

CHARTING THE WATERS: TOWARDS A MUSIC THEATRE PERFORMANCE
BASED ON CHARLES DARWIN and his THEORY OF EVOLUTION

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ABSTRACT

Charting the Waters: Towards a Music Theatre Performance

Based on Charles Darwin and his Theory of Evolution

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An examination of the dramaturgical strategies involved in the creation of a work of music theatre concerning science. A clearer understanding of music theatre dramaturgy can help to determine the best strategies that may be employed to bring science and the life and work of scientists to the stage. Through defining music theater dramaturgy, an examination of case studies, and finally, an examination of my own creative research, a conclusion concerning the most useful dramaturgical strategies for creating a music theatre performance may be found.

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INTRODUCTION

An examination of the dramaturgical strategies involved in the creation of a work of music/theatre concerning science.

It is generally accepted that artistic creativity and scientific research share categories, attitudes and values to an extent that goes beyond what one might deduce from their immediate goals, and also other objectives which are considered characteristic of each of these activities. Beauty, intuition, elegance, the intimate feeling of perfection finally achieved, these are shared cultural values that bring about vivid and very direct communication between scientists and artists who share the same delight in the creation of universes.¹

This study will examine the connections between art and science and its portrayal on the music theatre stage, using dramaturgy. It will examine two case studies, and then, a series of four music theatre pieces that I created, centered on the life and work of Charles Darwin and the development of his evolutionary theory.

It will also examine the occasionally treacherous journey that scientific information may take on its way to the stage. Why treacherous? The journey from scientific observation to metaphor is a difficult one to begin with: "... when we say that a photon scattered off an electron, what concrete experience do we have with electrons or photons?" asks physicist-turned-novelist Alan Lightman. "Metaphors in modern science", he continues, "must . . . build their reality from scratch."²

¹ Parra, Hèctor. *Hypermusic Prologue - A projective opera in seven planes*. Ensemble Intercontemporain. Kairos Music Production, 2010. CD. Sirène series - Liner Notes: 23

² Lightman, Alan. *A Sense of the Mysterious*. New York: Random House, 2005: 62-63

There may be further pitfalls along this journey: scientific information may not be accurately depicted once it reaches the stage, as a result of both adaptation and the directorial processes. The process of converting scientific information, which seems to communicate in a language of its own, to a theatre music libretto, can distort the material in a way similar to what occurs when a poem is translated from one language to another. The science involved may then appear pedantic, sententious, or excessively theoretical when it reaches the stage. Biographical information may also be distorted by these processes: scientists may be portrayed as larger-than-life superheroes rather than ordinary, though extremely intelligent human beings. One key to understanding and evaluating the degree of success at the end of this informational journey is the use of dramaturgy.

After first establishing a working definition of music theatre, I will examine various definitions of dramaturgy as it applies, first to theatre, and then to music. I will then attempt to discover some form of dramaturgy that may be applied to music theatre. A music/theatre performance consists of many layers that run concurrently, such as text, songs, accompaniment, lighting, and projections, etc. Dramaturgical examination can focus with great detail on each one of these layers, or zoom out to a larger focus to examine the working of all of the layers at the same time. It can help to determine the best methods for bringing scientific information to the music theatre stage.

I will next examine, using dramaturgical techniques, two case studies, which are both works of music theatre that utilize science-based subject matter. They are: *Einstein on the Beach*, the 1976 collaboration between director Robert Wilson, and composer Philip Glass; and *Hypermusic Prologue, A projective opera in seven planes* - a 2010 collaboration between Catalan composer Hèctor Parra and Harvard-based brane-theory physicist, Lisa Randall.

This will be followed by an examination of the four science-based music/theatre works concerning Charles Darwin that I created as a part of research conducted at Concordia University in Montreal. They are:

- *The Darwin Show - Version 1* (2006)
- *The “D” Opera, Version 2* (2008)
- *The “D” Opera, Version 3* (2009)
- *Darwin: Endless Forms Most Beautiful* (2011)

I will then conclude by examining some of the possible directions that research on Darwin, evolution, theatre, and composition may take in the future.

Chapter 1: MUSIC THEATRE DEFINED

What is music theatre? Eric Salzman and Thomas Desi define it as:

...theater that is music driven (i.e., decisively linked to musical timing and organization), where . . . music, language, vocalization, and physical movement exist, interact, or stand side by side in some kind of equality. . .³

In other words, the music links all the other performing elements, and they are roughly equal. In my perception, however, the elements are almost never equal, but rather, co-exist in different proportions, at any given moment, either the text, the movement, or the musical score, etc. is in the foreground. The curve of how the balance of these elements changes in proportion to one another over the course of the show comprises one aspect of the overall performance score.

Also, Salzman and Desi are careful to distinguish music theatre from both opera and musical theatre. Music theatre, they say: . . . is performed by different performers in a different social ambience than works normally characterized as operas or musicals.”⁴ Though some works blur these genre distinctions, the question of exactly what defines a work of music theatre is outside the focus of this paper, as it is concerned with works that have already been designated as music theatre works.

Is there a dramaturgy of music theatre? In order to define music theatre dramaturgy, I will first examine some definitions of theatre dramaturgy by itself. In the late 18th century, the innovator of dramaturgical methodology, Gotthold

³ Salzman, Eric, and Desi, Thomas. *The New Music Theatre*. New York: Oxford University Press, 2008: 5

⁴ *ibid*: 5

Lessing, defined it in this way: “Dramaturgy is the concern with composition, structure, staging and audience from literary analysis and historiography.”⁵

Lessing’s definition reflects a late 18th century view of dramaturgy as an extension of literary and historical studies. It is useful to note that Lessing’s is the only definition that includes the audience as a part of the theatrical equation. The position he held at the theatre in Hamburg, where he wrote his pioneering work on dramaturgy, was as an “in-house critic”⁶.

More than two centuries later, contemporary theatre director and theoretician Eugenio Barba and co-writer Nicola Savarese made this definition: “Dramaturgy: from ‘text’ – a weaving together; from ‘drama-ergon’ – the work of the actions; thus, that which concerns the weave of the performance.”⁷

Barba and Savarese’s concept of a performance as a kind of weaving will return later in this paper, where I define the compositional process of “mapping” as a kind of weaving or braiding.

Here is a more contemporary definition from dramaturg/producer Norman Frisch: “Dramaturgy is the dialogic relationship between subject matter and its theatrical framing; content and form.”⁸

Frisch locates dramaturgy in the interaction that occurs between the subject matter, (content) and its frame, (form), which includes everything discernible on the stage: lighting, text, music, staging, etc. This rhetorical definition is compelling as it is the only one that implies that there is content, i.e.,

⁵ Lessing, Gotthold Ephraim. *Hamburg Dramaturgy*. New York: Dover Publications, 1962.

⁶ Keefe, John. "The Dramaturg Past and Present." *Dramaturgs' network*. Web. 15 Mar. 2012.

⁷ Barba, E. & Savarese, N. *A Dictionary of Theatre Anthropology*. New York: Routledge, 1995: 68

⁸ Frisch, Norman. “Just deal with it!” *Theaterschrift*. 5-6. (1994) – interview.

something to be expressed at the basis of theatre, but unfortunately he does not clarify what that is and what it means.

Finally, the most recent definition (2009) comes from Flemish dramaturg Marianne van Kerkhoven: "Dramaturgy: not only the subject but also the object is constantly moving, dramaturgy is movement itself, a process."⁹ Kerkhoven's open-ended definition views dramaturgy as something constantly in motion and implies a constantly changing, flexible process.

Dramaturgs' Network commentator John Keefe sides with Kerkhoven's process-oriented definition while also citing Barba & Saravese's "weaving" metaphor:

There is no one definition that captures both the technical role-function and the open contribution of the dramaturg per se. We may be able to speak rather of 'dramaturgical acts' that are woven into processes of the drama-script and the performance text.¹⁰

The clearest definition of dramaturgy comes from theatre scholar/semiotician Patrice Pavis. Writing specifically about text-based script analysis, he states: "Dramaturgy, which is the art of the composition of plays that also takes into account theatrical practice"¹¹

Pavis' reference to "theatrical practice" implies the inclusion of other theatrical elements, such as acting, staging, music, sound design, etc. Both Pavis and Lessing use the term "composition" to refer to the making of plays. This seems to imply an assembling process, a piecing together of the basic

⁹ Kerkhoven, Marianne van. "European Dramaturgy in the 21st Century." *Performance Research* 14:3, (2009): 7

¹⁰ Keefe, John. "The Dramaturg Past and Present."

¹¹ Pavis, Patrice. "Theses for the analysis of dramatic text." Web. 4 Jan. 2012.

elements that constitute a work of theatre.

Pavis' assertion that dramaturgy "*also* takes into account theatrical practice", implies that dramaturgy cannot simply be understood as a reading of the written text of a play, but must also examine the practices that are either directly embedded in the text (for example, the written stage directions), or are implied; these may include the interpretative input of the director, the choreographer, the composer or sound designer, and those elements that are added by the actors themselves as they interpret the written text.

All of these elements taken together may be seen as bearers or carriers of information, whether perceived consciously or unconsciously by the audience – for example, few audience members during a dramatic moment will be consciously aware of make up or lighting, though these elements will combine to influence the "flavor" or "taste" of their received experience, at what is perhaps a subliminal level, just outside the field of ordinary consciousness.

So theatre dramaturgy may be viewed as the study of the play's script coupled with an awareness of some or all of the complex theatrical events described above, including background research and rehearsal improvisation, elements not necessarily included in the final presentation: what is known as the performance text. Relying on Barba & Savarese's definition, dramaturgy may be viewed as an examination of the multitude of elements "woven" together to create any given theatrical moment, while keeping in mind the importance of Frisch's dialogue between subject and frame, i.e., form and content.

