the former distinctions of pop versus high art, has evolved. Their new aesthetic has been made possible by the continuing evolution of computer music technologies that started in the 1970s and 1980s, along with the aesthetic progression of late-20th-century culture into a more global, less Eurocentric form. Many art-music composers scoff at the idea of using regular 4/4 rhythm patterns in their works... composer John King has described this attitude as ‘the fear of the funk’... This attitude is also reminiscent of the bias many classical musicians have traditionally taken towards jazz and improvisation, feeling that it is too vernacular or unsophisticated for their interest. It is no coincidence that the minimalists (e.g. La Monte Young, Terry Riley, Steve Reich, Philip Glass) were also actively involved with jazz and/or various forms of world music.” Neill, “Pleasure Beats, Rhythm and the Aesthetics of Current Electronic Music,” 3-4.

Like many of his electronic tracks on *Aniscorcia*, Allen adds new layers of musical material as the piece progresses. The clarinet and tape parts feature identifiable (“catchy”) yet complex rhythms that are repeated numerous times with increasing energy and anticipation of the inevitable bass drop, a common feature of EDM.

Clarinetists rarely have the opportunity to explore contemporary popular music, and certainly not to perform electronic dance music. This adaptation for the clarinet provides an exciting opportunity for clarinetists to “connect with their inner DJ” and may offer inspiration to those who wish to pursue their own forms of musical hybridization.

6.4 Relevance to my study

It is important for all artists to ensure they are exposed to new ideas and approaches. Artists must explore, engage, and expand their artistic practice. Accordingly, the musical material and technological requirements for *Dry Cell* will challenge many clarinetists to adapt their performance practice and artistic dispositions. This piece may, to quote Allen, “flip the switch,” and inspire a new creative direction, especially when introduced to younger students. Thus, this piece is highly relevant for this project and it has significantly impacted my artistic research.

The technological requirements for this piece are well suited to the self-sufficient approach. In comparison to the other works, it has proven to be relatively simple to perform the work without technical assistance. Yet, there are undeniable challenges with regards to adjusting balance for the audience, in addition to ensuring that there is adequate stage monitor output for the performer.

6.5 Program notes

The piece was inspired by Alan Weisman's non-fiction book, *The World Without Us*. Notably, Weisman expresses doubt that today's recorded music and digital media will survive or make any sense to a "sentient being" who may discover it in the future. He continues, "And yet, of all human expression, it happens that music may have the best chance of all to echo on."¹³²

Allen offers the following program notes: "The piece begins in the 'old west' of this future age, and as it progresses (and builds in intensity) we move into the remains of our major cities and see the remains of urban sprawl and the batteries clinging to life."¹³³

6.6 Available recordings

Currently, there are no commercial recordings of *Dry Cell* in the original version for soprano saxophone, or the adapted version for clarinet. I was fortunate to hear a live performance of this work in Montreal in 2014 by saxophonist Tommy Davis, albeit without video.

For reference, I plan to release a studio recording of *Dry Cell* in 2018.

6.7 Adaptation for clarinet

In my adaptation, I have been able to retain most of the original material that is written for the soprano saxophone. In fact, some sections of the piece, even technically challenging parts, work well on the clarinet without the need for much revision. For example, the excerpt from mm. 122-149 is certainly not easy to perform. However, if the clarinetist is creative with the choice of fingerings, it can be comfortably executed. Particularly, I use the *1+1* fingering for the B-flats, which makes the entire section of the piece relatively simple to play with careful, coordinated practice. Furthermore, I use an alternate long fingering for all of the altissimo F-naturals and an alternate long fingering for the altissimo G-flats. I have found that this approach

¹³² Weisman, Alan. *The World Without Us*. (New York: St. Martin's Press, 2007): 248.

¹³³ <http://janthonyallen.com/dry-cell/>

to choice of fingerings has also helped me achieve the “mechanical” style that the composer indicates in this section.

Nevertheless, there are a few sections which I have adapted to make more manageable on the clarinet. The most drastic change I made is at m. 152, where I played the “*aggressive*” run two octaves lower than written. This has allowed me to play this difficult run more aggressively at the fortissimo dynamic; I can “dig in,” as the composer suggests. Conveniently, the composer has written “*optional 8vb*,” that would allow the musician to play an octave lower than written. On the clarinet, playing this run only one octave lower could be almost as difficult as playing it in the written octave, so transposing down two octaves has proven to be a good solution.

6.8 Interpretation of the written score

When I received the files for this piece, it quickly became apparent that there were no written cues for the tape part. In *ektenes III* and *Tagore Songs*, the written cues for the tape part were crucial for the purposes of coordinating with the tape part and studying the interactive relationship between the clarinet and electronic sounds. Therefore, the analysis of the tape part and creation of written cues has been essential to my research. A description of this process can be found in section 6.10.

6.9 Technological requirements

Amplification: The clarinet should be amplified at all times to achieve optimal balance between acoustic and electronic parts. In accordance with traditional EDM practices, the overall mix should be quite loud (yet never uncomfortably so for performer or audience).

Tape: The isolated tape part can be used for practice purposes. It can also be used during performance if video playback is unavailable. Like the video, the tape part plays from beginning to end, with no additional actions required of the performer except balance adjustments.

Video: The video that accompanies *Dry Cell* was created by Arie L. Stavchansky. Since the tape part is integrated into the video, only one action (pressing “play” on the video) is required to start the piece. Thus, *Dry Cell* is suitable for the self-sufficient approach.

The video component of this piece complements and enriches the performance. Indeed, Philip Rehfeldt states, “Visual media (film, video, synchronized slides, and so forth) can enhance, to varying degrees, the concert hall environment.”¹³⁴ Throughout the video, images appear that resemble batteries, or dry cells, referencing the title of the piece. The composer offers the following insight: “In a future dystopic world absent of humans, only the remains of our technology survive. With energy running out, the “batteries” are left gasping for power.”¹³⁵

To intensify the concert experience, the hall and stage lights should be dimmed.¹³⁶ The performer should remain visible to the audience members while the video image becomes the primary focus. The performer can use portable (i.e. clip-on) stand lights so they can comfortably read the score. Additionally, a small lamp placed on the technology table may be required so the musician can make adjustments to levels on their mixer or audio interface.

¹³⁴ Rehfeldt, Philip. *New Directions for Clarinet*. (Lanham, MD: The Scarecrow Press, 1994): 83. For a detailed study of works for clarinet and video, refer to Mary Alice Druhan’s Doctor of Music document from 2003.

¹³⁵ <http://janthoniyallen.com/dry-cell/>

¹³⁶ At certain concert venues, lights can only be adjusted by the stage manager. I recommend that musicians contact the appropriate stage personnel as early as possible in order to discuss specific production requirements. Additionally, there may be extra fees for use of a video projector and screen.

6.10 Analysis of the tape part

My analysis of the tape part was crucial to be able to perform the work. One of my first tasks was to listen to the tape part on its own. I incorporated many different listening strategies and in the process I discovered some creative techniques for listening to electronic-acoustic music. I started with some basic exercises, where I listened to the tape alone with the score in front of me. Then I proceeded to use a metronome in my listening exercises. The metronome was set to quarter note = 160. This enabled me to carefully follow along in the score and physically conduct. Throughout this process, I used a separate copy of the score in order to write in rough cues. It was beneficial to use a coloured highlighter, draw shapes from the sounds in the tape, and make general notes. I proceeded to notate precise timings of important events in the tape part (examples are provided in **Figures 6.1** and **6.2**). Precise time markers allow a musician to quickly jump to any section in the piece when rehearsing and serve the same function as a rehearsal number or letter.

The analytical software *EAnalysis* has proven to be an effective research tool. A description of this software can be found in **Chapter 2**. Please refer to **Figure 2.1** (page 25) for a graphical representation of *Dry Cell*, which was generated with *EAnalysis* software.

The written cues are necessary to be able to perform this piece since many parts require precise coordination. Additionally, these details enable a performer and teacher to study the work on a deeper level as they would with traditional scores. By way of comparison, consider

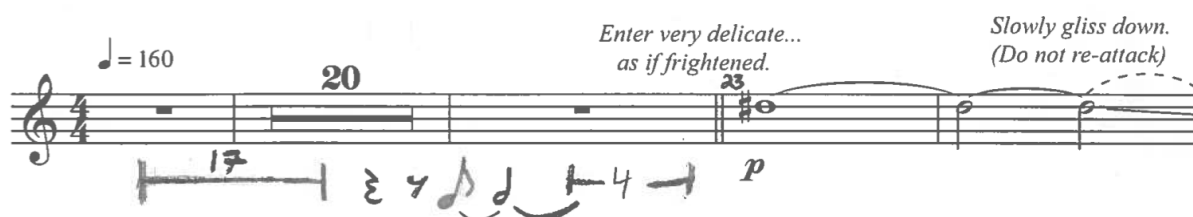


Figure 6.1: *Dry Cell*, mm. 1-24. Used by permission. Markings provided by the author (S.E.).

