OCEAN OF FORMS: FOR SOPRANO AND COMPUTER

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Ocean of Forms is a cycle of five songs for solo soprano voice and electronic/computer music accompaniment on poems by noted Bengali poet, musician, philosopher, and author Rabindranath Tagore. This work approaches the song cycle as a vehicle for expressing and highlighting the poet's words. Word and syllabic stress, text painting, melodic development, and formal structure all function in relation to the text and its meaning. The replacement of the traditional piano accompaniment with electronic accompaniment provides further possibilities for new timbral structures and transformations, expressive microtonal intonation, algorithmic and aleatoric formal structures, acousmatic and spatialized sound, and a broad sonic palette. This work strives to provide a more fully developed expression of the text as afforded by these expanded musical means.

The critical essay primarily explores the interaction between text and music in the work. The first chapter explores the historical precedents for the genre of the song cycle and other texted music as well as specific influences on the work. The following chapters explore the connections between the text and the vocal line and electronic/computer music, respectively. The final chapter deals with the formal structure of the work, especially the justly-tuned harmonic scheme and its relation to the text.

ACKNOWLEDGEMENTS

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PART 1

CRITICAL ESSAY

Introduction

Ocean of Forms is a cycle of five songs for solo soprano voice and electronic/computer music accompaniment. Traditionally, the song cycle provides composers a vehicle for expressing and highlighting a poet's words. Word and syllabic stress, text painting, melodic development, and formal structuring have been a primary focus of many composers working within the song cycle form. The replacement of the traditional piano accompaniment with electronic accompaniment in *Ocean of Forms* provides further possibilities for new timbral structures and transformations, expressive microtonal intonation, algorithmic and aleatoric formal structures, electroacoustic and spatialized sound, and a broad sonic palette. This work strives to provide a more fully developed expression of the text as afforded by these expanded musical means.

The texts for the cycle consist of poems by noted Bengali poet, musician, philosopher, and author Rabindranath Tagore. In particular, four of the poems were first published in *Gitanjali (Song Offerings)*[1] and one poem is found in *The Crescent Moon,*[2] both collections dating from 1913. Much of the poet's work concerns concepts such as love, death, and the nature of the human experience. These themes are often connected to the natural world, time, and the cosmos, often in a quasi-religious yet surprisingly universal manner. The continuing popularity of his work lies mainly in his ability to poetically capture and express such universal concepts. Notably, he worked as his own translator when rendering his works into English, becoming the first non-Western author to win a Nobel Prize in literature in 1913 for the translation of *Gitanjali (Song Offerings)*. His poetry provides a particularly humane and personal expression of concepts

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1 Rabindranath Tagore, *Gitanjali (Song Offerings)*, translated by the author (London: MacMillan and Company, 1913).

2 Rabindranath Tagore, *The Crescent Moon*, translated by the author (London: MacMillan and Company, 1913).

and emotions common to the human experience.

Given the universality of these concepts, an overriding humanistic theme is clearly present throughout his work; particularly so in the selected poems. This underlying universality of the human experience is the overriding literary theme of the piece. The text setting and electronic accompaniment reflect and enhance this theme musically. The ordering of the individual poems creates an overarching narrative structure. The formal structure of the music reflects and reinforces this dramatic curve, thereby imbuing the music itself with the same dramatic tendencies as the text.

Overall, the electronic part enhances and extends the textual and musical meaning of the poetry. The electronics consist of real-time electronic manipulation of the live voice part, pre-recorded electroacoustic sound, and synthesized sound. Furthermore, some elements of the electronic part are algorithmically/stochastically determined and/or interactive in nature. Due to its flexible and wholly customizable structure, the Supercollider[3] audio processing environment is best suited to production and control of the real-time elements of the electronic part. Additionally, Supercollider provides easy integration of real-time sound processing and synthesis with pre-recorded electroacoustic sounds. These electroacoustic sounds were prepared primarily using the Csound[4] audio processing environment. Csound was chosen due to its highly customizable and extensible processing algorithms. A Digital Audio Workstation (DAW) provided the means to mix and finalize the electroacoustic sounds. This hybrid approach using a live soloist, live computer interaction, algorithmically determined machine performance, and fixed electroacoustic sound provides the most flexible performance environment while

[3] James McCartney et al., "Supercollider," http://supercollider.sourceforge.net/ (Accessed July 7, 2011).
[4] Richard Boulanger, ed., *The Csound Book* (Cambridge, Massachusetts: MIT Press, 2000).

maintaining sound quality and the immediacy of performance.