The focus of this theoretical exploration is to find a dramaturgical method for considering 19th century scientific history and biography in relation to Darwin, a method that might demand a particular relation between literary and musical ideas, which is grounded in the style of Darwin's thought and personality.

MUSIC DRAMATURGY

How then can dramaturgy be applied to music? Commenting on dramaturgy in the music of Chopin, Plotnikov calls it: “. . .the flow of musical events in the texture of great works of music. It opens a way to construct bridges leading to extra-musical fields of association.”¹²

Plotnikov's phrase “extra-musical fields” is similar to Pavis' added field of “theatrical practice”. In order to define extra-musical fields - performance practices, textual resonances, and various other ambient musical associations, such as room acoustics, crowd noise, mechanical instrument noise (flute key clicks, piano action sounds, etc.) must be taken into account. An alternative reading could be that Plotnikov speaks here of the literary, visual, poetic, or other emotional associations that may be invoked by the flow of musical events.

The following division of musical dramaturgy into several categories from Argentinean composer/music theorist Javier Alejandro Garavaglia also takes into account the emotional reception of the material on the part of the audience:

1) *Intrinsic (or inherent) dramaturgy*: the dramaturgy that the musical discourse carries within itself; it is of an objective nature (planned, however, subjectively by the music creator).

¹² Plotnikov, Boris. "Notes on musical dramaturgy in Chopin's second piano sonata" Web. 12 Feb. 2012.

The intrinsic type of dramaturgy can be divided into two subtypes:

a) "*a priori*" *intrinsic dramaturgy*, where the materials for the creation of the piece (the principles of the composition, which will govern the whole piece and determine its own dramaturgy) have their origin *before* the composition of the music itself takes place.

b) "*a posteriori*" *intrinsic dramaturgy* is the type of dramaturgy that does not have a predetermined dramatic plan evident to the listener. Its origin and development are based on principles and concepts directly linked to either pure musical aspects and/or complete extra-musical contexts, *neither of which can give the listener a clear idea (or any at all) of the dramaturgical path intended in the piece.*

2) *Extrinsic (or emergent) dramaturgy*: it arises solely in the listener's mind by means of the act of listening and therefore, it is of entirely subjective nature. Circumscribed to *the recipient's side*, this is the dramaturgy happening in his mind *during and after the performance* (the musical drama, action or event), which requires the passage of time to occur.¹³

In other words, *intrinsic dramaturgy* deals with information from within the piece, while *extrinsic* comes from things external to the piece, and occurs solely in the mind of the listener, therefore a piece may have both intrinsic and extrinsic dramaturgy at the same time. *A priori* dramaturgy means that the music has a pre-arranged plan that was made before the act of composition, (such as a predetermined numerical structure or a tone row) while *a posteriori* does not have a predetermined plan that is discernible to the listener, though the composer had either a "purely musical" or "extra-musical" strategy in mind at the moment of composition. This might also be called a *metaphorical* approach to composition. These categories may well be applied to theatrical dramaturgy as well.

¹³ Garavaglia, Javier Alejandro. "Music and Technology: What Impact Does Technology Have on the Dramaturgy of Music?" *JMM: The Journal of Music and Meaning*, 7, (2008). Web. 29 Feb. 2012.

TOWARDS A MUSIC THEATRE DRAMATURGY

These have been some methods for examining theatrical and musical dramaturgy separately, but which template may be applied when all of these elements are combined to make music/theatre? There are few guides or signposts in this territory, as little that is useful to this study has been written specifically about music/theatre dramaturgy, with the exception of the writings of playwright, director and dramaturg Bertolt Brecht, and of composer Kurt Weil. Brecht, who hated the sensuous musical underlining of text that occurs in opera, referring to it as “culinary” or by saying that the audience became “doped” by it¹⁴, attempted to develop a new style of music (and theatre) which he called “*gestic*”. *Gestic music*, in keeping with his goal of creating distancing effects in theatre, would be simple, direct and without ornament, and would often be composed in opposition to the meaning of the text. This, he believed, would free the audience from an emotional identification with either text or music, and allow them the detachment to make up their own minds.¹⁵

Kurt Weil, on the other hand, believed that *gestic music* could:

channel and focus music’s communicative capacities and free it from its parallelism to the text, as well as its descriptive and psychological functions, thereby granting wider melodic, formal and harmonic latitude . . . The resulting ‘play’ between the music and the lyric . . . could convey complicated layers of meaning and contradictory attitudes.¹⁶

¹⁴ Thomson, Peter and Sacks, Glendyr, eds. *The Cambridge Companion to Brecht*. 2nd edition. New York: Cambridge University Press, 2006: 244

¹⁵ *ibid*: 219-223

¹⁶ *ibid*: 251

These two almost completely opposed definitions of the same word will be referred

to later in this paper as *gestic music*, and I will specify whether I am employing Kurt Weill's or Bertolt Brecht's definition.

In the next section I will attempt to extrapolate a series of questions to help establish the dramaturgy of a piece of music theater. Owing to the complex, multi-layered texture of most music/theatre works, I propose the following templates to serve as tools for analysis:

Regarding the dramatic text (if there is one): In what style is it written? Is it naturalistic or surreal, are there elements of what Brecht called the distancing effect? Was it originally written as a music theatre libretto or is it an adaptation from another genre?

Furthermore, the intentionality of the text is important. Is the text "intentional," i.e., informed by content,¹⁷ or is its content "non-intentional," as occurs, for example, in many of the works of composer John Cage?¹⁸

Next, the performed text must be examined. How do performers, directors, actors, and designers finally mediate the script? Was improvisation employed? Was there interaction with the audience?

Finally, the script and performed text may be read according to a Brechtian analysis. Are there examples of the distancing effect? Were costumes,

¹⁷ See pg. 5 of this study - reference to Frisch on content

¹⁸ Marjorie Perloff and Charles Junkerman. *John Cage: Composed in America*. Chicago: University of Chicago Press, 1994: 191

masks or puppets employed to encourage distancing? Were there comic treatments of potentially serious situations?

In *isomorphic dramaturgy*, the music exists in a one-to-one relationship to the dramatic text, (the character is sad, so the music is sad). The music could be said to directly support the action on stage. This could include the technique, popular during the renaissance, called “word painting” – creating a “musical picture” of a certain image drawn from the dramatic text or the stage directions. Another example is when music is required to directly reinforce the events on stage, such as a loud drumbeat to indicate when a character gets hit on the head. Sound effects for the most part fall into this category.

In *atmospheric dramaturgy*, music creates a “background” or “bed” for the dramatic text that continues over time, not reacting to the transient flow of the dramatic events on stage and the text, but on a much larger time scale in terms of the work as a whole. Much film music is of the atmospheric variety.

In *ironic dramaturgy*, the music functions in a way that is in opposition to the dramatic action taking place on stage, in order to provide a humorous or deeply ironic level of interaction with the dramatic text. The use of jolly circus music while a murder is taking place on stage would be one example. This could also contain elements of the Brechtian dramaturgical reading mentioned above, such as the use of music that is tragic to apply to a comedic situation, or when a narrator/singer comments on the stage action in a humorous way, thus

distancing his own character, as well as the audience, from an emotional identification with the events on stage.¹⁹

In *metaphoric dramaturgy*, the music is directly linked to a certain emotion, image, text, character or movement from the piece in a metaphorical way, as filtered through the composer's creative imagination and process. This technique concerns the composer's artistic/psychological response to the dramatic moment, which will of course vary from one composer to another. Metaphoric dramaturgy can occasionally create what seems like an additional presence on stage, as if there were another character. Arguably, this kind of dramaturgy may have parallels to Olivier Messiaen's concept of "personnages rythmiques", rhythms that he believed interacted with other rhythms in the way live actors interact on the stage. He personified these rhythms using dramatic language, calling them "the character who attacks, . . . the character who is attacked," and "...the character who remains immobile."²⁰

Finally, the dramaturgy may be *random or non-intentional* – this kind of music functions in a way which is completely independent from the text and the actors, existing as its own separate artistic creation, co-existing in the temporal realm with the dramatic text, but connecting to it only through chance or random elements, non-intentionally. The most readily available example would be John Cage's work with choreographer Merce Cunningham, who would often work independently of one another, only coming together for the performance. In one

¹⁹ See Willett, John. *Brecht on Theatre*. New York: Hill and Wang, 1987.

²⁰ Olivier Messiaen, qtd. in: Shores, Corry. "Characterizing Rhythm: Messiaen's Analysis of the Rhythmic Characters." *Pirates & Revolutionaries*. 22 Feb. 2010. Web. 11 Mar. 2012.

(in)famous piece, Cage used the conductivity of the leaves of a plant in the performing space to create the music to one of Cunningham's dance pieces.

In addition to these categories, music theater dramaturgy needs to take into account the whole of the performance score, including movement, visual design, light, external media, moving objects, puppets, etc., which can all be examined with the above mentioned dramaturgical approaches. Though my creative research occasionally employed video projections and puppet and object manipulations, this study will for the most part focus on what compositional techniques can bring to the music theatre stage, and the ways that these techniques may be employed to connect theatre and science. These connections are crucial to the project of bringing Charles Darwin and evolutionary theory to the stage. The next chapter will examine the ways that science has been adapted to the music theatre/opera stage in two case studies, for the purpose of deciding whether or not to employ similar techniques in my own works.

CHAPTER 2: MUSIC/THEATRE AND SCIENCE

How can the complexities of science be “translated” for the stage?