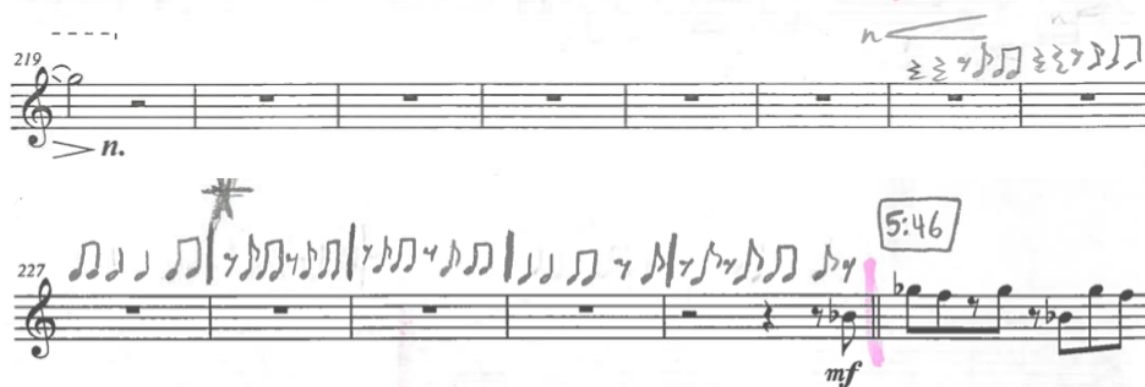


Figure 6.2: *Dry Cell*, mm. 219-232. Used by permission. Markings provided by the author (S.E.).

that it is common practice for a musician to refer to a full score of an orchestral piece. The study of scores is a fundamental pedagogical approach used by teachers and conductors.

6.11 Stage set-up

My stage set-up for *Dry Cell* is identical to *ektenes III* and *Tagore Songs*, except for the addition of a cable for the video projector in Tanna Schulich Hall¹³⁷ that was connected to my laptop. A large projection screen is also necessary.

6.12 Practice and study

The instrumental part of this piece requires careful, slow practice with a metronome. The priority should be relaxed hands and body when practicing and performing the “acrobatic” leaps and fast runs. Practicing at a slow tempo will also create good coordination between articulation (tongue) and fingers, which will ultimately improve coordination with the tape.

Throughout the movement, the long descending *glissandos* should start and stop at the specified times. A combination of embouchure and finger technique can be used to effectively

¹³⁷ Schulich School of Music, McGill University.

play the *glissando*. Yet, the *glissandos* should not be exaggerated as only one quarter-tone or semitone is required.

In order to effectively perform the fast and difficult passage at mm. 252-267, I recommend that clarinetists experiment and make modifications (e.g. omit notes as needed).

6.13 Pedagogical recommendations

a. Identify the softest and loudest moments in the piece: The student can first examine the written score to identify the softest and loudest written dynamics (e.g. the loudest written dynamics is fortissimo, as in m. 52). Encourage the student to also consider the written tessitura (range) of the clarinet, as this provides additional feedback regarding dynamic levels. Once the student identifies the softest and loudest moments they should indicate it in the written score. The student should also study the pre-recorded CD track alone and identify the softest and loudest moments. It is important that they use high quality headphones or loudspeakers for careful listening. They should follow along in the score to identify the precise locations. Once the student identifies the softest and loudest moments of the tape part, they should indicate it in the written score (making sure to specify that the marking corresponds to the tape part rather than the clarinet part). Finally, the student should consider the clarinet and tape parts together to identify the softest and loudest moments. They can study an available recording and/or record their own playing for reflection. The student can indicate softest and loudest moments for the combined version. The student should be ready to perform the chosen excerpts in the soundcheck (with required amplification and reverb) so their teacher or friend can provide advice on the balance. The student can also listen to the tape part from the audience vantage point during the soundcheck and adjust the levels of the pre-recorded tape and gain for clarinet amplification as needed.

b. Studying the video: Introduce the student to the video. Encourage the student to come up with some ideas for the meanings behind the images (i.e. Are the images recognizable? What is the “story” that the video is telling?). Introduce the student to Alan Weisman’s *The World Without Us* (i.e. general themes). Ask the student to explain the connections between the video and the themes in the book. Pose some questions to the student, such as: How can this interpretation influence your performance choices? Can

this new information/perspection change the way you practice and study the work? How so?

c. Introduction to EDM and other electronic music subgenres: The instructor should provide a general introduction to EDM (i.e. common characteristics, popular artists, and DJs). The teacher should suggest several tracks/artists to students (ensuring that the content, lyrics, and images are appropriate for the student). The students can also search on YouTube. Discuss similarities and differences between Allen's *Dry Cell* and the EDM tracks. Some recommendations are as follows:

- Allen's album of electronic music, *Aniscorcia*, and the remix album *Conic Arias*. (<http://janthonyallen.com>)
- J. Anthony Allen's *Trance* (2006) for alto saxophone and live electronics (Max/MSP) (<http://janthonyallen.com/trance/>).
- The album *4x4=12* (2010) by deadmau5.
- The track *Tsunami* (2013) by DVBBS & Borgeous.
- The track *Animals* (2013) by Martin Garrix.
- The tracks *One More Time* (2000) and *Technologic* (2005) by Daft Punk.
- The album *Running Out of Love* (2016) by The Radio Dept.
- Refer to Mary E. Halick's article "*What Can You Teach With Electronic Dance Music? A Music Teacher's Guide to EDM*" (General Music Today, 2016, Vol. 30 (1), 4-10) for further pedagogical suggestions.

Chapter 7

Dialogue de l'ombre double (1985)

By Pierre Boulez

*I believe a civilization that conserves is one that will decay
because it is afraid of going forward and attributes
more importance to memory than the future... The more I grow,
the more I detach myself from other composers, not only from the distant past
but also from the recent past and even from the present...
history seems more than ever to me a great burden.
In my opinion we must get rid of it once and for all.*

-Pierre Boulez, 1975.¹³⁸

7.1 Composer biography

The legendary French composer and conductor, Pierre Boulez (1925-2016) conducted many of the world's great orchestras and founded the Lucerne Festival Academy in Switzerland. His contributions to the field of electronic music are significant, such as the founding of IRCAM, the *Institut de Recherche et Coordination Acoustique/Musique* that opened in 1977. The first piece Boulez composed at IRCAM was *Répons*, written from 1981-1984. *Dialogue de l'ombre double* was composed from 1982-1985.

7.2 Introduction to *Dialogue de l'ombre double*

Dialogue de l'ombre double, or Dialogue of the Double Shadow, has significance as one of the first pieces Boulez composed at IRCAM. Yet, it also has the distinction of being one of the most difficult pieces in the clarinet repertory. In Brian Fennelly's words, it, "is a challenging, virtuosic work of substantial proportions."¹³⁹

¹³⁸ <http://www.nytimes.com/1987/11/15/arts/music-view-boulez-forgets-to-forget.html>

¹³⁹ Fennelly, Brian. "Reviewed Work(s): Dialogue de l'ombre double [For Live Clarinet and Clarinet Pre-Recorded on Tape] by Pierre Boulez." *Notes* 50, No. 1: 391.

A booklet of *Technical Instructions* accompanies the full score, available in English, French, and German. I referred to the English instructions that are 25 pages in length, detailing the equipment list, recording procedure, spatialisation instructions, lighting instructions, and set-up diagrams.

There are two versions of the work: *Roman Numerals* and *Arabic Numbers*. The difference between the versions is the order in which the strophes and transitions are performed.¹⁴⁰ French clarinetist Alain Damiens's benchmark recordings of 1985 and 1996 feature the *Roman Numerals* version. Boulez composed this work for Damiens, whose mastery of the instrument is impressive. I chose to perform the *Arabic Number* version simply because it was more convenient.

The piece is divided into 13 sections. The *strophes* are performed live and the pre-recorded *transitions* are played back through 6 speakers located around the hall. There are two additional pre-recorded sections that are played at the beginning and ending of the piece: *Sigle initial* and *Sigle final*. The organization of the piece, with reference to the *Arabic Number* version, is as follows:

Sigle initial (pre-recorded)
Strophe 1 (live)
Transition 1 à 2 (pre-recorded)
Strophe 2 (live)
Transition 2 à 3 (pre-recorded)
Strophe 3 (live)
Transition 3 à 4 (pre-recorded)
Strophe 4 (live)
Transition 4 à 5 (pre-recorded)
Strophe 5 (live)
Transition 5 à 6 (pre-recorded)
Strophe 6 (live)
Sigle final (pre-recorded)

¹⁴⁰ Joe Rogers provides a detailed analysis of the work. He identifies additional differences between the Roman Numeral and Arabic Number versions, which he describes as a "mobile structure" or "formal open endedness." Rogers, Joe. "Dialogue de L'Ombre Double: Construction by Assemblage," *Perspectives of New Music* 38, no. 2 (2000): 32.

Each movement overlaps, so that the live clarinetist performs with their own “double”; the pre-recorded movement. Recordings of the “double” parts are available for rental from Universal Editions, but the composer recommends that the performer records their own “double” parts.

An important feature of the work is spatialisation, or sound diffusion, that Simon Emmerson defines as, “the active directing of a pre-recorded signal to an array of loudspeakers.”¹⁴¹ Boulez’s computer music designer, Andrew Gerzso,¹⁴² describes the spatialisation for *Dialogue de l’ombre double* as follows: “Following the cues marked in the score, the pre-recorded clarinet sounds are to be sent around the hall from one speaker to another giving the listener the impression that the sounds are moving in physical space.”¹⁴³

Two types of spatialisation appear in the work: 1) *Discrete*, where the sound moves quickly between speakers; and 2) *Continuous*, where the sound pans smoothly between speakers. Gerzso suggests that the spatialisation can be automatically programmed or performed manually at a mixing console.

7.3 Relevance to my study

A study of Pierre Boulez’s *Dialogue de l’ombre double* (1985) is highly revealing. The practice of pre-recording the “double” parts, which is strongly encouraged by the composer, requires experimentation and careful preparation. Additionally, this piece involves considerable technical challenges in both the live and pre-recorded material. A large, more intensive technological set-up is required and must be realized in collaboration with assistants. The

¹⁴¹ Emmerson, *Living Electronic Music*, 96.