Furthermore, the use of a live computer music environment provides flexibility in live performance that falls within the traditional dynamic of soloist and accompanist. A fluid approach to tempi, phrasing, dynamics, cutoffs, and entrances creates an intimate interplay between soloist and accompanist in traditional song performance that ideally contributes to the overall expression. This intimacy is considered an essential aspect of song performance. An interactive computer environment provides a similar yet distinct fluidity, as the computer is able to follow and respond to the dynamics and phrasing of the vocalist. This allows the vocalist a degree of freedom in interpretation that is similar to a live accompanist. This freedom of interpretation should provide an additional layer of meaning to the text and will ideally enhance musical expression.

Another expressive possibility offered by computer accompaniment is the inclusion of microtones, with a particular emphasis on just intonation. Unlike a piano or other fixed-pitch instruments, the computer can easily and accurately access the entire pitch spectrum. Live processes such as harmonization and comb filtering are especially suited towards just intonation, due to their emphasis of pitch content. The Supercollider environment includes several methods for dealing with just intonation. These include abstraction of scales, tuning systems, scale degrees, and gamut transpositions. This provided an easy way to integrate just intonation into the melodic, harmonic, and formal aspects of the work. In this way, the work's overall harmonic and formal scheme does not compromise the immediate resonance and purity of individual harmonic structures. In fact, just intonation strengthens the overarching harmonic progression. Just intonation makes available a wider variety of consonance and dissonance than standard equal temperament. This greater plasticity of consonance induces harmonic structures and progressions with a much greater sense of function, with dissonant structures more clearly

demanding resolution and consonant structures providing a much greater sense of stability. In this way, the structure of the work's intonation greatly determines its form.

Lastly and perhaps most importantly, computer playback allows the inclusion of electroacoustic or disembodied sound. Electroacoustic sound provides the richest possible palette of timbres and transformations of those timbres. Electroacoustic sound also provides a rich set of associations between the text and the prerecorded sound. In this way, electroacoustic sound functions as a type of text painting itself. Furthermore, recording of the text was transformed and abstracted into electroacoustic sound. This approach is most often associated with the Italian composer Luciano Berio, particularly in works such as *Thema: Omaggio a Joyce*[5] and *Visage.*[6] Despite this abstraction, the text retains its meaning as text while also acquiring further meaning as a sonic structure. Overall, the inclusion of electroacoustic sound provides opportunity to fully heighten and express the text and is therefore a primary focus of the work.

[5] Luciano Berio, *Thema: Omaggio a Joyce* (BV Haast. BVHaastCD-9109, 1990). Compact Disc.
[6] Luciano Berio, *Visage* (BV Haast. BVHaastCD-9109, 1990). Compact Disc.

Precedents and Influences

Ocean of Forms functions as a song cycle in that all musical elements, from the melodic setting of individual words to the high level formal structure, serve the expression of the text. The increased range and control of timbre offered by the computer accompaniment is perhaps the most radical aspect of this work in light of its historical precedents. To this end, one of the more notable aspects in the development of this song cycle involves the expansion of the role of timbre. The most common instrumentation for the song cycle throughout the 19th century consists of a solo voice with keyboard accompaniment, usually piano or pianoforte. Given the timbral homogeneity of the piano, early song cycles could only explore timbre within the registral, dynamic, and articulative constraints of contemporary keyboard technology. Composers working in the late 19th and early 20th centuries expanded this timbral palette with small chamber ensembles and even full symphony orchestras. With the advent of electronic music in the mid 20th century, this palette expanded even further, with electronic processing of the voice itself as well as the additional timbral possibilities offered by electronic and computer music.