Music/theatre is in itself a complex form, allowing a plethora of information to be simultaneously transmitted on many different levels. This richness of texture indicates that it might serve as the perfect medium to express the richness and complexity of scientific material. Part of my research will be to determine the best dramaturgical strategies to present this kind of material to a non-scientific audience in the most compelling fashion.

It is bizarre how little of twentieth-century science has been assimilated into twentieth-century art.²¹ - C.P. Snow, writing in 1959

I think we were working in some kind of binary language . . . It was about using ones zeroes and creating something out of the chunks of information that you generate²² - Philip Glass, in 2012, (reminiscing about his 1975 collaboration with Robert Wilson on the making of *Einstein on the Beach*)

In the half century that separates these two statements, an enormous growth has taken place regarding the connection between the arts and science. In the music/theater genre alone: *Doctor Atomic* by John Adams, *Three Tales* by Steve Reich, *Kepler* by Philip Glass, *Tomorrow, in a year* by Hotel Pro Forma, featuring the electronic music duo The Knife, are all works of science-based music/theatre composed within the last 15 years. Glass’ statement above may indicate one reason for this: the assimilation of digital media into our lives, and the degree of highly visible experimentation that is taking place in the arts has connected the public to science and technology in a very personal way, as has

²¹ Snow, C. P. *The Two Cultures and a Second Look*. Cambridge: Cambridge University Press, 1969:16

²² Stewart, Will. "Creators Philip Glass, Robert Wilson discuss legendary 'Einstein.'" *AnnArbor.com*. 16 Jan. 2012. Web. 18 Mar. 2012.

the home computer and the profusion of art and music related soft- and hardware created for it. Many artists have a close relation to technology, if not employing it directly in the making of their art, then in the very least they are using it as a part of the distribution process.

Also, as science heads further and further into the unknown territory that followed the breakdown of the Newtonian universe²³, the thought processes that scientists must use to cope with the metaphysical intricacies of the new indeterminate model of the universe approach more and more the kind of metaphorical thinking and language that artists may employ as a part of their own work process.²⁴ British poet and scholar Ruth Padel, Charles Darwin's great-great granddaughter, comments on the connections between poetry and science:

. . . poetry and science . . . depend on metaphor, which is as crucial to scientific discovery as it is to lyric. A new metaphor is a new mapping of the world. Even maths uses metaphor; and this is where more condensed forms of poetry join in. John Donne, living through exciting new scientific discoveries, relished the door-opening powers of science. "A mathematical point is the most indivisible and unique thing which art can present," he said.²⁵

The next sections of this paper will examine two science-based music/theatre pieces, using the music/theatre dramaturgy templates discussed earlier, mostly employing the definition of Barba and Savarese: viewing music/theatre as a complex fabric composed of separate strands. Each of these strands makes a statement on its own - and when woven together will create a

²³ See Randall, Lisa. *Warped Passages*. New York: Harper, 2005. Also, Fritjof Capra, *The Tao of Physics*. Boston: Shambhala Publications, 1999. which has a particularly clear and elegant explanation of recent physics in Chapter 4 ("The New Physics")

²⁴ For an interesting discussion of how the metaphors of science coincide with the metaphors employed by various world religions, see Capra, Fritjof. *The Tao of Physics*. Boston: Shambhala Publications, 1999.

²⁵ Padel, Ruth. "The science of poetry, the poetry of science." *Guardian* [London] 09 Dec. (2011). Web. 12 Mar. 2012.

synergistic whole. This will include a look at the ways that scientific ideas and terminology have been “translated” to the language of the music theatre stage in each of the works to be explored.

ROBERT WILSON AND PHILIP GLASS: *EINSTEIN ON THE BEACH*

Viewing this work in its second incarnation in 1984, many of its features were as shocking to me as they were fascinating - its almost five hour length, seemingly endless use of musical repetition, use of a non-operatic vocal style, which at that time was much more closely associated with the world of pop music and early music than with opera, use of instruments not generally employed in classical music (electronic organ, soprano saxophone), use of live mixing and amplification of all voices and instruments, use of simultaneous spoken texts, and its non-traditional staging, lighting and choreography – many of these techniques were completely new to most audience members at that time.

It seemed to be about the historical Einstein, and then again it didn't, it was as if it meant “all around” Einstein – indeed he was always present in some way, from the violinist who impersonated him for a large part of the show, to the baggy pants worn by many of the characters, and, in addition, the choreographic references to iconic Einstein photographs. It was as if Einstein was there, or the image of who we thought he was, was there.

This mysterious, powerful, extremely long performance had a strong effect on its audience: after attending the 1976 premiere, New York Times critic Robert F. Jones, who had previously been a sharp critic of Philip Glass' music, wrote:

. . . by the end of the first Train scene, my own ideas of the possibilities of music had been turned upside down and inside out. As Robert Wilson's intricate and beautiful stage images came and went, as Philip Glass' music seemed to breach the bounds of the possible, I watched and listened in a state of awe. I don't remember breathing. I do, though, remember weeping.²⁶

Neo-beatnik musical innovator Tom Waits commented that, after seeing *Einstein*, he had been:

Pulled into a dream of such impact and beauty, I was unable to fully return to waking for weeks. Wilson's stage images had allowed me to look through windows into a dusting beauty that changed my eyes and ears permanently.²⁷

How did Wilson, Glass, and choreographer Lucinda Childs create this magic?

Einstein's dramaturgy could perhaps be called indeterminate in the sense that the collaborators have renounced the need to generate a specific linear narrative. This is in keeping with postmodern literary criticism, where Lyotard and others renounced the use of the "metanarratives."²⁸ Recent scientific theories (quantum physics, chaos theory, Heissenberg's indeterminacy principle)²⁹ also support this kind of indeterminate reading of events. Director Robert Wilson has often commented: "In a sense there was no reason to tell a story, because we already knew a story."³⁰

This statement does not mean to imply that the dramaturgy of the production was in any way chaotic or unclear. Wilson, who is among the most

²⁶Glass, P., & Jones, R. T. *Music by Philip Glass*. New York: Harper & Row, 1987: ix

²⁷ Waits, Tom. *The Black Rider*. Island Records, 1993. CD. Liner Notes: 2

²⁸ Appignanesi, Richard & Garatt, Chris. *Postmodernism-A Graphic Guide*. Cambridge:Icon Books, 2007: 102

²⁹ See Fritjof and Randall, footnote #12

³⁰ Robert Wilson on *Einstein on the Beach*, as quoted in the documentary film: *Absolute Wilson*. Dir. Katharina Otto-Bernstein. Film Manufacturers, Inc, 2007. DVD.

precise of directors, reputedly spent three hours lighting a single hand gesture.³¹

Philip Glass echoes this precise methodology involving the use of many different theatrical elements, when he writes:

The result – or I should I say convergence – of this visual process with a very close musical articulation of the same, had the effect of empowering what had started as an abstract structure with a highly dramatic and theatrical shape. . . The work . . . was fired throughout by images, movement, words, music and finally the imaginations of the spectators themselves.³²

So, according to Glass, what began as a totally “abstract structure”, by the end of the process became something “highly dramatic and theatrical.” The audience would supply its own narrative, commented Glass:

Fundamental to our approach was the assumption that the audience completed the work . . . the “story” was supplied by the imaginations of the audience, and there was no way for us to predict, even if we had wanted to, what the story might be for any particular person.³³

Such notions of indeterminate artistic reception have parallels with scientific theory, as in the following text from particle physicist Lisa Randall, the librettist for the next music/theatre work under examination – *Hypermusic Prologue*. Commenting on the impossibility of determining the precise location of individual particles at the sub-atomic level, which is based on indeterminacy theory, she writes: . . . “particles cannot be pinned down and can be detected only in terms of probabilities . . . you cannot know a particle’s exact location. You can only specify the probability of finding it somewhere.”³⁴

³¹ Holmberg, Arthur. *The Theater of Robert Wilson*. Cambridge: Cambridge University Press, 1996: 126

³² Glass, Philip. *Opera on the Beach*: 34

³³ Ibid: 35

³⁴ Randall, Lisa. *Warped Passages*. New York: HarperCollins, 2005: 131

The power of this negation of narrative is commented on by musicologist J. Richardson in *Singing Archaeology*, his absorbing work on Glass' opera

Akhnaten:

In *Einstein* whatever content there is takes the form of an implied subtext rather than a clearly defined narrative, although the choice of a non-narrative as opposed to a received historical form can arguably be interpreted as its own kind of narrative, the meaning of which adheres precisely in the act of negation.³⁵

Of supreme importance to Wilson, Glass, and Child's work was time, measurement, information, and data. Glass, speaking on the music that comprised his "minimalist output", said:

What sets this music apart is the fact that it's non-narrative. . . . most other music . . . takes ordinary time, day-to-day time - what I call colloquial time - as a model for its own musical time. . . the themes become the focus of the listener's attention, and what happens to the theme happens to the listener via a certain psychological trick of identification.³⁶

What is interesting in terms of dramaturgy is Glass' implied assertion that his music moves in its own time frame, as opposed to what he refers to as "colloquial time". So much has already been written on Glass' process concerning his use of musical time, and on the additive and subtractive structures and looping processes that he freely employs, that there is no need to delve into them here³⁷, other than to say that they contribute to a feeling of time displacement on the part of the listener. Clearly, time and measurement are two

³⁵ Richardson, John. *Singing Archaeology*. Lebanon, NH: University Press of New England, 2000: 35

³⁶ Glass, Philip, *Opera on the Beach*: 26

³⁷ See Kostelanetz, Richard. *Writings on Glass: Essays, Interviews, Criticism*. Berkeley: U.C.Press, 1999. - and *Opera on the Beach*, for Glass' own explanation. For an interesting analysis of minimalism from a cultural and philosophical standpoint, see Fink, Robert. *Repeating Ourselves: American Minimal Music as Cultural Practice*. Berkeley: U.C.Press, 2005.

of the strong undercurrents that run like powerful visceral presences throughout

Einstein on the Beach:

. . . a huge black disc slowly eclipsing the handless clock (a visual reference to a confirmation of Einstein's theory of relativity which involved observing a lunar eclipse and measuring the apparent displacement of light from stars visible next to the blanked-out sun).³⁸

. . . all the visual details – elevators [part of a textbook analogy in which the relative nature of gravity is demonstrated to a falling observer], space rockets (one of Einstein's illustration of the relativity of time involves the passage of time for a traveler on a rocket approaching light speed) . . . watches, clocks, . . . [these] were things we had come to associate with Einstein.³⁹

The libretto, too is filled with references to time – the rhythmic counting of numbered beats chanted against solfege syllables are perhaps a reflection of what musicians do internally while they are playing: dividing time into beats and visualizing (or its aural equivalent) the pitches. Even the constantly repeated refrain (with textual variations) “could it get some wind for the sailboat”⁴⁰ (Einstein was reputedly an avid sailor) implies waiting and the passage of time.