¹⁴² “As a member of IRCAM’s permanent staff since 1977 he has held over the years a number of positions: researcher, Technical Director, Director of Musical Research, Director of the Production Department and Manager of the IRCAM Forum, the institute’s software user group.” Gerzso collaborated with Boulez on such works as *Répons* (1981), *Explosante-fixe* (1991) and *Anthèmes 2* (1997). <http://resonances2006.ircam.fr/?bio=49&L=1>

¹⁴³ Gerzso, Andrew. “Technical Instructions”, *Dialogue de l’ombre double*. (Vienna: Universal Edition A. G., 1992): 18.

spatialisation can be performed in real-time by the clarinetist under optimal conditions, as demonstrated at my lecture-recital. I selected the following excerpts for this project: *Sigle initial*, *Strophe 1*, and *Transition 4 à 5*.

7.4 Program notes

On the IRCAM website, Gerzso provides highly relevant information concerning the origins of *Dialogue de l'ombre double*. Since these details are not included in the *Technical Instructions* that accompany the score, its inclusion here is apropos.

The original inspiration for this composition comes from a specific scene in the play *Le Soulier de Satin* written in 1924 by Paul Claudel. This is a work that Pierre Boulez came in contact with on the occasion of Jean-Louis Barrault's production at the Comédie Française. The action in *Le Soulier de Satin* takes place mostly in Spain but also many other places (Mogador, Americas etc.). There are many references to distant places and times, but few to "here and now". The work is a sort of "zig-zag" of place and time.

The title of Boulez's work comes from a particular point in Claudel's play : the second day, scene 13 entitled *L'Ombre Double* (literally : the double shadow) because of the shadow of a man and a woman together projected onto a wall. So the inspiration for Boulez comes from this specific scene, not the work as a whole. In the play the double shadow is treated as a single character. In *Dialogue de l'Ombre Double* a solo live clarinet (called *clarinette première*) placed in the middle of the hall dialogs with a kind of shadow of itself. The shadow is the pre-recorded clarinet (called "*clarinette double*") which is spatialized over a six point loudspeaker system placed on the periphery of the hall. The audience is placed between the solo clarinet and the loudspeaker system.¹⁴⁴

7.5 Available recordings

Dialogue de l'ombre double has been recorded many times by clarinetists and non-clarinetists. Alain Damiens's recordings are featured on several Ensemble Intercontemporain CDs, and are presented in a single uninterrupted track¹⁴⁵ or 13 separate tracks.¹⁴⁶ Damiens's

¹⁴⁴ <http://brahms.ircam.fr/analyses/dialogue/>

¹⁴⁵ Damiens, Alain, performer. *Boulez: Sonatine pour flûte et piano; Première sonate pour piano; Derive; Mémoriale; Dialogue de l'ombre double; Cummings ist der Dichter*, Erato, 2292-45648-2, 1991.

¹⁴⁶ Damiens, Alain, performer. *Répons; Dialogue de l'ombre double*, Deutsche Grammophon, 289 457 605-2, 1998.

live recording and video from 1992 (Salzburg Festival Concert)¹⁴⁷ is a useful resource for performers and technicians.

John Bruce Yeh (assistant principal clarinetist and E-flat clarinetist of the Chicago Symphony Orchestra) collaborated with Howard Sandroff for live performances and a recording.¹⁴⁸ Sandroff later documented the extensive computer realization process.¹⁴⁹ According to reviewer Brian Fenelly, Yeh's pre-recorded "double" parts were, "Reported to have consumed almost 100 hours in preparation."¹⁵⁰

Recordings are also available from Canadian clarinetist Francois Houle,¹⁵¹ Jérôme Comte¹⁵² and Tara Bouman.¹⁵³ Other notable recordings are available from saxophonist Vincent David,¹⁵⁴ Bass clarinetist Volker Hemken,¹⁵⁵ and recorderist Erik Bosgraaf.¹⁵⁶

7.6 Technological requirements

A performance of *Dialogue de l'ombre double* is a substantial undertaking if all technological instructions are to be followed. My original intention was to collaborate with assistants who would perform the manual spatialisation, in addition to live sound technicians.

¹⁴⁷ "Pierre Boulez - Dialogue de l'ombre double, (Salzburg Festival Concert, 1992)," YouTube Video, <https://www.youtube.com/watch?v=tRALrBqIn8s>.

¹⁴⁸ Yeh, John Bruce, performer. *Dialogues With My Shadow*, Koch International Classics, 7088. 1997.

¹⁴⁹ Sandroff, Howard. "Realizing the spatialization processing of Dialogue de l'ombre double by Pierre Boulez." *International Computer Music Conference*, San Jose, 1992: 202-205.

¹⁵⁰ Fenelly, 392.

¹⁵¹ Houle, Francois, performer. *Double Entendre*, Earsay Productions, 2005.

¹⁵² Comte, Jérôme, performer. *Stravinsky – Boulez*, Les Belles Ecouteuses, LBE10. 2015.

¹⁵³ Bouman, Tara, performer. *Contemporary*, Aktivraum, AR 50101. 2003.

¹⁵⁴ David, Vincent, performer. *Berio & Boulez: Dialogue, chemins, récit...* aeon, AECD 0860. 2013.

¹⁵⁵ Hemken, Volker, performer. *Bass Clarinet Recital*, Edition Zeitklang, 2014.

¹⁵⁶ Bosgraaf, Erik, performer. *Dialogues* Brilliant Classics, 94842. 2015.

However, after collaborating with Richard McKenzie (DCS) and making further adaptations to my set-up, it became possible for me to perform the spatialisation from the stage.

I utilized the Yamaha Digital Mixer DM1000, available through the DCS. According to the instructions in the *Technical Requirements* portion of the score, I programmed the automatic spatialisation for six faders (corresponding to the six loudspeakers). I was able to recall the presets during my performance of *Sigle initial* by pressing the foot pedal. A simple Max/MSP patch was required (**Figure 7.1**) and a MIDI Interface was added to the setup, enabling the real-time progression through the fader settings.

For *Transition 4 à 5*, manual spatialisation was necessary due to the gradual, rather than instant, method of panning. It was necessary to isolate this movement for the purposes of demonstration at my lecture-recital rather than perform the *Strophes* that come before or after. Indeed, if I was performing sections that overlapped with this pre-recorded section, it would not

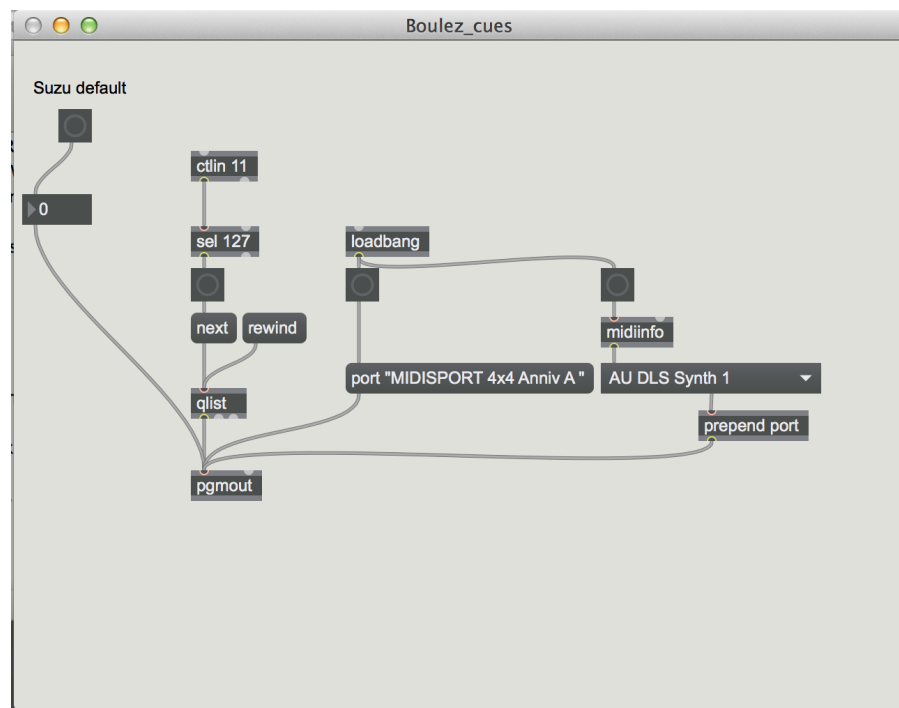


Figure 7.1: Max/MSP patch used in live demonstration of excerpts from *Dialogue de l'ombre double*. Created by Richard McKenzie.

have been possible to also perform the manual spatialisation. In order to ensure that I could move all six faders at a steady and slow pace, they were synced (also called “ganged” or “grouped”) through the faderlock feature.

Please note that for the purposes of this project, I chose not to incorporate a piano during the live demonstration of *Strophe 1*.¹⁵⁷ For more information on how to achieve the resonating piano strings effect, refer to the *Technical Requirements* in the score.

While I have successfully adapted this work to meet the needs of my self-sufficient approach, I believe that further experimentation and modifications are required. For this piece, I do not recommend the chosen set-up and software to other performers. With regards to equipment, the Yamaha Digital Mixer worked well, yet it was overly complicated for my needs and did not fulfill my requirement for portability. I was unable to conveniently incorporate it into my self-sufficient approach and it became a distraction in performance rather than a practical solution. Ultimately, the demanding technological requirements may disrupt the instrumentalist’s intense concentration and poise which are crucial to be able to perform this virtuosic work.

7.7 Recording the “double” parts

I recorded the “double” parts on March 26, 2017 in Clara Lichtenstein Hall.¹⁵⁸ The sound recording engineer for the session was Veronica Galicia Lopez and I am grateful for her assistance with this project.