This significant growth in the role of timbre is clearly a result of the associative qualities between timbre and the text of the cycle. With music and text, the concrete and verbal nature of the text often drives the form and structure of the music. Even if the composer intends to negate or otherwise ignore the text, this is still a method of dealing with the musical setting of a text. A clear connection from the earliest song cycles to the most recent exists in their deference of musical structures to the text. In this way, timbre is simply another means of expressing the text, whether this expression consists of an individual word or the dramatic curve of the entire cycle.

Text Setting and Song Cycle

Ludwig von Beethoven's 1816 composition, *An die ferne geliebte*,[7] is generally considered one of the first examples of a song cycle by a major composer. The text of this work deals with love and physical separation, focusing especially on the emotional impact of distance between two lovers. Significantly, the formal and harmonic structure of this work reflect the dramatic arc of the text. A prominent melody from the first song is repeated at the close of the final song, creating a cyclical musical structure that also reflects the cyclical structure of the poetry. The harmonic structure further reflects the poetry through a cyclical progression, which returns to the opening key at the close of the cycle. However, timbral association does play a role in the work. The accompaniment figure which begins the second song of this cycle features a stepwise upper voice over a pedal bass, seen in figure 1. Likewise, the accompaniment that begins at measure 13 of the fifth song also features a pedal bass supporting a stepwise melody, as shown in figure 2. The voice leading in both of these figures closely resembles the voice leading common to natural horns. As a result, these figures are strongly associated with the natural horn, which itself is associated with outdoors and nature. The presence of these voice leading and harmonic patterns, despite being performed on the piano, helps to paint the important theme of distance through this association.

[7] Ludwig von Beethoven, *An die ferne Geliebte* (Munich: G. Henle, 1970).

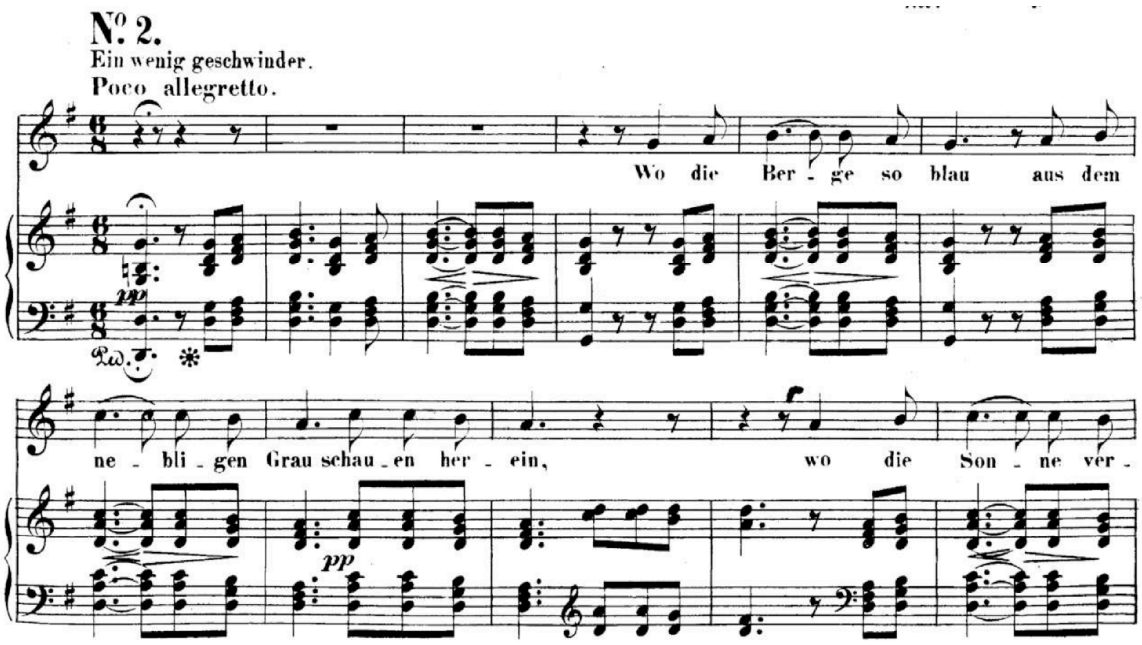

Figure 1: Horn-like melody and voice leading over pedal bass in opening of *An die ferne Geliebte*, no. 2