Glass' music seems to embody the distortions of time that infuse Wilson's theatrical constructions, and the additive structures, repeatedly sung numbers, and pulsing loops and repetitions give the work its scientific, mathematical edge, a constant barrage of signs and signals that reflect life in a post-atomic, media saturated world. Lucinda Childs' striking, repetitive, precise and absorbing choreographer has allowed some commentators⁴¹ to refer to it as a “dance opera”,

³⁸ Glass, Philip. *Opera on the Beach*: 80

³⁹ *ibid*: 34

⁴⁰ *ibid*: 70

⁴¹ For example, composer John Rea, at a lecture at McGill University attended by the author.

since so much of the content is communicated to the audience through the movement score.

Watching *Einstein on the Beach* in 1984, I was keenly aware of the remarkable amount of information flowing from stage to the audience member at any given moment. The show seemed a metaphor for modern urban life - constantly surrounded by multiple streams of data and information flowing everywhere around us. In a sense it was a kind of prophetic vision of our age of digital technology, as is evidenced by Philip Glass' 2012 observation:

I think we were working in some kind of binary language . . . It was about using ones and zeroes and creating something out of the chunks of information that you generate⁴²

To summarize: Glass, Wilson and Childs embedded science into the physical, visual, and musical score of *Einstein*, without using any direct textual references to Einstein as a scientist, to his physics or to his many formulae.⁴³ Science was present as a series of references: the numbers and syllables chanted at various speeds, the additive and subtractive structures in Glass' score, Childs' repetitive gestural choreography, Wilson's illuminated girders, his beams and flashes of carefully sculpted light: all gave the feeling that we in the audience were directly experiencing science rather than being informed *about it* through text. Science did not need to be "translated" to the stage - it was present and fully embodied. Experiencing *Einstein* so long ago was one of the creative

⁴² Stewart, Will. "Creators Philip Glass, Robert Wilson discuss legendary 'Einstein.'" *AnnArbor.com*. 16 Jan. 2012. Web. 15 Mar. 2012.

⁴³ Einstein is only once mentioned by name, see the libretto in *Opera On The Beach*: 76

moments that inspired me to begin research on the ways in which data and information flow could be embedded into the score of a work of music/theatre.

#2 - *HYPERMUSIC PROLOGUE*, A PROJECTIVE OPERA IN SEVEN PLANES

What would the fifth dimension look and sound like? Dramaturgically interesting in Catalan composer Hèctor Parra's *Hypermusic Prologue*, an "opera in seven planes", is its attempt to use scientific theory as an agent of dramaturgical practice, in order to create a music/theatre work that enables us to see and hear into another dimension.

The opera, written by Parra in collaboration with particle physicist/librettist Lisa Randall, was premiered in 2009 at the IRCAM Centre Pompidou in Paris.⁴⁴ Its libretto was based on material from Lisa Randall's 2005 book, *Warped Passages*⁴⁵, which explains in fairly simple terms her model for particle physics. She and a co-researcher had created mathematical models which explain the behavior of the so-called weak forces (such as gravity) at the sub-atomic level. They employed "branes" - (extra dimensional placeholders) and required both an extra dimension and the warping of space-time, in order to function.⁴⁶

The models provided a template for the musical dramaturgy of the work, in both a literal and metaphorical fashion:

⁴⁴ Parra, Hèctor. *Hypermusic Prologue - A projective opera in seven planes*. Ensemble Intercontemporain. Kairos Music Production, Sirene series, 2009. CD. Liner Notes: 3

⁴⁵ Randall, Lisa. *Warped Passages*. New York: Harper Collins, 2005.

⁴⁶ Ibid: 50. ff.

These specific models, and . . . the overall picture they give . . . have provided me with the opportunity to construct a symbolic space of great richness that may be used as a framework for musical composition . . .⁴⁷

These models interact with many aspects of the composition. This interaction is reminiscent of the process of those total serialist composers who employed numbers to determine some or all of the compositional parameters of their works, including pitch, timbre rhythm, dynamics⁴⁸. According to Parra, these scientific models provide:

... a framework where the instrumentation, the orchestration, the sung music, and the electronic techniques in real time, are able to generate and provide new acoustic experiences.⁴⁹

Parra attempts to portray in his music the quality that life outside of the four dimensions that define our lives would have, in the highly warped spacetime of the fifth dimension:

. . .from this moment on, the space and energy the soprano encounters depend on her position in this new dimension . . . moving freely in five dimensional hyperspace . . . Music, an extremely organized form of acoustic energy, helps take us closer and enjoy . . . those mysterious and attractive, intensely distorted spaces.⁵⁰

This is how the musical parameters of Parra's composition are affected by these brane models: Parra lists four parameters, which are: "the 'musical equivalents' of some basic elements of physics – the parameters of the warped musical dimension."⁵¹ They are:

⁴⁷ Parra, *Hypermusic Prologue* CD. Liner Notes. 23

⁴⁸ See Whittall, Arnold. *Serialism*. Cambridge:Cambridge University Press, 2008.

⁴⁹ Parra, 24

⁵⁰ *ibid*, 24

⁵¹ *ibid*, 25

Spatial measurement/distance: the duration (in seconds) of a musical phrase. . . . Physical distance also finds its musical equivalent in . . . the temporal dimensions of sound (time-stretch, delays)

Time: physical time is equivalent to the rhythmic density of the musical discourse. . . . One example is the “granularity” of the electronic treatments in real time.

Mass: equivalent to the spectral amplitude and richness of the voices, the instruments, and the corresponding electronic treatments.

Energy: equivalent . . . to the dynamics of the thrust of the musical gesture, to the velocity at which the discourse changes (in amplitude and/or spectrum)⁵².

These parameters are altered by mappings, so when Parra wants to create the sensation of a change in physical time, he will change the rhythmic density of the music, according to his plan (2nd in the list above) that shows which scientific property (physical time) should be used to alter which characteristic of the music (the rhythmic density.) Parra apparently did not often use direct physical mapping:

I worked all in musical terms, of course, and we have not worked with . . . linear mappings between equations and sound structures. We agreed that we should work with music in musical terms and not doing linear mappings.

... Of course we have done mappings . . . structural mappings . . . which have to do about perception, musical architecture . . . (with) how we perceive musical time, which is warped in the opera . . . those rhythmic transformations have not respected the exact equations’ curves which describe Lisa’s model.⁵³

So Parra used “structural mappings” instead of “linear mappings,” - he did not use actual numerical values to alter the musical properties, but rather a metaphorical interpretation of the “structure” of the values. This has a profound

⁵² *ibid*, 26

⁵³ Parra, Hèctor, Disk #2, companion CD to the recording of *Hypermusic Prologue*, (see footnote #1), which is called *Lisa Randall and Hèctor Parra, Interview*: track #8, starting at 7:46, transcribed by the author.

effect on the results, as the interpretation will be tempered by the mind of the composer, by the “framing” the data according to creative insight and intuition. I will refer to this as “metaphorical mapping.”

Parra does in one example does use direct mapping, by having the quality of the string bowing directly affect the amount of electronic treatment of the singing voices. He explains: “the more unharmonic the sound produced by the strings . . . the louder the electronic treatment of the voices, and the stronger the transposition applied.”⁵⁴ In this case, the more the strings are bowed in a “scratchy” way (“unharmonic”), the more the singing voices are electronically altered, and the more their pitch may be shifted higher or lower.

LIBRETTO

Hypermusic Prologue is composed for one soprano and one baritone singer, accompanied by an instrumental ensemble of eight players. It is divided into seven “planes”, some of which have informative titles, such as: *Plane II: Questioning Reality*, or *Plane V: Forces and unification*. Several of the *Planes* are in the form of duets for soprano (S) and baritone (B), such as this one from *Plane II*:

S: But what lies outside perceptions? Beyond senses?

B: Beyond sense!!

S: Imagine a universe outside-

B. Abstract obstructions!

S. Or inside . . .

B. This cannot exist!

⁵⁴ Parra. *Hypermusic Prologue*. CD. Liner Notes: 31

Here the listener easily recognizes the form of the scientific or philosophical dialogue between master and disciple, which are echoed in the teaching texts of so many world cultures. It soon becomes apparent that the soprano is the master (who will travel to the 5th dimension) and the baritone is the disciple, dwelling here with the rest of us in our conventional four-dimensional universe. Soon the characters begin to employ the physics equations and other terminology from particle physics, which makes comprehension difficult if you are unfamiliar with the language of the equations of particle physics:

S. Let me understand the math.

How to compose my music.