We recorded two movements from *Dialogue de l’ombre double: Sigle initial* and *Transition 4 à 5*. The preliminary set-up and adjustment of microphones took approximately 45

¹⁵⁷ Practically, self-sufficient performers must consider the feasibility of this technological requirement. Additional hours of planning, experimentation, research, set-up and implementation are required to incorporate this element into the live performance. The use of additional microphones and a piano are outside the scope of this project and deserve further study.

¹⁵⁸ McGill University’s Schulich School of Music.

minutes. We experimented a great deal with microphone placement and other parameters. Two AKG C460 microphones were used for close-miking and two DPA 4006A were used for the room-miking. When close-miking the clarinet, it is important to consider the tone production across the range of the clarinet. It is insufficient to have a single microphone in the vicinity of the bell of the clarinet since the majority of the sound comes from the tone holes. Therefore, the ideal location for the AKG microphones (for the purposes of close-miking) was directly in front of me under the music stand (shown in **Figure 7.2**).

As with any recording session, I made efforts to reduce loud breathing and noisy instrumental sounds, such as key clicks, in order to minimize disturbances. For instance, embouchure air leaks will be picked up by the microphone, so clarinetists must anticipate this well in advance of the recording session and take necessary steps in their practice to reduce such noises.

Since recording sessions are often long and exhausting, I chose to sit during the recording session. Whether a performer sits or stands, they should decide in advance and inform the engineer so the set-up process is efficient.



Figure 7.2: The recording session for *Dialogue de l'ombre double*.
Photo credit: Suzu Enns

7.8 Stage set-up

The set-up was identical to the other works on the program except for the addition of the large Yamaha Mixer and MIDI Interface (**Figure 7.3**, shown in grey). In addition, six loudspeakers were placed around the hall according to the specifications in the *Technical Instructions*.¹⁵⁹

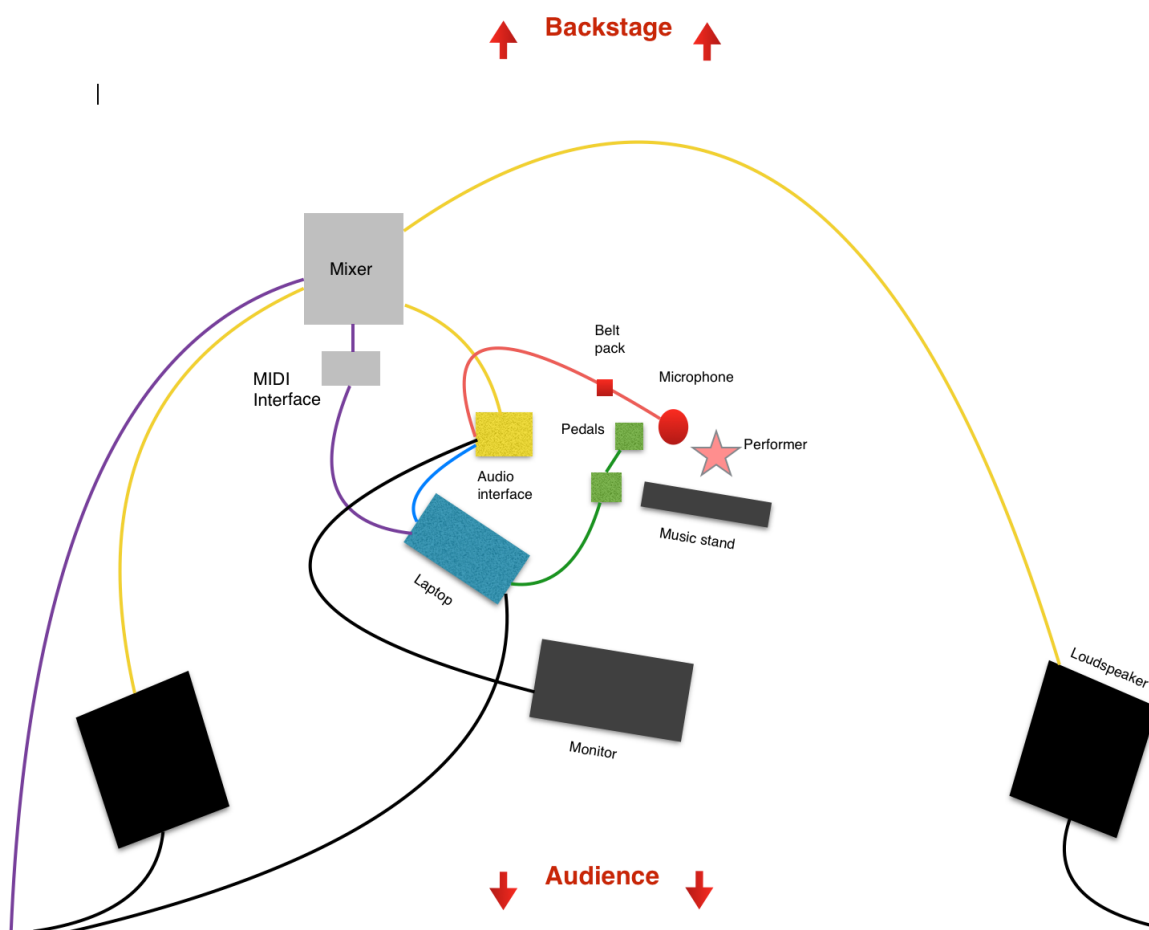


Figure 7.3: Stage map for *Dialogue de l'ombre double*.
Created by Suzu Enns.

¹⁵⁹ Gerzso, "Technical Instructions," 25. Refer to Figure 1b.

7.9 Practice and study

Sigle initial

The first movement of *Dialogue de l'ombre double* features rapid changes of dynamics and tempo. These two pages must be learned slowly and carefully. Every phrase should be smooth and the intervals should be legato so as not to detract from energetic dynamics and tempo.

According to Joe Rogers, there are twenty-six phrases in *Sigle initial* that can be further divided into sub-phrases based on Boulez's use of slurs.¹⁶⁰ Rogers provides the following analytical perspective of the movement: "The downward drift still is maintained on the global level, but on the local level, the contour is less direct and more jagged. Until the final few pitches, regular changes in direction occur."¹⁶¹ The performer should allow plenty of time to learn this movement. Ultimately, it must be performed at such a rapid tempo that some, if not all, of the movement will need to be memorized.

It was beneficial to practice this movement by temporarily disregarding the note values, which permits the musician to focus on legato, intervals, relaxed fingers, and voicing. It is also beneficial to exaggerate the dynamics, which will impact the musical shape of the movement when performed at tempo.

Throughout the movement, descending intervals to low E with slight crescendo may project louder than intended. Clarinetists will likely exaggerate the low E as well as lower the tongue slightly and "slap down" the fingers when rapidly descending to this pitch within a crescendo. Therefore, these habits should be identified and corrected. For all movements of this piece, I recommend that performers frequently record their playing in order to monitor progress and identify problems.

¹⁶⁰ Rogers, "*Dialogue de L'Ombre Double: Construction by Assemblage*," 40.

¹⁶¹ Ibid., 34.

When performing the spatialisation, the “*partition avec régie son*” must be used. The performer carefully follows the pre-recorded clarinet and presses the pedal at each rest, where there is a cue number noted above the staff. Practice the spatialisation so the act of pressing the pedal at the correct moment becomes natural and relaxed.

Strophe 1

The clarinetist starts performing *Strophe 1* while *Sigle initial* is being played through the loudspeakers. Note that the second staff of the performer’s score (indicated as “*fin du sigle initial*”) is the pre-recorded part that provides a clear notation of the interaction between the movements. This transition between the pre-recorded and live sections is challenging for the self-sufficient performer who must continue to realize the spatialisation by pressing the pedal while also preparing to perform a long, controlled tone in a considerably slower tempo.

Each long tone in this movement is assigned a performance indication (e.g. the first note of the section must be “a very remote sound”) and subtle multiphonics must be produced. While these should be produced with the embouchure and voicing (i.e. split tones), a variety of multiphonic fingerings can produce a similar effect. However, the notated pitch must sound in the multiphonic. Ultimately, the performer must consider their strengths with regards to extended techniques and make long-term efforts to develop additional skills.

The rapid articulation should be light and carefully phrased according to the pacing of the diminuendo. It is highly beneficial to experiment with the “groupings” of the staccato runs (i.e. a quintuplet can be grouped as 3+2 or 2+3 according to musical and technical considerations). Once technical mastery is achieved, greater emphasis should be placed on larger musical gestures, phrasing, and beauty of tone. The pacing should be relaxed and each run must be even and cleanly articulated. The fingers should be supple and “resonance” fingers

should be used when possible (e.g. m. 6, beat 3, the fourth/ring finger of the left hand can stay down for the A-flats).

Transition 4 à 5

When recording this movement, a smooth legato must be achieved and the precise dynamics must be followed. This section should be practised with the metronome set to the 8th note and the performer should diligently subdivide during the recording session. Yet, it should be performed “without haste and very freely,” so the clarinetist must achieve rhythmic accuracy while projecting this meditative, relaxed quality.

Again, the “*partition avec régie son*” must be used in live performance. I began this section at m. 6, so the faders on the mixer were already prepared for cue 2 (i.e. slightly raised). The performer carefully follows the pre-recorded clarinet while adjusting the faders. The faders should be all the way up for cue 3 (*forte*) then lowered gradually for a slow diminuendo to the end of the section. The performer needs a steady hand and must practice with the mixer as they would practice their primary instrument.

7.10 Pedagogical recommendations

Dialogue de l'ombre double presents significant challenges for all clarinetists. The performer must have advanced instrumental and musical skills in addition to technological expertise. Therefore, the work should be introduced to very advanced students who should review section **7.9 — Practice and study**.

Nevertheless, it is an important work that can be introduced to younger students through guided listening exercises (e.g. play recordings for the student and discuss elements of interaction, balance and instrumental technique) and group learning (e.g. the student learns one movement and performs with another clarinetist or their teacher in place of a pre-recorded “*double*” part.)