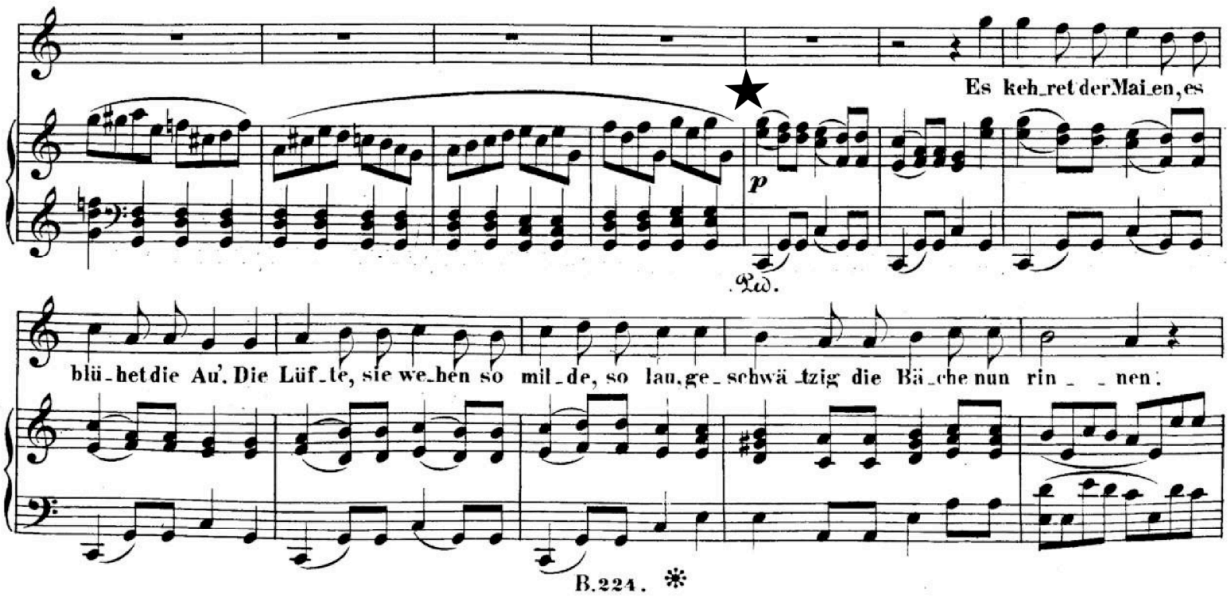

Figure 2: Horn-like figure in no. 5 of *An die ferne Geliebte*. Beginning of example is starred.

Schubert's *Winterreise*[8] also uses formal and harmonic devices to capture the dramatic arc of the poetry. The progressive tonal structure of *Winterreise* , which leads through multiple keys

[8] Franz Schubert, *Winterreise* (New York: C.F. Peters, 1975).

and eventually settles away from the opening key, captures the winding structure of the narrative as well as the deterioration of the protagonist's emotional state. Schubert uses numerous associative devices throughout this work to help portray both the mood and setting of the poems, such as rolling arpeggios that portray falling snow or a running river to the drone fifths of the hurdy-gurdy in the final song of the cycle, depicted in figure 3.