Let me model this world!

The action for our system is:

$S = S \text{ gravity} + S \text{ brane} + S \text{ brane}'$

(s. continues singing increasingly complicated equations for several lines, at which point the baritone voice replies):

B. Do I hear something?

S. It can only be identified as a slice of AdSS.

The solution holds only when the boundary and bulk cosmological terms

are related by:

$V \text{ brane} + -V \text{ brane}' = 24M^2k, A = -24M^3k^2$ ⁵⁵

This is an example of scientific language appearing on stage – naked, without an attempt by composer or librettist at translation or adaptation, to help a render it comprehensible to a non-scientific audience. Nothing in the dramaturgy of the music distinguishes the use of scientific language from the vernacular. It is very different in character from *Einstein's* repeated number patterns, which

⁵⁵ *ibid*: 40-41

suggest science rather than quoting it verbatim, and by means of which the listener becomes caught up in the energy of the rhythmic variations in a visceral way, without worrying about their “meaning”. The density and complexity of Parra’s music does not appear to further the science he and Randall are trying to convey. Instead of inviting the listener in, it emphasizes its difficulty and “otherness”, making the audience feel that science may only be understood by experts.

The plot, too occupies a slippery place, dramaturgically. Hector Parra states:

Lisa Randall’s libretto introduces a composer-scientist torn between the love she feels for her partner (baritone) and her passion for knowledge . . . their relationship changes when the soprano, after a fierce quarrel, decides to undertake a hypothetical voyage to the warped 5th dimension . . .⁵⁶

This dramatic plot follows an entirely traditional, predictably familiar path, and there is little dramatic tension involved. Little distinction is drawn between the two characters, as in the following excerpt:

B.: Dual interpretations!
S.: Harmonious underpinnings . . .
B. One single world!
S. . . and captivating music . . .
B. Simultaneous truths
that mystify,
That embrace!
S. . . . Our foundation underneath.⁵⁷

The love story between them forms a thin backdrop before which each character articulates a particular scientific point of view. The Baritone describes a Newtonian universe; the Soprano postulates a post-Einsteinian, five-dimensional

⁵⁶ Ibid: 23-24

⁵⁷ Ibid: 43

universe. The listener soon notices that the characters are mouthpieces employed to articulate certain scientific positions, and they lose much of their dramatic power and characterization. Though the characters do use metaphors, they are so obfuscated by their use of 19th century romantic language (“harmonious underpinnings” “captivating music” “simultaneous truths that mystify”) that their power is blunted.

There seems to be a lack of connection between the romanticized language of the libretto and the more contemporary dramaturgical intentions of the musical composition and electronic sound transformations, as well as in the way in which the vocal parts interact with the instrumental music, as if there were two separate, unconnected musical dramaturgies operating simultaneously, one for instruments, and one for voices. Perhaps Parra has allowed the mappings and electronic effects to substitute for a lack of both content and musical discourse, as if the medium (real time sound manipulation) has become the message: technology has overshadowed dramaturgy.

The work also raises questions of over-complexity. Should there be an isomorphic relationship between the subject (particle physics) and the artistic result (*Hypermusic Prologue*)? Must complex physics & mathematics be reflected in a relentlessly complicated, dense musical structure? Is this not a kind of artistic reductionism?

Chapter 3: EXPERIMENTS IN COMPOSITION with DARWIN and EVOLUTIONARY THEORY

An examination of the slippery and tumultuous reception that evolutionary theory received in Darwin's time and the present led to further explorations of its origins, the biographical figure of Charles Darwin, and the historic and cultural landscape onto which the seeds of his theory were first planted. Of interest were reactions to the theory during his lifetime, its more recent interpretations, and extrapolations as to where it might lead in the future. The provocative nature of evolution, Darwin's remarkably curious yet orderly mind, his ambiguity of character, shyness, and Hamlet-like hesitation before finally publishing his theory, all formed interesting paths for continued dramaturgical research.

When I began my research, I found that only one Darwin-based opera, a handful of plays, and one music/theatre piece on Darwin-inspired themes had been produced as of 2006⁵⁹. Were people still so uncomfortable with the religious and anthropological ramifications of his theory? Or were directors, playwrights and composers afraid to embrace scientific language, and undertake the slippery translation process from science to stage?

⁵⁹ The opera is *Sextuor (The Origin of Species)*, by Georges Aperghis, an interesting experimental work from 1992. Notable among the plays is Timberlake Wertenbaker's *After Darwin* from 2002. The music theatre work is the *Voyage of the Beagle*, composed by Jon Gibson, and directed by Joanne Akalaitis in NYC, 1987. Several new music and theatre works on Darwin have appeared more recently, including the play *Trumpery*, by Peter Parnell, and a 2008 piece for orchestra and chorus by composer Richard Einhorn, *The Origin*. Notable and unusual is the 2009 music theatre work, *Tomorrow in a Year*, a collaboration between electronic music duo The Knife and Copenhagen's Hotel Pro Forma theatre company.

Not so, according to Kirsten Shepherd-Barr, whose 2006 *Science on Stage*⁶⁰, reveals dozens of plays from the past 15 years written on scientific themes, from Tom Stoppard's *Arcadia* to Michael Frayn's *Copenhagen*. Since the act of translation doesn't seem to be the problem, the reception of Darwin's theory must be the disturbing factor, though more than 150 years have passed since the publication of *The Origin of Species*. Research will now follow Darwin's personal history and theory, with the intention of creating a performance based on that research.

A wish to extend compositional resources encouraged me to pursue a study on mapping⁶¹ – the translation of raw scientific data into musical information; and the ways in which theatre/music dramaturgy could be employed to best use these techniques to enrich the dramatic text by embedding them into the musical score.

Could the experimental results of these processes be polyphonic and multi-layered, exposing this material to the audience from many different perspectives? Would there be a way to include the unheard voices of the indigenous populations whom Darwin encountered on his global voyage of exploration? Which were the best dramaturgical techniques that would enable Darwin and science to be brought to the stage?

These lines of inquiry led to the beginnings of practical work on a series of four music/theatre performances, based on Darwin's biography and Darwinian

⁶⁰ Shepherd-Barr, Kirsten. *Science on Stage*. Princeton: Princeton University Press, 2006.

⁶¹ A website that explains sonification, a way of translating scientific data directly into sound, which is one example of a mapping technique, can be found at: <http://sonification.de/son> - Web. 12 Mar. 2012. Another site that contains interesting sound and video examples of sonification: <http://sonification.de/publications/paper-media> Web. 12 Mar. 2012.

and post-Darwinian evolutionary theory, and its possible ramifications in the present and the future. An examination of these works will follow.

THE DARWIN SHOW, VERSION 1

The first Darwin-based performance research took place in 2006 at the Bread & Puppet Theatre in Glover, Vermont. I co-wrote a script based on various works by Darwin and secondary material, and contemporary research on short-term evolution from Jonathan Weiner's 1994 book, *The Beak of the Finch*⁶². Weiner's book details the research of Peter and Rosemary Grant on "short-term evolution" in the Galapagos islands – the same islands where Darwin had noticed variations between the same kinds of birds on adjacent islands, which would lead him towards the development of his theory of species variation, a part of evolution.

The script was humorous and direct, with plenty of ironic dramaturgy:

Narrator: In 1836, Darwin returned to London where a zoologist friend examined his finches. Guess what, Chuck? These aren't variations, but entirely new species, never seen before. Congratulations! Why don't you go off and create a new theory that explains the origins of these new species? How did they get here and where did they come from?

The humorous asides and distancing techniques such as the use of a small hand puppet to represent Darwin kept the audience from identifying with him and casting him as too much of a hero. The dramaturgical intention was to present Darwin and his theory in a form that was both comical and informative.

⁶² Weiner, Jonathan. *The Beak of the Finch*. New York: Vintage Books, 1994.

The dramaturgy was therefore part ironic, including cabaret-style humor and effects, as well as the use of popular music forms; these are clearly examples of the *gestic* effects that may be linked to the Brechtian techniques mentioned earlier.

The dramaturgy was also in part metaphoric, in the sense of Kurt Weill's definition of *gestic music*, in that it was freed from the necessity to literally illustrate stage events. For example: during a section of the piece where a cardboard cutout of the HMS Beagle was sailing across the stage, the musical ensemble repeated a phrase, but we instructed one group of players to fall slightly behind the other group, so that a phase loop was created, which increased gradually. This interesting overlapping of phrases produced an effect that was not intended as a literal interpretation of the stage action, yet may have suggested the overlapping of ocean waves to the audience.

The dramaturgy was also occasionally isomorphic, in that the musicians sometimes had to make sounds that would illustrate the events on the stage, similar to the way that sound effects function. One important dramaturgical device that was employed was this use of the HMS Beagle's voyage, (as portrayed here by a cardboard cutout puppet), as a unifying metaphor for Darwin's path towards his discovery, from his first intimations of evolutionary theory to his eventual publication of *The Origin of Species* almost twenty years later.

I scored the work for small chorus, some solo singers, and a small ensemble composed of various wind and brass instruments as well as cello and

violin. I wrote for whatever instruments were available, and used a great deal of instrumental doubling and repetition, giving the piece something of a minimalist style. In this version, a series of songs for a narrator character were composed, which would continue to be used in the next two versions of the piece. This narrator was often humorous and ironic and could comment on the stage action from his position outside of the staged events, another example of the use *ironic dramaturgy* based on the use of Brechtian *gestic* music and text. In addition, a choral song in canon was composed at this time, which articulated the position of the opponents of Darwinism, called the *Song of the Creationists*. It would continue to be used in the all three subsequent versions of the piece.