Chapter 8

Conclusions and Future Considerations

Opportunities for composers and performers, professional or amateur, have never been so extensive and rewarding in this exciting medium of artistic expression.

-Peter Manning, *Electronic and Computer Music*¹⁶²

8.1 Reflection

An important outcome of this research has been my personal development of a self-sufficient practice for electronic-acoustic repertoire. I achieved my objective of successful integration of pre-recorded, live electronics and video into my artistic practice. Further, I exceeded my original expectations with regards to self-sufficiency,¹⁶³ permitting me to rehearse and perform with complete independence. My recital served as an integral component of my research, affording me the opportunity to test the limits of this self-sufficient approach in a concert setting. The process of post-recital reflection has exposed some of the benefits and disadvantages of the chosen approach and highlighted areas that deserve further exploration.

I believe the most important outcome for my artistic practice has been the realization that some electronic-acoustic repertoire requires me to serve primarily as instrumentalist, while other repertoire requires more technological attention. Out of necessity and eagerness, I have become an interdisciplinary musician with the ability to serve the roles of instrumentalist and technician¹⁶⁴. Upon reflection, I have come to understand and respect that, in the context of a self-sufficient approach, my attention will necessarily be split between these roles. For example,

¹⁶² Manning, Peter. *Electronic and Computer Music*. (Oxford: Oxford University Press, 2013): 491.

¹⁶³ At the early research stage, I thought I would have to perform with some technical assistance for some pieces, especially the Boulez.

¹⁶⁴ Though admittedly, it will take several years for my level of technological expertise to equal my instrumental expertise.

when performing the pre-recorded movements to Brockman's *Tagore Songs*, approximately 70% of my focus was on my role as instrumentalist. When performing Ianza's *ektenes III*, my attention was more balanced, with 50% of my attention on performing the instrumental part and 50% on performing the electronics. Finally, the performance of excerpts from Boulez's *Dialogue de l'ombre double* required approximately 70% of my attention on the electronics and 30% on the live clarinet. Unsurprisingly, I was most at-ease performing *Tagore Songs* at my lecture-recital since it closely resembled the performance practice to which I am accustomed, while the Boulez posed the greatest challenges since the majority of my attention was on the technological elements.

Some performers will naturally be concerned about the proposed approaches. However, as Alex Shapiro offered in the opening quote to **Chapter 2**, "Letting go of one's knowledge of *how things have always been* is among the most important techniques for successful paradigm shifting."¹⁶⁵ Exposure to new repertoire and skills, experience with different approaches and above all a willingness to try new things is essential. Alternative artistic practices such as the ones discussed in this paper will not jeopardize the music or quality of experience. With careful experimentation and integration, this approach can strengthen the performance experience, provide opportunity for creative exploration, enhance personal investment in the production, and foster collaboration with composers and technicians.

Following are some additional, practical reflections on performing electronic-acoustic music based on my experience. For self-sufficient clarinetists, the traditional roles of the performer will necessarily change during all stages of the concert (including pre- and post-performance). Before the performance, the musician will need to ensure that all electronics are working correctly. Practically, this may require that the musician is on-stage before the concert

¹⁶⁵ Shapiro, Alex. "The e-Frontier: Electroacoustic Music, Multimedia, Education, and Audiences in the Digital World (Part 2)." *WASBE World*. (September 2014): 8.

and during intermission rather than waiting backstage as is customary for many performers. Between pieces, the performer should plan to remain on-stage in order to reduce risk of cable disconnection, damage to equipment (including instruments), software difficulties and unintentional blasts through the loudspeakers while leaving the electronics unattended. After each piece as well as at the conclusion of the concert, performers must attend to the electronics, a necessary part of fulfilling their role as technician. While performers typically spend a fair amount of time bowing to the audience following the completion of the piece and concert in order to show appreciation, a self-sufficient performer's job is not done when they have played the last note of the performance. Rather, the performance is finished once the necessary steps have been taken to adjust settings or turn off the electronics. With careful planning and patience on-stage, the performer will become accustomed to fulfilling these roles and retain many of the important traditional theatrics of classical stage performance.

8.2 Benefits of the self-sufficient approach

As a result of a self-sufficient approach, performers, teachers and students will:

- Become more independent and marketable.
- Experience a more convenient and practical way to perform.
- Be able to perform in virtually any venue without restriction.
- Experience decreased reliance on computer music assistants or live sound engineers.
- Realize long-term cost efficiency.
- Enjoy increased confidence and consistency in performance.

The benefits of a self-sufficient approach are also readably transferable to the teaching studio. The more we are able to offer our students, the more opportunities they will have to study and perform this repertoire. I refer to this as a holistic pedagogical approach in which all parts are consolidated within the self-sufficient performance practice. Thus, students will learn

clarinet fundamentals alongside all components of electronic-acoustic practice, working towards self-sufficiency and independence.

8.3 Disadvantages of the self-sufficient approach

Throughout my research and experimentation process, I have inevitably discovered some disadvantages to the self-sufficient approach, including:

- At the beginning, a considerable amount of time must be invested towards research and learning to use the equipment.
- Up-front costs (i.e. equipment, insurance).
- Transportation difficulties (i.e. weight, weather conditions).
- Careful planning and organization are required in order to ensure that all equipment is operable. This can be a time consuming process (i.e. batteries fully charged, cables and cords are properly labelled for greater efficiency, etc.).
- Greater responsibility for the musician in order to avoid risk of damage and theft of equipment.
- An increasing amount of obsolete technology (hardware and software) that may necessitate the purchase of new equipment.
- Lack of knowledge of programming software results in continued dependence on a computer music technician.

8.4 Thoughts on pedagogy

Becoming a self-sufficient performer necessitates a wide range of technological skills and rehearsal solutions. Accordingly, pedagogy must adapt to serve the needs of today's repertoire and future generations of clarinetists.

The pedagogical approaches proposed in this paper are applicable for both beginning and advanced clarinetists, despite the fact that very little electronic-acoustic repertoire is available for young clarinetists.¹⁶⁶ Upon completion of this document, I intend to collaborate with composers on the development of new electronic-acoustic repertoire specifically intended for

¹⁶⁶ Grégoire Lorieux (http://gregoirelorieux.net/gregoire_lorieux_compositeur/etudes_electroniques.html) has composed pedagogical pieces. This contribution is significant, yet it is merely a beginning.

beginner and intermediate level clarinetists. By creating more diverse repertoire for a variety of levels and ages, and by developing clear pedagogical approaches to performance practice, I suspect that more educators and performers will be inspired to explore electronic-acoustic music.

8.5 Suggested electronic-acoustic works for beginners

The four chapters on repertoire are intended to serve as a resource guide for the study of those works while also offering relevant information that can be applied to other electronic-acoustic works.

Brockman's *Tagore Songs* and Allen's *Dry Cell* are ideal works for clarinetists looking for an introduction to electronic-acoustic repertoire. Below is a list of several additional works (presented in alphabetical order) that feature pre-recorded electronics. These works require minimal technological expertise and are therefore ideal starting points. I chose the works based on: 1) Type of electronics employed; 2) Musical interest; 3) Study of scores and/or recordings; and 4) Popularity amongst professional performers.

-A Little Night Music (2009)

Composer: F. Gerard Errante (<http://fgerrante.org>)

-Circles in the Sun: Clarinet Solo with Prerecorded electronics on CD (2002)

Composer: Jane Brockman (<http://www.janebrockman.org>)

-Crack Hammer for clarinet and computer-generated sounds (2004)

Composer: Zack Browning (<http://www.zackbrowning.com/index.htm>)

-Five Arabesques for clarinet & electronics (1999)

Composer: Barry Schrader (<http://www.barryschrader.com/index>)

-Nautilus for B-flat clarinet and digital tape (1988)

Composer: David Keane (<https://www.musiccentre.ca/node/37230/showcase>)

-New York Counterpoint (1985)

Composer: Steve Reich (<http://www.steverreich.com>)

-Water Crossing (Bb Clarinet and Electronic soundscape) (2002)

Composer: Alex Shapiro (<http://www.alexshapiro.org/index.html>)

8.6 Future considerations

To conclude, I will address four areas for future consideration: **standardized software**, **refinements to the set-up**, **adaptation of works** and **performer involvement**.

Standardized software: Bukvic emphasizes the importance of software standardization that will enable more musicians to perform electronic-acoustic repertoire. He states:

In those not-so-common instances where complex pieces are well executed and where technological prowess shines, the audience is often so impressed by the technical elements of the work that it becomes hard to make a sane judgement about the artistic value of the work. In order to thwart this kind of flux between art and technology and furthermore to simplify the process of artistic creation, and even more importantly performance, the artistic community needs to have more easy access to a comprehensive and easy-to-use interface that will shift the focus from the technology to values of greater importance, such as the overall artistic merit of one's creation.¹⁶⁷

In order to become a fully independent performer-technician, it will be necessary for me to receive further training in Max/MSP and other software. These skills will enhance my ability to effectively perform and teach this repertoire. However, I look forward to future developments in software that are performer-focused and meet the needs and abilities of instrumentalists.

Refinements to the set-up: I have determined my performance practice will benefit from the following set-up changes: experimentation with different foot pedals¹⁶⁸ and a pick-up microphone installed in a clarinet barrel.

Due to rapid developments in available technology, it has not been possible to experiment with innovative new products such as the SABRE Multi Sensor¹⁶⁹ for live electronics (as presented at the International Clarinet Association's annual ClarinetFest, July 26-29 2017 in Orlando, Florida).

¹⁶⁷ Bukvic, "RTMix — towards a standardized interactive electroacoustic art performance interface," 280.