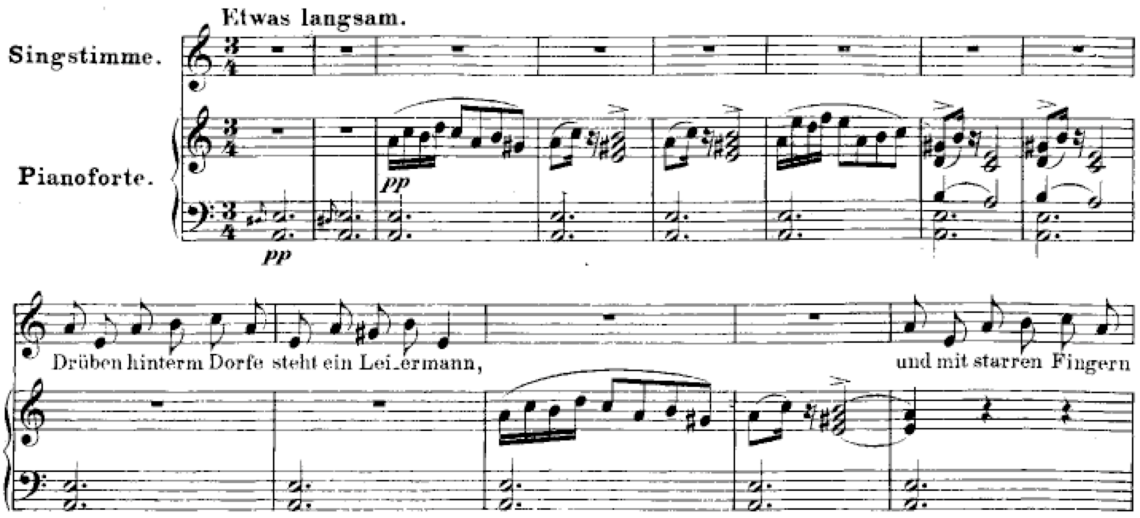

Figure 3: Hurdy-gurdy like figure in no. 24 of Schubert's *Winterreise*.

Many other 19th century composers furthered this integration of harmonic and formal structure with poetic and narrative structure. The song cycles of Hugo Wolf pair this emphasis on musical and poetic structure with late-Romantic harmonic language. Timbral/associative innovations, however, do not appear as often as their harmonic or formal counterparts. Most associative devices found in this period are either derivative of the earlier innovations or excluded in order to favor harmonic and formal structure.

With the symphonic song cycles of Gustav Mahler, particularly *Kindertotenlieder*[9] and *Lieder eines fahrenden Gesellen*,[10] timbre assumes a larger role, no doubt a result of the

[9] Gustav Mahler, *Kindertotenlieder* (New York: Ernst Eulenberg, 1988).
[10] Gustav Mahler, *Lieder eines fahrenden Gesellen* (Leipzig: Edition Peters, 1982).

expanded timbral palette of the symphony orchestra at that time. Interestingly, Mahler still uses timbral connotations that trace back to *An die ferne geliebte*, with horns implying an outdoor or pastoral setting. Likewise, in *Kindertotenlieder*, the double reeds often appear at interludes, with their somber yet resonant timbre providing an appropriately mournful commentary on the text. As may be expected, these cycles also show a strong integration between poetic and musical structure.

Arnold Schoenberg's *Pierrot Lunaire*[11] is an important example of an early post-tonal song cycle that integrates an expanded timbral palette. Here the timbral emphasis is found in both the instrumental and vocal parts. Schoenberg uses the full registers of the entire ensemble, even using doublings of auxiliary instruments to further extend the timbral range. This results in a broad range of timbres, which help to portray the dream-like and expressionist nature of the text. The sprechstimme technique in the voice provides an important timbral aspect that further heightens the expression of the text. The inclusion of sprechstimme is particularly important as it can be seen as the first use of extended vocal techniques in the service of text expression.