THE D OPERA, VERSION 2

Continuing biographical research on the voyage of the HMS Beagle; the history of the Fuegians⁶³ (the indigenous people from the southernmost tip of South America, who sailed with Darwin); James FitzRoy⁶⁴ - the Beagle's captain; the ship and its crew; and Darwin's fellow scientists and peers, helped inspire the next version of my creative research, which was now called *The "D" Opera*.

This performance took place at the Matralab, a Concordia University performance research facility.⁶⁵ I designed this work as a solo performance piece using projected video backgrounds. As an actor/singer, I played three characters: a narrator/singer, Charles Darwin, and a Fuegian known as Boat Memory.

⁶³ Hazelwood, Nick. *The Life and Times of Jemmy Button*. New York: Thomas Dunne Books, 2000.

⁶⁴ Nichols, Peter. *Evolution's Captain*. New York: Harper Collins, 2003.

⁶⁵ see the Matralab's website: <http://matralab.hexagram.ca/home/>

I collaborated on the script, visual images and staging with director/writer/editor Billy Dee. The videographer, created a piece of “visual jazz”, using advanced real-time interactive computer control systems to create an improvised, visually complex “set”, which served as the backdrop for my performance.

This made for dramaturgical difficulties, since in each performance the visual backgrounds were different, an example of “non-intentional dramaturgy,” that put difficult demands on the performer - never knowing exactly how strong the lighting would be, and where it would be focused.

I composed or designed all of the sounds for the performance, using sample-based synthesizers and computer-based sampling, and combined those with my voice as amplified by a wireless microphone. The sound in the room was mixed, spatialized and effected slightly in real-time. The songs were extremely simple, either using drone-based or modal harmonies or structured as rounds. Their musical dramaturgy was designed to communicate the text to the audience as clearly and intelligibly as possible.



Illustration 2: The author as the character "Boat Memory"
Matrabox Theatre, Concordia University, Montreal, November 2008. Photo: Ben Jackson

This performance introduced a character named Boat Memory. He was named after one of the Fuegians who were taken into captivity by Captain FitzRoy, and then brought to England, where he shortly died of smallpox⁶⁶. The dramaturgical concept for the character of Boat Memory was that of a shaman who could leave his body at will, and who could see into both the past and the future. His prophetic voice was a warning to a civilization out of balance, heading towards ecological catastrophe. Some of his text was drawn from the Hopi prophecies of destruction and rebirth that were transcribed in the 1950's.⁶⁷ Boat was to have a strong influence on the voice and dramaturgy of the Cyborg, a prophetic character who will appear in later incarnations of this research.

Dramaturgically, the text in this performance functions mostly as biographical narrative. The narrator's songs celebrate Charles Darwin's life and

⁶⁶ Hazelwood, Nick. *The Life and Times of Jemmy Button*. New York: Thomas Dunne Books, 2000.

⁶⁷ Banyaca, Thomas. "Message from Hopi Spiritual Leaders." 08 Jun1976. Web. 20 Mar. 2012. <http://banyacya.indigenousnative.org/un76.html>

character, praising his remarkable powers of observation, his passion for collecting and organization, and his connection to nature, as can be seen from in following example:

SONG: DARWIN'S BIRTH

Narrator:

Charles Robert Darwin
Born February twelfth, eighteen o nine,
In Shrewsbury, England

Loved nature, and roaming in the woods
Loved to hunt and collect beetles
In pairs, male and female
Always the theme and never the variation!

Scientific research for this performance focused on the work of science commentator Howard Bloom, who believes that if the evolution of sub-atomic particles began in the first nanoseconds after the creation of the universe, then matter itself must somehow be programmed with an innate tendency to evolve into increasingly complex forms, of which life itself and Darwinian evolution are but two examples.⁶⁸ The following song was composed based on this research:

⁶⁸ Bloom, Howard. "Article: The Xerox Effect." *Big Bang Tango Media Lab*. Web. 10 Jan. 2008.

SONG: THE BIG BANG TANGO

Narrator: The perpetual swing of a single electron around a single proton-a tango held together by intimate fascination. This is the particle dance that we call hydrogen.

(Just) add a neutron to the center and the swirl's deuterium. Put a second neutron in, and VOILA - tritium.

The swish of two electrons circling around the pivot of two protons and one or two neutrons. These are the particle gavottes known as helium.⁶⁹



Illustration 3 - "just add a neutron to the center" - the author performing as the Narrator in the Big Bang Tango at the Matrabox theatre, November 2008. Photo: Ben Jackson

The ironic element employed here is the use of tango rhythms and chord structures to deliver a scientific text about particles and their evolution in a newly created universe. The use of popular music was also a characteristic of Brecht

⁶⁹ text adapted by the author from: Bloom, Howard. "Article: The Xerox Effect." *Big Bang Tango Media Lab*. Web. 10 Jan. 2008.

and his various musical collaborators, which would have a distancing effect on the audience. There is also a certain humorous aspect invoked here: the idea of particles locked together in a tango of galactic survival, and the contrast between the perceived “flatness” of conventional scientific language and Howard Bloom’s intriguingly anthropomorphic depiction of electrons, neutrons and protons as if they were human beings dancing before our gaze. Bloom’s achievement was to “translate” scientific thought about particle interactions into a series of succinct yet humorous dramatic prose metaphors.

THE D OPERA, VERSION 3

In the winter of 2009, also in the Matralab, a third version of the Darwin performance was created, **the “D” Opera, version 3**. It included a second actor, and featured live shadow puppet and object video projections created and performed by Billy Dee, not as backgrounds, but as featured elements in the show. Dramaturgically speaking this version of the piece focused more strongly on the biographical aspects of Darwin’s life, including the character of Emma Wedgwood, who would become a powerful force in Darwin’s life, first as his wife and then as the mother of their ten children, but more interestingly as his confidante, occasional editor, and advisor on scientific matters as well as spiritual and moral ones. This performance featured excerpts from the correspondence between them.

As I examined the biographical material on Darwin,⁷⁰ certain key patterns began to emerge, which would influence many of the dramaturgical choices later on in my work process. I realized that Darwin was for most of his life a shy, reclusive man who was often ill, shunned publicity, and constantly downplayed himself and his achievements, and in a sense could be described as an "anti-hero."

By examining biographical information, including the way Darwin had held on to his theory for almost twenty years before bringing it to the public, I realized that the main conflicts in his life did not lend themselves to a particularly dramatic form of characterization. The points of dramatic tension, I observed, would more likely be located in that part of Darwin's youth spent aboard the H.M.S. Beagle, and in the details of his relationship with his wife, family and colleagues. By reading history, I came to view the function of the Beagle voyage in the context of British Imperialism – mapping the globe, and finding a safer trade route around the tip of South America was their ultimate project.⁷¹ This would later be realized in one of FitzRoy's songs, in the next version of this work.

I decided to examine the reception of evolutionary theory and its more recent political ramifications. I wished to explore the subsequent misappropriation of Darwinian evolution by eugenicists⁷² and racial supremacists – and as a result, this version had more political content than any other.

⁷⁰ Such as, Quammen, David. *The Reluctant Mr. Darwin*. New York: Norton, 2006, and Keynes, Randall. *Darwin, His Daughter, & Human Evolution*. New York: Penguin Putnam. 2001.

⁷¹ see Barzun, Jacques. *Darwin, Marx, Wagner*. Chicago: U. of Chicago Press, 1981.

⁷² See the work of Sir Francis Galton, Charles Darwin's cousin.

The music for this version was fairly similar to the last version, with the addition of several new songs and a text that had grown more complex and layered. The following song details the clash between Darwin's discoveries and his wife Emma's deeply held religious beliefs. A duet between Charles and Emma, Charles' text was freely adapted from his autobiography, and Emma reads from a letter she wrote to Charles, where she expressed her fears for his soul, as a result of his discoveries:



Illustration 4 – Emma & Charles Darwin (Shannon Hamilton & Kyle Purvis)
Oscar Peterson Concert Hall, Concordia, February 2010 – Photo: Tristan Brand
(photo from a later version)

SONG: EMMA & CHARLES (Excerpt)

Emma: (speaks) I should say also that there is a danger in giving up revelation . .
. .
Every thing that concerns you concerns me & I should be most unhappy if I
thought we did not belong to each other forever.

Darwin: (sings) if two ostriches
should change from place to place
could not all animals
be modified over time?
And the evidence of these facts
can only be explained
by the supposition
that species modify!

Emma: (speaks) I thank you from my heart for your openness with me & I should dread the feeling that you were concealing your opinions from the fear of giving me pain.

Darwin: (sings) yes! the evidence of these facts
Can only be explained
by the supposition
that species modify!

Dramaturgically speaking the juxtaposition of Darwin's breathless recounting of evidence that would lead up to his discovery, with Emma's deeply felt emotional strife, all to the accompaniment of what sounds like a South American folk song, is an example of ironic dramaturgy. The juxtaposition of these two very different kinds of text tends to distance the audience from identifying too much with either character, leaving them free to make up their own minds, once again an example of the use of a form of Brechtian distancing effect.

Here is another song from this version of the performance, the text of Boat Memory, the Fuegian boy kidnapped by Captain FitzRoy and brought aboard the Beagle to England, only to die of smallpox:

BOAT MEMORY'S DEATH SONG

Boat Memory:

I have passed 20 winters and summers on this earth - yet none among you even knows what I look like – Fitzroy never even took the time to draw my picture –
(/indicates points of interruption, gradually becoming more delayed)

Let me rest here /invisible to history, a name, a cipher...a fragmen/t of a voice calling from between the...

invisible to history ... a fragment of a voice calling from between the...