¹⁶⁸ My objective is to find pedals that are quiet when pressed and easy to operate while standing.

¹⁶⁹ <https://www.sabre-mt.com>

For the repertoire in this project, I chose not to use a click track for performance. Yet, I am encouraged about the current prototypes of a Vibrotactile Metronome that have been developed at IDMIL¹⁷⁰ and CIRMMT¹⁷¹ at McGill University. Patrick Ignoto¹⁷², Ian Hattwick and Marcelo Wanderley have collaborated with Guillaume Bourgogne¹⁷³ on the development of a device that can be attached to the body, transmitting a pulse¹⁷⁴ that would normally be transmitted to performers through earphones. Although the device has been created for use by conductors of contemporary music, I was invited to test it while playing the clarinet. There are numerous performance applications for this device that will become apparent through further research, experimentation, and performer involvement.

Technology will continue to rapidly develop, making electronic-acoustic music a stimulating and challenging field. Composer Philippe Leroux states:

I have the feeling that we are still in the prehistoric era, compared to what is coming...For me, the future of electronics lies in its very obliteration, meaning when we can do the most complex operations in the most easy and simple way, but that is still far from being the case.¹⁷⁵

Adaptation of works: As an extension of this research, I will continue to adapt electronic-acoustic works to fit the self-sufficient model of performance. I will be able to perform a

¹⁷⁰ Input Devices and Music Interaction Laboratory, <http://www.idmil.org>.

¹⁷¹ Centre for Interdisciplinary Research in Music Media and Technology, <http://www.cirmmt.org>.

¹⁷² This project served as Patrick Ignoto's M.Mus. thesis at McGill University.

¹⁷³ Bourgogne is co-artistic director of the music ensemble Cairn (Paris, France), principal conductor of Camerata Aberta (Sao Paulo, Brazil), and artistic director of the ensemble Op.Cit (Lyon, France). Since 2013, he has served as Professor of Conducting and Director of the McGill Contemporary Music Ensemble at the Schulich School of Music, McGill University. <https://www.mcgill.ca/music/guillaume-bourgogne>

¹⁷⁴ According to the needs of the performer and repertoire, the device "uses more natural feeling pulses to convey tempo information to the conductor." Ignoto, Patrick, et al., "Development of a Vibrotactile Metronome to Assist in Conducting Contemporary Classical Music" In *Proceedings of the International Conference on Applied Human Factors and Ergonomics*. Los Angeles, 2017. *In Press*. 10.

¹⁷⁵ Vassilandonakis, "An Interview with Philippe Leroux," 21.

substantial list of repertoire, conveniently tour, offer workshops, and share performance materials with performers, teachers and students.

Performer involvement: According to Elizabeth McNutt:

When performers are fully engaged in the process of creating electroacoustic music, their contributions can be of great value. Composers acknowledge this, and often ask me what I most want from music technology. I personally prefer the musical opportunities provided by interactive systems, and hope that composers will continue to explore these directions.¹⁷⁶

Performers have the opportunity to actively contribute and participate in the creation of new repertoire and technology. Ultimately, they have the ability to shape the future of electronic-acoustic music and clarinet performance.

¹⁷⁶ McNutt, "Performing electroacoustic music: a wider view of interactivity," 303.

Appendices

Appendix A: D.Mus. Lecture-Recital Program

Appendix B: List of equipment

Appendix C: Performance cue sheets

ektenes III
Tagore Songs
Dry Cell
Dialogue de l'ombre double

Le mercredi 12 avril 2017
à 17h

Wednesday, April 12, 2017
5:00 p.m.

Conférence-récital de doctorat

Doctoral Lecture-Recital

Suzu Enns

clarinette / clarinet

classe de / class of
Simon Aldrich

***Pédagogie de la clarinette pour la musique électronique-acoustique :
Une ressource pour les interprètes et les enseignants /***

Clarinet Pedagogy for Electronic-Acoustic Music: A Resource for Performers and Educators

Dialogue de l'ombre double (1985; extraits / excerpts)

Pierre Boulez
(1925-2016)

ektenes III for clarinet, tape and digital signal processing (1995)

alcides lanza
(né en / b. 1929)

entracte

Tagore Songs, for Clarinet Solo with Pre-recorded Electronics on CD (1997)

Jane Brockman
(né en / b. 1965)

I. *A lurid glow waxes and wanes on the horizon...what was sorrow
has now become peace.*

II. *...Swept by the mad cadence of the storm*

III. *Reflected... from a far off world... and vanished!*

IV. *Where roads are made, I lose my way...*

Dry Cell for soprano saxophone, tape and video
(2009)

J. Anthony Allen
(né en / b. 1965)

adapt. pour clarinette par / for clarinet by Suzu Enns /

Ce concert fait partie des épreuves imposées à Suzu Enns pour l'obtention d'un doctorat en interprétation.
This recital is presented by Suzu Enns in partial fulfilment of the requirements for the degree of Doctor of Music in Performance.

Appendix B: List of equipment

Created by Suzu Enns

Additional equipment:
-USB expander hub
-extension cords and power bars
-extra batteries
-good quality earplugs
-iPhone/iPod/Android phone

Type of equipment	Product choice	Company websites	Purpose	Benefits	Disadvantages	Additional product recommendations
Mircophone	Applied Microphone Technology (AMT) Clarinet double-microphone	http://appliedmicrophoneshop.com/products/amt-ws	-Amplifying the instrument. -Input source for live electronics.	-Professional quality. -Popular choice for professional clarinetists; designed specifically for the clarinet. -Good sound; good option for close-miking the clarinet. -Option of battery or phantom power. -Easy and safe to attach to bell of the instrument. -Easy to adjust position of microphones to fix balance.	-Not as readily available in local shops (must be ordered). -Unable to put clarinet on a clarinet stand. -Adds weight to the bottom of the instrument. -Condensation dripping from the bell may damage microphone. -Breathing/air/instrument sounds may be picked up.	-Clip-on mics for clarinet -Pick-up microphone installed into a clarinet barrel, such as Nalbantov Electronics NCM 8X (http://n-electronics.com/products/ncm8x) or Rumberger-KiX (http://www.rumberger-soundproducts.de) -A common alternative is to set-up a microphone on a stand, however, there are some disadvantages to this approach. The performer must stand quite still, especially when sensitive pitch tracking software is implemented in the electronics.
Audio Interface	RME Babyface Pro	http://www.rme-audio.de/en/products/babyface_pro.php	-The audio interface enables the microphone to be connected to the laptop for amplification and live electronics. -May also serve as a mixer.	-Efficient desktop design make it ideal for use on-stage use. -Professional quality. -Extremely portable. -Simple connection to laptop via USB cable (provided).	-High cost; for it's steep price, it doesn't have as many input and output options as another cheaper brand may for the same cost. -The driver, TotalMix FX takes time and patience to learn.	-Apogee Duet (http://www.apogeedigital.com/products/duet) -Universal Audio Apollo Twin USB (http://www.uaudio.com/audio-interfaces/apollo-twin-usb.html) -ZOOM UAC-2 (https://www.zoom.co.jp/products/audio-converter/uac-2-usb-30-audio-converter) -Focusrite Scarlett z12 (https://us.focusrite.com/usb-audio-interfaces/scarlett-z12) -MOTU UltraLite mk3 Hybrid or mk4 (http://www.motu.com/products/motuaudio/ultralite-mk3 / http://motu.com/products/proaudio/ultralite-mk4) -Steinberg UR22mkII (https://www.steinberg.net/en/products/audio_interfaces/ur_series/models/ur22mkii.html)
Laptop	Macbook Pro 13 inch	https://www.apple.com/macbook-pro/	-Its most basic purpose is playing a pre-recorded track on a CD or on iTunes. -A more demanding use is running software or stand-alone Max/MSP patches. -The audio interface is connected through USB cable to the laptop. A driver needs to be installed, serving as a translator between the audio interface and the software.	-Quality. -Long lifespan.	-Cost.	-Macbook Air is light and compact, making it ideal for travel.
XLR Cables	Digiflex® Professional Touring Series NXX-6 (6')	http://www.sfm.ca/digiflex/products/	-1 Balanced XLR cable is used to connect the microphone to the input of the audio interface, and 2 (two) Balanced XLR cables are used to connect the audio interface to two loudspeakers. An additional cable is used to connect the audio interface to the stage monitor.	-These cords are relatively inexpensive and good quality. -Designed and built in Canada; readily available in Montreal. -Lifetime warranty. -Uses high quality Neutrik connectors and copper shielding which is ideal for regular use.	-Lower quality cables are more susceptible to picking up interference and other noise.	-Mogami Gold Studio -Planet Waves XLR Cables -No matter what cables are used, the musician should learn how to properly wrap their cords! Refer to YouTube videos, etc.