The vocal works of Luciano Berio are particularly important in the development of text expression. Both *Circles*,[12] for soprano, harp and percussion, and *Sequenza III*,[13] for solo female voice are important for their deconstruction of text into music. In these pieces Berio uses vocal sounds as primary musical material. In this way, he uses the inherent expressivity of the human voice to create a musical-emotional expression that is removed from any concrete verbal content. Despite the abstraction and deconstruction of text in these works, they still retain their importance as examples of the range and precision of expression of which the human voice is

[11] Arnold Schoenberg, *Pierrot Lunaire, Opus 21* (Wien: Universal Edition, 1941).
[12] Luciano Berio, *Circles* (London: Universal Edition, 1961).
[13] Luciano Berio, *Sequenza III: per voce femminile* (London: Universal Edition, 1968).

capable.

George Crumb's affinity for extended instrumental and vocal techniques provides another excellent source for text expression. His *Ancient Voices of Children*[14] provides numerous examples of the integration of text and extended instrumental timbres and textures. One such example occurs in the second movement where the text deals with imagery of the sea. Throughout this section, the gliding sound of a musical saw provides an eerie and evocative obligato melody. This gesture creates an association with the sea, as it can be understood as mimicking either the whistle of the wind as it comes off the water or the recognizable calls and songs of whales. Still, regardless of its actual intended association (if any), the distinctive sound of the musical saw creates a mysterious and ambivalent atmosphere that invites such associations and speculations.

Text and Electronic Sound

As the previous examples demonstrate, composers working in purely acoustic music have been successful at heightening the expression of text with structural, harmonic, and timbral means. Not surprisingly, the development of electronic and computer music provides further means of heightening text. The electronic vocal works of Luciano Berio, *Thema: Omaggio a Joyce* and *Visage*, are excellent examples of the heightened expressivity possible with electronic manipulation of the voice. *Thema: Omaggio a Joyce* is particularly important as a recorded reading of the text provides the basic sonic materials for the entire piece. In this way, the text and musical sound are unified in a way that would not be possible with purely acoustic means. Furthermore, this work demonstrates the extent to which the aural and verbal contents of a word or phrase can be meaningfully unified and expressed. For example, Berio sets the word

[14] George Crumb, *Ancient Voices of Children* (New York: C.F. Peters Corporation, 1970).

'blooming' in a way that resembles a flower blooming – each phoneme in the word is repeated, with each following sound continuing in sequence until the word is heard in its entirety. The end result sounds somewhat like "b-bl-blo-bloo-bloom-bloomi-blooming," effectively using the word itself to animate its verbal meaning.

Karlheinz Stockhausen's *Gesang der Jünglinge*[15] shares many of the properties of Berio's vocal/electronic works. This work uses a recording of a young boy singing text from the biblical book of Daniel as its primary sound source. Stockhausen augments the tape manipulations of this recording with purely electronic sounds, often matching the resonances and timbre of the manipulated vocal sounds with sine tones and electronic pulses. This work demonstrates a unification of the text with its attendant vocal sounds as well as a further integration of synthesized sound.

While these examples rely on studio production in their realization, Milton Babbitt's *Philomel*[16] and *Phenomena*[17] demonstrate early attempts at the integration of live voice and fixed electronics. Like *Gesang der Jünglinge*, these works use manipulated recordings as well as synthesized sound. Unlike Stockhausen, however, Babbitt scores these works to include a live performer. The integration of live performer and fixed media provides significantly more opportunities for expression of the text. Notably, the inclusion of a live performer offers the immediacy and intimacy of an interpretive performance. Furthermore, with the addition of electroacoustic sound, the expressive potential is greatly expanded. electroacoustic sound may be manipulated to create changes in space as well as timbre. In addition to the wide timbral palette offered by pre-recorded sound, the relationship of the live performer to the

[15] Karlheinz Stockhausen, *Gesang der Jünglinge* (Kürten, Germany. Stockhausen 3, 1991).
[16] Milton Babbitt, *Philomel* (New World Records. 80466-2, 1995).
[17] Milton Babbitt, *Phenomena* (New York: C.F. Peters, 1979).

electroacoustic sound provides another means of textual expression.