Sharon & Ralph whisper, echoing, as at the beginning:

Who are the savages, and who the intelligent barbarians anyway?⁷³

As there is virtually no biographical information available about Boat Memory, he is essentially a creation of my own imagination, without his own history. The central problem with this character from a dramaturgical point of reference was that he came from a pre-scientific culture, and it did not seem appropriate for him to articulate texts concerning current and future technology.

My studies of evolutionary theory led me to consider its future ramifications, by way of a study of biotechnology, which included the philosophy of biology.

This led to a reading of biologist/feminist/philosopher Donna Haraway,⁷⁴ and to a study of trans- and post-humanism.⁷⁵ These theoretical explorations began to engender the idea of a prophetic new character, which would be known as the Cyborg. The term itself is an historical construction; invented in the 1960's by

⁷³ This is adapted from a quote by HMS Beagle Captain Robert FitzRoy – he referred to the Fuegians as: “these ignorant, though rather intelligent barbarians” from Hazelwood, Nick. *The Life and Times of Jemmy Button*. New York: Thomas Dunne Books, 2000: 50

⁷⁴ Haraway, Donna. *The Haraway Reader*. New York: Routledge, 2004.

⁷⁵ Bostrom, Nick- see his website, www.nickbostrom.com - also Young, Simon. "The Transhumanist Manifesto." *You Tube*. Web. 14 Mar. 2012.

two scientists researching space exploration and the limits of the human body, who combined the terms “cyber” and “organism” to make “cyborg.”⁷⁶

When I read Donna Haraway’s prescient 1985 text: “By the late twentieth century . . . we are all chimeras, theorized and fabricated hybrids of machine and organism, in short, we are all cyborgs,”⁷⁷ I was immediately struck by both the concept and her means of expressing it. If we were all cyborgs already, it was not difficult to imagine a cyborg character, a melding of human and computer, which would make the connection between Darwin, evolution, the present moment, and the future. The Cyborg could communicate with the audience in a prophetic, visionary, densely packed language, inspired perhaps by Haraway’s own highly charged prose: a combination of philosophy, science, biology, feminism, politics, and art.

I came to realize that this character must have a kind of music that bears a different “dramaturgical signature” from any other. After the last performance of the “*D*” *Opera, version 3*, an audience member made a very useful criticism – that the emotional quality of the music that I had composed did not dramaturgically reflect the “coldness” or “impersonality” of the natural selection part of Darwin’s evolutionary theory, and I understood that a more dramatic music of conflict and resolution could be employed to make the score more powerful, and would provide a strong emotional contrast to the simple, utilitarian music that I had composed up to this point.

⁷⁶ Gray, Mentor, and Figueroa-Sarriera, eds. *The Cyborg Handbook*. New York: Routledge, 1995: 29–34

⁷⁷ Haraway, Donna: 8

I had begun a year long study of mapping, fueled by a book that had a great deal of influence on my research, Douglas Hofstadter's marvelous *Gödel, Escher, Bach: An Eternal Golden Braid*⁷⁸, which among many other things describes the entanglement of music (and its wonderful varieties of structure and form) with mathematics and science. I turned towards the new mapping and braiding techniques that I had acquired in order to give the music additional depth, and hoped that this would be able to connect it to science and data in a very direct way

I wanted the Cyborg's music to possess a layer of embedded information that always accompanies her presence on stage, that always connects her to DNA, to genetic code, and so, indirectly, to Darwin and evolutionary theory. I wanted the "natural selection" music to connect to the shape and structure of the building block of life, DNA. I searched for a way of mapping genomic information directly into a musical format. Some of the results are reflected in the next section.

4. DARWIN: ENDLESS FORMS MOST BEAUTIFUL

Darwin: Endless Forms Most Beautiful (subsequently referred to as *EFMB*), the next version of my ongoing practical research, would be a larger production than any in the previous Darwin series. I collaborated with a director, a playwright and a scenic designer. I worked with seven actor/singers, six musicians, and a class of design students. As well as composing, I was both musical director and conductor.

⁷⁸ Hofstadter, Douglas. *Gödel, Escher, Bach: An Eternal Golden Braid*. New York: Basic Books, 1999.

In a traditional music/theatre setting, the composer would receive the libretto at least one year in advance of the opening for a major work. In this case I did not receive the full libretto until approximately three months before the performance, and the actual sequence of the songs was not fixed until two or three weeks before the opening. It had been my wish to write a through-composed music/theatre work that was closer in form to an opera, but as a result of time constraints the work that emerged was in the form of a *singspiel*, in which dramatic scenes, many without music, alternated with accompanied songs.

Playwright Ryan Hurl, a graduate of Concordia's playwriting department, wrote the dramatic text. Highly expressive and emotional, it emphasizes the psychological aspect of Darwin and the other characters, especially focusing on the controlling yet suicidal temperament of Captain James FitzRoy. It moves in a roughly chronological fashion, from Darwin's early years to his death.

The result of the collaborative work between the director and the playwright rendered *EFMB* into a more linear biographical and psychological portrait than I had imagined it would be. It became a serious, tightly woven, fairly chronological, highly narrative-based biographical portrait of Darwin and those around him.

The main characters are the young Charles Darwin; Darwin's father Robert and the old Charles Darwin (both played by the same actor); Emma Wedgewood; the Cyborg (who is present in every scene); Captain James FitzRoy; Archbishop Wilberforce (who vigorously opposed Darwin and his theory); and a character called Huxley, who is based on an amalgam of two

scientist friends: biologist Thomas Huxley (often called Darwin's bulldog, for his fierce defense of Darwin's theory) and Joseph Hooker, a botanist and lifelong friend of Darwin's.

The Cyborg character, discussed earlier, is a powerful new presence on stage. Dramaturgically she functions as a kind of mediator between the 19th century milieu of the show and the audience member watching in the 21st century. Her text is sometimes garbled, as if her connection to the audience was a bit uncertain, or noisy, like a poor connection on a mobile phone. She also has the power to influence the events on stage, as in this exchange, issuing commands, sometimes speaking in a kind of cyber language:

Huxley: Science demands we test belief. In time it must sustain the test . . .
Bringing belief into meaningful comprehension.
Cyborg: Wilberforce. Counteract!
Wilberforce: Religion is a comfort construct . . .

As mentioned earlier, her music contains a special dramaturgical signature: genetic information, braided into the instrumental lines, and shapes her melodic lines as well.

Some of the songs in the libretto came from British poet Ruth Padel, the great-great granddaughter of Charles Darwin, who published *Charles Darwin: A Life in Poems*,⁷⁹ in 2009. The poems reveal a kind of personal, intimate connection to Darwin that many of his biographers do not achieve, and yet are thoroughly researched from a historical point of view. Their narrative quality made them quite suitable for use as song texts for the *EFMB*, and Ms. Padel was

⁷⁹ Padel, Ruth. *Darwin: A Life in Poems*. New York: Knopf, 2009.

kind enough to grant permission to use her poems for parts of the libretto. The other song texts were written by playwright Ryan Hurl, or else adapted by the author from the writings of Charles Darwin. My decision to use Ms. Padel's lyrical, sensitive poetry as a framework to punctuate the dramatic text with songs also contributed to the narrative-based structure of the work, since the poems are short narratives in themselves.

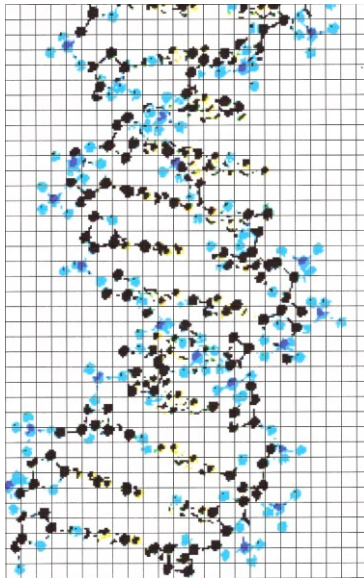
Darwin: Endless Forms Most Beautiful is scored for 7 actor/singers and 6 musicians: violin, trumpet, clarinet/bass clarinet, cello, piano and percussion (vibraphone, drum set, timpani). It was performed between February 16th and 20th 2011, for a total of 6 performances at the Oscar Peterson Concert Hall at Concordia. The ensemble and singers were conducted by the author, who also did the musical direction. The work consists of twenty songs, and one instrumental piece. It is structured in the form of a *singspiel*, in which songs alternate with dramatic scenes. The best-known example of this form is Mozart's opera, *The Magic Flute*.

SONG: ENDLESS FORMS

In this song, I set out to use some of the mapping techniques mentioned previously to compose music that would connect both through intrinsic and extrinsic dramaturgy to the process of evolution, and the concept of multiple forms derived from one single organism. The chords were derived from an X-ray crystallographic photo that shows the structure of a two strands of DNA, which is

far more rough and asymmetrical than the double-helix icon by which it is often represented. It was printed on a sheet of graph paper, musical pitches were assigned to the horizontal axis, and wherever the dots (representing the nucleotide molecules) intersected with one of the lines, a pitch was mapped, and each instance became one of the notes of the chord.