Type of equipment	Product choice	Company websites	Purpose	Benefits	Disadvantages	Additional product recommendations
Foot Pedals	Logidy UMt3 Parametric USB MIDI Foot Controller <i>and</i> Roland EV-5 Expression Pedal	http://www.logidy.com/?pid=1 <i>and</i> https://www.roland.com/global/products/ev-5/	-Used to trigger audio files and effects that have been programmed into the stand-alone patches. -I connected the Roland pedal to the Logidy pedal via the “exp” input, then connected the Logidy pedal to the laptop through the provided USB chord. -The Logidy pedal was used as an intermediary in the pedal chain between the Roland pedal and laptop. I performed on the Roland pedal, that served as a general purpose start/stop pedal rather than an expression pedal.	-The Logidy pedal can be plugged directly into laptop via USB port. -The Logidy pedal has 3 separate switches that can be configured according to the needs of the performer. -The Logidy pedal has a strong steel enclosure. -The Roland pedal features a large footbed, so the performer can keep their foot planted on the pedal; this is especially useful for standing performers to help with stability. -No driver installation is required for these pedals.	-The Logidy pedal makes an audible sound when pressed, which isn't ideal for quiet electronic-acoustic music. Therefore, I added the Roland pedal to the set-up because it was readily available and produced minimal sound when depressed. While this was a good short-term solution, the necessity of two pedals in the set-up is cumbersome. Additionally, my foot and leg had to be in a somewhat awkward position to use this pedal at a trigger pedal rather than its intended use as an expression pedal. -An unexpected inconvenience of this pedal set-up was the restrictions it placed on my choice of footwear (a pair of kitten heels with a small heel for performance). Musicians who typically wear heels during performance should choose flat shoes, no matter what pedal is used. Don't wait until 5 minutes before the concert to try out the pedals with your performance footwear — you may end up performing in socked feet!	- Yamaha MIDI Foot Controller MFC1 — as recommended by F. Gerard Errante (Yoder dissertation, 91) - Behringer MIDI Foot Controller FCb1010 — as recommended by Marianne Gythfeldt (Yoder dissertation, 100) (http://www.music-group.com/Categories/Behringer/Accessories/Midi-Foot-Controllers/FCB1010/p/P0089)
Loudspeakers	Meyer UPJ Compact VariO™ Loudspeaker	https://meyersound.com/product/upj/	-Project all audio information for a piece. -Amplified acoustic instrument (clarinet), electronic sounds, spacialisation.	-6 of the same loudspeakers (for Boulez only) allowed me to maintains the same timbral character throughout the hall.	-Weight (not portable).	- Bose® L1® Compact system (https://www.bose.ca/en_ca/products/speakers/portable_pa_speakers.html) - Yamaha speakers (http://www.yamahaproaudio.com/global/en/products/speakers/)
Rehearsal speakers	Bose® SoundDock® Portable <i>Note: This product is no longer available (sold from 2007-2014)</i>	https://www.bose.ca/en_ca/support/products/docking_speakers_support/sounddock_portable.html	-Use for personal practice, rehearsal, lessons and studio class demonstrations. -Connect to an audio interface, laptop, smartphone or iPad using an 1/8' to 1/8' audio cable* such as the Insignia NS-AUX7 1/8' to 1/8' Audio Cable (3') (https://www.insigniaproducts.com/pdp/NS-AUX7/4289992)	-Despite its compact size, the speaker produces exceptional sound and significant volume that is more than adequate for rehearsal purposes and demonstrations. -The product is high quality and portable, with a convenient carrying case. -It can double as a speaker for home use.	-This product is no longer available; please see “Additional product recommendations” for alternative models.	- Bose® Soundlink Revolve Bluetooth Speaker (https://www.bose.ca/en_ca/products/speakers/wireless_speakers/soundlink_revolve.html) -Good quality headphones for personal practice.
Stage Monitor	Electro-Voice EV SXA-250 2-Way Full-Range 15” Powered PA Speaker	http://www.electrovoice.com	-Project important back to the performer such pre-recorded electronics and live electronics. -Should be placed at 180 degrees to performer (i.e. directly facing each other).	-Aids in coordination and interaction with pre-recorded and live electronics. -Good quality sound (i.e. it is possible to hear all necessary cues in the pre-recorded part).	-Weight and size.	Behringer EUROLIVE B215D Active PA Speaker System (https://www.music-group.com/Categories/Behringer/Loudspeaker-Systems/Portable-Speakers/B215D/p/PoA2F) Behringer EUROLIVE B212C Active PA Speaker System (http://www.music-group.com/Categories/Behringer/Loudspeaker-Systems/Portable-Speakers/B212D/p/PoA2E)
Mixer (for Boulez only)	Yamaha Digital Mixer DM1000	http://www.yamahaproaudio.com/global/en/products/mixers/dm1000vcm/	-2 inputs, 6 outputs to the 6 loudspeakers. -Manual spacialisation for Boulez (<i>Sigle initial</i> and <i>Transition 4 à 5</i>).	-Capability of 16 inputs, 12 outputs for analog functionality. -Automated faders. -I/O (input/output) functionality.	-Bulky and heavy. -Not portable. -Served no purpose for other works on the program.	Refer to: https://cycling74.com/forums/non-midi-fader-box
USB MIDI interface (for Boulez only)	M-Audio MIDISPORT 4 x 4	http://www.m-audio.ca/products/view/midisport-4x4-anniversary-edition#	-Max/MSP sent data through USB connection to the MIDI Interface, then MIDI Interface sent data to the Yamaha Mixer (i.e. Max saw the mixer as a USB device).	-Hardwired USB interfaces are dependable, making them ideal for live performance.	-Served no purpose for other works on the program.	M-Audio Midiman MIDISPORT 2x2 (http://www.m-audio.ca/products/view/midisport-2x2-anniversary-edition)

Appendix C: Performance cue sheets

alcides lanza, *ektenes III* (1995-I) for clarinet, tape and digital signal processing

Performance cue sheet (created by Suzu Enns)

Pre-recorded audio (tape) created by alcides lanza

Max/MSP patch created by Takuto Fukuda in collaboration with Richard McKenzie and Suzu Enns

Description of effects (as described in the score):

#1: single repeat echo, ca. 300 ms.

#2: single repeat echo, ca. 450 ms. with feedback at 40% [3 or 4 repeats]

#3: Pitch Shifted effect, generating a lower Augm. fourth interval, with variable feedback, up to 70% [multiple repeats] [indicated as Harm. I in the score]

#4: spiraling effect added to #3 [Pitch Shift by lower Augm. fourth, spiraling effect indicated as INV. in the Boss unit] [indicated as Harm. II in the score]

Steps	Description	Location (measure)	Additional notes
1	TotalMix FX— CLICK THE lanza SNAPSHOT (that automatically reverts all settings to the pre-sets that have been saved for this piece)	N/A	Adjust window size so that only the settings in use are shown (it is recommended that the window takes up approx. 1/4 of the screen).
2	Pick up clarinet	N/A	Attach and adjust the positioning of the microphone as needed. Ensure reed is wet, prepare music on stand, etc. as needed.
3	Play clarinet to test input on TotalMix FX (play a <i>mf</i> long tone)	N/A	If needed, phantom power (48V) must be on (when it is on, the 48V button is orange in the corresponding input of the window). *WARNING: DO NOT TURN ON PHANTOM POWER IF A BATTERY IS INSERTED IN THE MICROPHONE BATTERY PACK*
4	Open stand-alone MAX PATCH file (-alcidesNew)	N/A	Adjust the size of the Max window so that the TotalMix window is also visible on the screen.
5	DSP on/off — CLICK X	N/A	This step turns on the Max patch for practice and performance. (DSP = Digital Signal Processing)
6	Play a note on clarinet to test input on Max patch	N/A	N/A
7	Press pedal — ON Tape	m. 1 (beginning)	Tape starts immediately after pedal is pressed.
8	Press pedal — ON #1	m. 6	N/A
9	Press pedal — OFF #1	m. 7	N/A
10	Press pedal — ON #1	m. 8	N/A
11	Press pedal — OFF #1	m. 8	N/A
12	Press pedal — ON #2	m. 9	N/A
13	Press pedal — OFF #2	m. 10	N/A
14	Press pedal — ON #3 Harm. I (feedback 70%)	m. 10	N/A
15	Press pedal — OFF #3 Harm. I.	m. 11	N/A
16	Press pedal — ON #2	m. 12	N/A
17	Press pedal — OFF #2	m. 12	N/A
18	Press pedal — ON #3 Harm. I (feedback 0%)	m. 13	N/A
19	Press pedal — ON #3 Harm. I (feedback 70%)	m. 14	N/A
20	Press pedal — ON #3 Harm. I (feedback 0%)	m. 16	N/A
21	Press pedal — OFF #3	m. 17	N/A
22	Press pedal — ON #3 Harm. I (feedback 0%)	m. 17	N/A
23	Press pedal — ON #3 Harm. I (feedback 70%)	m. 19	N/A

Steps	Description	Location (measure)	Additional notes
24	Press pedal — OFF #3 Harm. I	m. 20	N/A
25	Press pedal — ON #4 Harm. II (feedback 70%)	m. 23	N/A
26	Press pedal — OFF #4 Harm. II	m. 24	N/A
27	Press pedal — ON #2	m. 25	N/A
28	Press pedal — OFF #2	m. 26	N/A
29	Press pedal — ON #1	m. 27	N/A
30	Press pedal — OFF #1	m. 28	N/A
31	Press pedal — ON #1	m. 29	N/A
32	Press pedal — OFF #1	m. 29	N/A
33	Press pedal — ON #3 Harm. I (feedback 70%)	m. 30	N/A
34	Press pedal — ON #4 Harm. II (feedback 70%)	m. 31	N/A
35	Press pedal — OFF #4 Harm. II	m. 32	N/A
36	Press pedal — ON #1	m. 34	N/A
37	Press pedal — OFF #1	m. 34	N/A
38	Press pedal — ON #4 Harm. II (feedback 70%)	m. 35	N/A
39	Press pedal — OFF #4 Harm. II	m. 35	N/A
40	Press pedal — OFF Patch	m. 36 (end)	N/A
41	DSP on/off — CLICK X	N/A	This step turns off the Max patch (no input or output when the X is off).
42	TotalMix FX — turn down all levels/gain for the input, software input and output.	N/A	All gain levels must be off before phantom power is switched off and microphone is unplugged.
43	TotalMix FX — turn off the phantom power (if applicable)	N/A	Phantom power (48V) is located in the input category (top left of the window).
44	Tear-down of set-up can now begin.	N/A	Basic tear-down procedure as follows: 1) Turn off all loudspeakers and monitor, 2) Unplug the XLR cables connecting the microphone, monitor and loudspeakers to the audio interface, 3) Unplug the USB foot pedal from the laptop, 4) Unplug the USB cable connecting the audio interface to the laptop, 5) Close all applications and programmes on laptop before closing/shutting down laptop, 6) Wrap all cables; put all hardware in their appropriate cases; swab and put away clarinet, reed, sheet music, etc.