Alice Shields' *Apocalypse*[18] and *The Transformation of Ani*[19] and Elainie Lillios' *Earth Ascending*[20] present more recent developments for this combination. However, the inclusion of live electronics resolves many problems resulting from the combination of a live performer with static fixed media. Kaija Saariaho's *Lonh*[21] provides an excellent example of voice integrated with live electronics in a manner that specifically serves the text, as well as electroacoustic spatialization integrated with the meaning of the text. The text of *Lonh*, much like that of Beethoven's *An die ferne Geliebte*, concerns romantic love and distance. Saariaho portrays this effectively through the manipulation of the spatial characteristics of the live electronics. In this way, the perception of spatial distance, as manipulated through artificial reverberation and stereophonic panning, directly associates the theme of distance with its aural equivalent.

As these preceding examples demonstrate, the primary focus of many works that incorporate text is the musical expression of the text, regardless of the means used to achieve this expression. Even if the text is significantly abstracted, as in the works of Berio, the vocal sounds contained therein still provide the expressive focus of the work. To this end, *Ocean of Forms* represents an exploration and expansion of the tradition of text-based music using contemporary means and methods.

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[18] Alice Shields, *Apocalypse* (Composer's Recordings, Incorporated. CRICD-647, 1994).
[19] Alice Shields, *The Transformation of Ani* (Composer's Recordings, Incorporated. CRICD-611, 1994).
[20] Elainie Lillios, "Earth Ascending: A composition in three movements for female voice, acousmatic music, and video" (Doctor of Musical Arts dissertation, University of North Texas, 2000).
[21] Kaija Saariaho, *Lonh* (London: Chester Music, 2005).

Vocal Part and Text Setting

As the text is the primary focus of *Ocean of Forms*, all text setting is intended to clarify, heighten, and expand the meaning of the text. In cases where melodic, harmonic, or rhythmic concerns might suppress the natural flow and diction of the text, the clarity of the text superseded any purely musical concerns. As much as possible, the text setting was derived from the natural diction of the text, so as to initially align enunciation and musical motion and avoid any situations where musical concerns may conflict with textual concerns.

Since many aspects of the piece present novel problems in terms of performance practice, special care was taken to ease these concerns. Most importantly, the justly-tuned harmonic structure of the work presents potential challenges for a performer used to navigating standard equal temperament. For this reason, the text setting is intentionally transparent; a more complex setting would only compound the performance concerns and obstruct a clear and expressive performance.

Syllabic Setting

In general, the text throughout *Ocean of Forms* is syllabic. This choice was made primarily in order to maintain clarity. For the sake of variety, musicality, and interest, neumatic setting does appear rather frequently. Melismatic setting is generally reserved for important words and structurally crucial moments.

The placement and handling of neumatic and melismatic setting most often follows the natural stress of the word. For this reason, most neumatically set words are either one- or two-syllable words with the melisma on the stressed syllable. Also, the melisma nearly always falls downward, thereby following the natural pronunciation of the word from stressed to unstressed syllables. Besides creating a coherent and recognizable melodic approach throughout the work, this also aids the clarity and diction of the text.

Melodic Setting

Melody throughout *Ocean of Forms* is generally simple and declamative. Conjunct motion is by far the most common melodic motion. As wide leaps, especially across the vocal *passaggio*, negatively impact enunciation, this allows for maximum clarity of the text while remaining musical and relatively easy to sing. Also, the prevalence of conjunct melodic motion further highlights any disjunct leaps. This helps reinforce the functional nature of the justly-tuned intervals when they appear on melodic leaps and reserves important functional melodic material for structurally significant moments.

Compared to other contemporary vocal works, the range of *Ocean of Forms* is rather narrow, from b to g". The tessitura is also limited, with most of the notes occurring within the staff. This narrow range serves several purposes. First, the extremes of the vocal range, particularly in the upper register, often require vowel modification, thus reducing the clarity of any text that appears in those registers. Second, the narrow range and prominence of conjunct motion helps to ease the difficulties of learning to perform just-intonation. This enhances the tuning precision and general ease of performance. Lastly, just-intonation creates a wider variety of intervals, thus allowing exploration of a broad tonal area within a fairly limited pitch range. For example, instead of one, there are three distinct intervals encompassing what we would refer to as a "minor seventh" in equal temperament: therefore, a wider range of intervallic expression is still available within the narrow registral range.