Illustration 5:
X-ray crystallography of
structure of DNA, super-
imposed on graph paper.⁸⁰



The chords that resulted, which I call the “DNA chords”, had a certain complex though dissonant beauty, maintaining a quality of sound that seemed to fulfill the need for the “music of conflict” dramaturgy mentioned earlier, locating the song within the context of the “natural selection” in Darwin’s theory, and relating it to a more contemporary understanding of biogenetics, since it is based on current technology (X-ray crystallography) and genetic research. The text was

⁸⁰ Image courtesy of U.S department of Energy website.
<http://www.aps.anl.gov/Science/Highlights/2005/20050511.htm> - Web. 12 Mar. 2012.

adapted by the author from the last line of Charles Darwin's *The Origin of Species*.⁸¹

CHORUS:

From so simple a beginning
endless forms most beautiful
and most wonderful
have been, and are being
evolved.

SONG: BLOOD



Illustration 6 - The Cyborg sings to Darwin
Cassandre Mentor and Kyle Purvis, photo Tristan Brand

CYBORG:

⁸¹ Darwin, Charles. *The Origin of Species*. London: Penguin, 1985: 460

Bloody segues
Across my viscera
Surprise be blind!
Before you know it –
Everything
has micro-barriers

(...spoken text...)

(sung) That is why
We try and consider
Shedding this drum,
That pushes us too far,
To the edge of the world...

It's been said that the ocean is just a circulatory system.
And all that water out there. . .
Blood .
But what does that make you and your tiny little boat?
(TEXT: Ryan Hurl)

This is the music of the Cyborg, whose creation and dramaturgical intentions have already been discussed. The music for *Blood* was composed using a mapping or braiding process where genomic data was translated directly into musical pitches for the vibraphone. The vocal part and the other instruments used an extremely metaphorical mapping, (referred to by Parra earlier as structural mapping.)⁸² The vibraphone plays a sequence of notes derived directly from the DNA genome, which codes for a component of human blood, while the other instruments outline the notes that correspond to the first letters of the names of the nucleotide pairs. This particular reading of genetic information emphasizes the darker, more dissonant tones. This is in keeping with the dramaturgical qualities of the text, which illuminates the suicidal element in the

⁸² See page 26 of this study

Cyborg's character, and the drum that pulses at moments in the song alludes to her human heartbeat. It is through these means that her character voices the wish to shed her part human, part cyber-interfaced body in exchange for a new, technologically enhanced post-human one.⁸³

⁸³ for example, see Bostrom, Nick- www.nickbostrom.com, also Young, Simon "The Transhumanist Manifesto." *You Tube*. Web. 14 Mar. 2012.

CONCLUSION: A COMPARISON of DRAMATURGICAL STRATEGIES;
IDEAS for FUTURE RESEARCH

In conclusion, I would like to discuss those strategies that seemed to be the most effective in bringing the science and biography of Charles Darwin to the music/theatre stage. Regarding textual adaptation, here is an example of one of the more successful strategies, from *EFMB*, taken directly from a section of Darwin's autobiography. The original text reads:

During the voyage of the *Beagle* I had been deeply impressed by discovering in the Pampean formation great fossil animals covered with armour like that on the existing armadillos; secondly, by the manner in which closely allied animals replace one another in proceeding southwards over the Continent.⁸⁴

The adapted version, with the unfamiliar reference to the "Pampean formation" exchanged for the more familiar "plains of South America", required very few changes in order to make it remarkably suitable for singing:

YOUNG DARWIN:

I discovered in the plains of South America
Great fossil animals,
All covered with armor,
Like armadillos.

I saw that closely allied species
Replace each other
In proceeding southwards
over the continent.

The clarity with which Darwin reported his observational findings and wove

⁸⁴ Darwin, Charles. *Selected Letters on Evolution and Origin of Species*. New York: Dover Publications, 1958: 41-42.

them into this eyewitness account of some of his earliest intimations of evolutionary theory made this adaptation of text into song quite easy to accomplish.

Another form of dramaturgy relating to large-scale structures has not yet been discussed. The musical score of *EFMB* contains a few examples of recurring themes, which can be employed to create thematic unity over the course of a work. This could be referred to as *structural dramaturgy*, in which the large scale form of a piece influences the overall dramaturgical effect, creating a psychological trigger in the listener, each time it is heard and recognized.



Illustration 7 “True Nature” theme, from EFMB song #6 – FINDING THE NAME

21
T. Fitzroy
You will know true na - ture!
pno.

Illustration 8 “True Nature” theme when it reoccurs in Song #16 – ONE DAY

Receiving the libretto earlier, and knowing the overall structure of the work a bit more in advance will enable a fuller exploration of the use of *structural dramaturgy* in future versions.

The effect of instrumentation on the work's dramaturgy should be mentioned at this point. The strategy of employing a small ensemble of only six instruments including a piano, gave the score an intimate feeling, not too different from the music that Darwin might have encountered in his parlor or in a neighborhood church; therefore, the orchestration functioned in such a way as to connect us emotionally and temporally to Darwin's social milieu.

The use of mapping as a dramaturgical strategy, partially a *metaphoric dramaturgy*, (since it was subjected to an interpretive process on the part of the composer,) seemed to be successful, at least in conveying an extra dramaturgical dimension to the character of the Cyborg. However, this extra dimension would most likely be experienced by the audience on an unconscious level, either during or after the performance, classifying it (according to Caravaglia)⁸⁵ as an example of *extrinsic dramaturgy*.

The "DNA chords" for the opening song of *EFMB* were partly derived through the use of *indeterminate dramaturgy*, since I did not know what the results would be before I began the mapping process. Once again, the chords were subjected to my own interpretation so *metaphoric dramaturgy* was also employed. Though the mapping music certainly impacted with the audience on some level, it is my hope that it occasionally assumed the quality of "science" being embodied by music during the performance, as if it were yet another character on stage. This would locate the DNA chords within Weill's definition of the *musical gestus*, ie . . . music that stands on its own, is freed from its dramaturgical responsibility to illustrate individual words and phrases from the

⁸⁵ see pg. 9 of this study

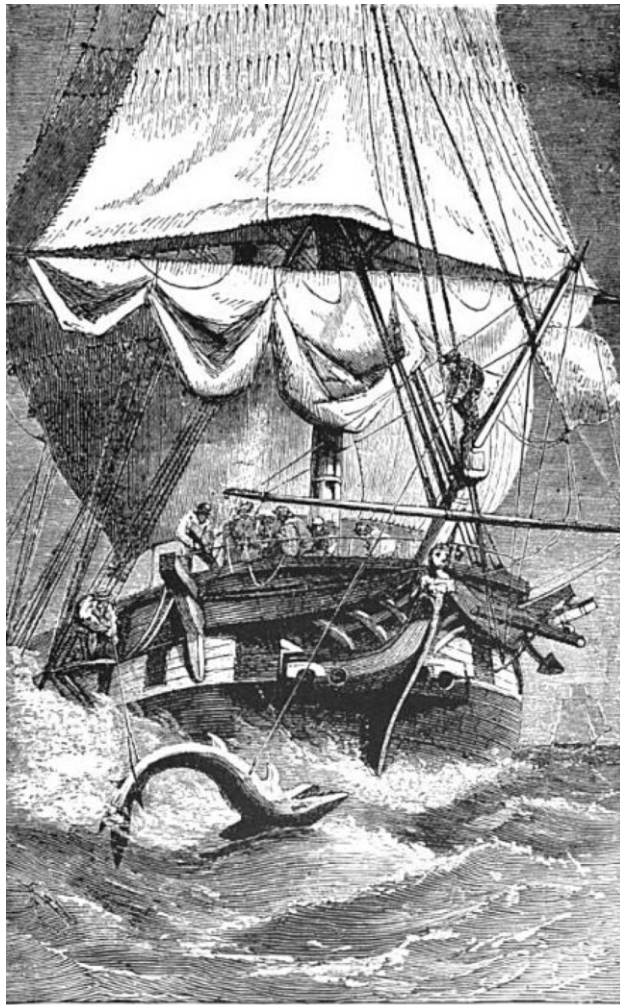
text, yet invokes a larger scientific concept: the evolution of life in all its forms from the simplest to the most complex, emerging from the genetic blueprint that is contained in DNA.

In future research I would like to continue to explore the Cyborg character, and plan to create a new music theatre work that features the Cyborg interacting with something like a ghostly presence of Charles Darwin, and with some of the other characters that have already been created. This will tentatively be known as *The Cyborg Opera*.

This work will encourage further research into biogenetics, trans-humanism, neo-Darwinism, and the works of Donna Haraway and other cyber visionaries. It will also entail further exploration of the compositional strategies involved in mapping, and will encourage an investigation of various computer-based real time voice manipulation systems, possibly exploring some of the ideas encountered in Parra's work, including the mapping of a live instrument onto the spectral and rhythmic characteristics of a voice, with the caveat of not letting electronic effects dominate the work's musical dramaturgy.

For the Cyborg character in particular, I am interested in experimentation with a kind of software that will subtract some of the tonal components from the performer's voice, taking away the words but leaving the rhythm, so we hear only a ghostly echo of the original voice. This has an interesting potential for the possibility of dramatic text being reduced to its essential rhythmic and spectral components, and then gradually restored to the level of understandable speech.

The division of musical dramaturgy into finer and more subtle categories would be a useful direction for further theoretical studies. So too, would be a study (if this is indeed possible) of the relationship between dramaturgical strategies and the final content of what is actually received by the audience. Dramaturgy, both musical and theatrical, has proven to be a useful and valuable tool in the examination of what makes music theatre work, and to help determine the best strategies to bring science and the biography of scientists to the music theatre stage.



SHARK-FISHING AT ST. PAUL'S ROCKS.

Illustration 9. Engraving of HMS Beagle by Meredith Nugent, from *Charles Darwin, His Life and Work*, by Charles Frederick Holder, Putnam & Son's Press: N.Y. 1899, Web. Google E-book. 12 Apr. 2012.

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