Jane Brockman, *Tagore Songs* for Clarinet in Bb with Prerecorded Digital Sounds on CD

Performance cue sheet (created by Suzu Enns)

Pre-recorded audio (tape) created by Jane Brockman

Max/MSP patch created by Takuto Fukuda, in consultation with Richard McKenzie

Steps	Description	Movement	Location (measure)	Additional notes
1	TotalMix FX— CLICK THE BROCKMAN SNAPSHOT (that automatically reverts all settings to the pre-sets that have been saved for this piece)	N/A	N/A	Adjust window size so that only the settings in use are shown (it is recommended that the window takes up approx. 1/4 of the screen).
2	Pick up clarinet	N/A	N/A	Attach and adjust the positioning of the microphone as needed. Ensure reed is wet, prepare music on stand, etc. as needed.
3	Play clarinet to test input on TotalMix FX (play a <i>mf</i> long tone)	N/A	N/A	If needed, phantom power (48V) must be on (when it is on, the 48V button is orange in the corresponding input of the window). *WARNING: DO NOT TURN ON PHANTOM POWER IF A BATTERY IS INSERTED IN THE MICROPHONE BATTERY PACK*
4	Open stand-alone MAX PATCH file (Tagore Songs April 1)	N/A	N/A	Adjust the size of the Max window so that the TotalMix window is also visible on the screen.
5	DSP on/off — CLICK X	N/A	N/A	This step turns on the Max patch for practice and performance. (DSP = Digital Signal Processing)
6	Play a note on clarinet to test input on Max patch	N/A	N/A	Observe the level indicator on the top right corner of the patch window.
7	Press pedal — starts tape of 1st mvmt	1	m. 1	Audio file start approx. 5 seconds after the pedal is pressed.
8	Press pedal — stops 1st mvmt	1	N/A	Swab after 1st movement if necessary.*
9	Press pedal — starts 2nd mvmt (Velo Techno)	2	m.1	The Velo Techno effect is very sensitive to any input from the microphone (not just notes played on the clarinet). Therefore, it is recommended that the performer is very careful when turning pages, swabbing their clarinet, etc. in order to avoid unwanted electronic sounds before performing the second movement.
10	Press pedal — stops Velo Techno	2	m. 5	N/A
11	Press pedal — starts Pick Bass	2	m. 11	N/A
12	Press pedal — starts Dynamar	2	m. 14	N/A
13	Press pedal — stops Dynamar	2	m. 16	N/A
14	Press pedal — starts Next Frontier (Note G)	2	m. 24	N/A
15	Press pedal — Next Frontier (Note Bb)	2	m. 26	N/A
16	Press pedal — Next Frontier (Note C)	2	m. 28	N/A
17	Press pedal — Next Frontier (Note Eb)	2	m. 32	N/A
18	Press pedal — starts Velo Techno	2	m. 36	N/A
19	Press pedal — starts Aurora	2	m. 46	N/A
20	Press pedal — starts Pick Bass	2	m. 52	N/A
21	Press pedal — starts Dynamar	2	m. 56	N/A
22	Press pedal — stops Dynamar	2	m. 58	N/A

Steps	Description	Movement	Location (measure)	Additional notes
23	Press pedal — starts Next Frontier (Note A)	2	m. 66	N/A
24	Press pedal — Next Frontier (Note G)	2	m. 67	N/A
25	Press pedal — Next Frontier (Note A)	2	m. 70	N/A
26	Press pedal — Next Frontier (Note G)	2	m. 71	N/A
27	Press pedal — Next Frontier (Note Gb)	2	m. 72	N/A
28	Press pedal — Next Frontier (Note G)	2	m. 73	N/A
29	Press pedal — Next Frontier (Note G)	2	m. 75	N/A
30	Press pedal — Next Frontier (Note A)	2	m. 76	N/A
31	Press pedal — Next Frontier (Note G)	2	m. 77	N/A
32	Press pedal — stops Next Frontier (end of 2nd mvmt)	2	N/A	Swab after 2nd movement if necessary.*
33	Press pedal — starts 3rd mvmt (reverb only)	3	m. 1	N/A
34	Press pedal — starts tape	3	m. 11	Audio file will start approx. 5 seconds after the pedal is pressed. Due to this delay, it is recommended that the performer presses the pedal at the beginning of m. 11 instead of Brockman's original indication at m. 12.
35	Press pedal — stops 3rd mvmt	3	N/A	Reverb from 3rd movement also stops; swab after 3rd movement if necessary.*
36	Press pedal — starts 4th mvmt tape	4	m. 1	Audio file will start approx. 5 seconds after the pedal is pressed.
37	Press pedal — stops 4th movement	4	N/A	N/A
38	DSP on/off — CLICK X	N/A	N/A	This step turns off the Max patch (no input or output when the X is off).
39	TotalMix FX — turn down all levels/gain for the input, software input and output.	N/A	N/A	All gain levels must be off before phantom power is switched off and microphone is unplugged and detached from clarinet.
40	TotalMix FX — turn off the phantom power (if applicable)	N/A	N/A	Phantom power (48V) is located in the input category (top left of the window).
41	Tear-down of set-up can now begin.	N/A	N/A	Basic tear-down procedure as follows: 1) Turn off all loudspeakers and monitor, 2) Unplug the XLR cables connecting the microphone, monitor and loudspeakers to the audio interface, 3) Unplug the USB foot pedal from the laptop, 4) Unplug the USB cable connecting the audio interface to the laptop, 5) Close all applications and programmes on laptop before closing/shutting down laptop, 6) Wrap all cables; put all hardware in their appropriate cases; swab and put away clarinet, reed, sheet music, etc.

NOTE: Frequent swabbing is important for clarinetists using a clip-on mic (like the AMT double-clarinet microphone). If condensation drips from the bell onto the microphone, it may become damaged. Remember: Water and electronics don't mix!

J. Anthony Allen, *Dry Cell* for soprano saxophone, tape, and video (2009)

Performance cue sheet (created by Suzu Enns)

Steps	Description	Additional notes
1	Connect overhead projector to laptop.	Depending on the performance venue, the stage assistant will need to assist with turning on the projector and preparing the projector screen. If an assistant is present, it is suggested that the projector remains off (or paused) until the performer cues to indicate that they are ready.
2	TotalMix FX— CLICK THE ALLEN SNAPSHOT (that automatically reverts all settings to the pre-sets that have been saved for this piece)	Adjust window size so that only the settings in use are shown. NOTE: TotalMixFX window will be hidden during the performance, since the video file must be expanded to full screen mode (see step 5).
3	Pick up clarinet	Attach and adjust the positioning of the microphone as needed. Ensure reed is wet, prepare music on stand, etc. as needed.
4	Play clarinet to test input on TotalMix FX (play a <i>mf</i> long tone)	Clarinet should be amplified through the loudspeakers during the test (as per the pre-set in the SNAPSHOT); if the clarinet is not audible, refer to TotalMix FX window and adjust input and output levels as needed (levels can also be changed manually through the audio interface). If needed, phantom power (48V) must be on (when it is on, the 48V button is orange in the corresponding input of the window). *WARNING: DO NOT TURN ON PHANTOM POWER IF A BATTERY IS INSERTED IN THE MICROPHONE BATTERY PACK*
5	Open video file and expand to full screen.*	Once the video is expanded to full screen, the performer indicates to the stage assistant (if available) to turn on projector (see Additional Notes for step 1). When the video is ready, cue the assistant to turn on the projector and lower stage lighting.
6	Press PLAY on video file.	N/A
7	PERFORM PIECE	N/A
8	FINISH PIECE	At the conclusion of the performance (such as during the applause), the assistant should turn off (or pause) the projector.
9	TotalMix FX — turn down all levels/gain for the input, software input and output.	All gain levels must be off before phantom power is switched off and microphone is unplugged.
10	TotalMix FX — turn off the phantom power (if applicable)	Phantom power (48V) is located in the input category (top left of the window).
11	Tear-down of set-up can now begin.	Basic tear-down procedure as follows: 1) Turn off all loudspeakers and monitor, 2) Unplug projector cable from the laptop, 3) Unplug the XLR cables connecting the microphone, monitor and loudspeakers to the audio interface, 4) Unplug the USB cable connecting the audio interface to the laptop, 5) Close all applications and programmes on laptop before closing/shutting down laptop, 6) Wrap all cables; put all hardware in their appropriate cases; swab and put away clarinet, reed, sheet music, etc.

Pierre Boulez, *Dialogue de l'ombre double*
 Excerpts: *Sigle initial*, *Strophe 1* and *Transition 4 à 5*

Performance cue sheet (created by Suzu Enns)

Steps	Description	Movement
1	Default and rewind.	N/A
2	Open BOULEZ Max patch.	N/A
3	Find pre-recorded tracks on iTunes.	N/A
4	Pedal once to get to first setting.	N/A
5	Pick up clarinet.	N/A
6	Check music on stand.	N/A
7	Press play for PART 1 on iTunes.	1
8	Pedal through all scenes.	1
9	Play PART 2.	1/2
10	Stop playing.	2
11	Put down clarinet.	N/A
12	Go to mixer.	N/A
13	Find PART 3 setting.	3
14	Check music on stand.	3
15	Go to laptop and turn on track.	3
16	Go to mixer and work faders.	3
17	Play PART 3.	3
18	Go to mixer and change to Default.	N/A

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