The relatively static harmony in this work frees the voice melodically so that local variations and harmonic deviations provide interest and color. The result is somewhat analogous to the role of melody in the Hindustani classical music tradition of northern India or other drone-based music. The static harmony also provides a constant tonal reference point. This ubiquitous reference point allows the melody to create both dissonance and consonance as it weaves around

this point of tonal stability. This further emphasizes smaller intervallic gestures and obviates a wider melodic range.

In general, melody throughout *Ocean of Forms* is treated quite freely. Since the melody is largely determined by the text, purely musical relationships at the note/word level are relatively inconsequential. However, examination of musical relationships at larger levels reveals musical structures that highlight and dramatize the thematic content of the text. This structuring is a significant facet of the work.

Rhythmic Setting

Rhythmically, the vocal part is notated very freely throughout using a variant of spatial notation. Traditional rhythmic notation is used sparingly to exclusively indicate relatively quick moving ornaments. This distinguishes these ornamentations from their surrounding longer durations; the indicated rhythm can still be taken somewhat freely. The rhythmic notation is intentionally vague in order to encourage a freer interpretation by the vocalist. Points of alignment between the vocalist and accompaniment are indicated with cue markings. Aside from these specific points, all alignment between the vocalist and the accompaniment should be considered approximate. The use of live electronics allows for this flexibility as cues can be triggered at the proper points regardless of interpretation. The relative relationship between notes, though approximate, should be observed in order to clarify enunciation and musical properties of the line. Ideally, the rhythmic qualities of the line should enhance the clarity and delivery of the text while remaining musical and song-like. Still, it is expected that the vocalist's individual interpretation and expression should be the primary determinant of rhythm throughout the piece. For this reason, no two performances, even by the same performer, should strive to be identical.

Phrasing

Phrasing throughout *Ocean of Forms* is largely dependent on the text. A melodic line generally falls within a single line of text or at least a single idea. Musical phrases are separated by at least a short break, allowing the vocalist enough space to begin each phrase with a complete breath. As with rhythm, length and separation of phrases is left to the performer. Simple indications of a complete (or incomplete) thought, such as punctuation, should be interpreted appropriately by the performer. Pacing, length, cadence, and connection between phrases are designed to follow the dramatic and rhetorical shape of the text.

Text Painting

The overuse of text painting or the use of flagrant text painting, especially as in secular Renaissance madrigals, for example, can often sound comical and overdone to modern listeners. Nonetheless, text painting is an important aspect of texted music, and has been used tastefully and artfully by many composers throughout history. Continuing in this tradition, text painting does appear frequently throughout *Ocean of Forms*. More importantly, where it does appear, it is used in a relatively inconspicuous and subtle manner in order to subtly highlight and illuminate the text and its attendant themes and images without rendering these associations blatantly obvious. Some examples of text painting serve to animate a particular word or phrase and function solely on a local level. Other instances provide essential structural and functional roles and illustrate the text in a manner that impacts the overall trajectory of the work. Still other examples illuminate words or phrases essential to the primary themes of the cycle.

The text of “Light” (*Gitanjali* 57) contains many active verbs and descriptive words, making this poem ideal for text painting. Accordingly, text painting occurs frequently in this text, heightening its vivid descriptions and illuminating the active nature of the poem. A melisma at cue 1-07 and 1-08 on the words 'the light dances' is a clear example of text painting at

a local level and is shown in figure 4. This melisma imparts the text with its sonic analog, and also allows the vocalist a brief departure from the mostly conjunct and declamatory line. This gives the vocalist some interpretative freedom as well as a brief vocalise, but has no significance to the overall structure. Other examples of text painting in this song do impact the overall structure. At cue 1-25 on the text 'the heaven's river,' the rising melodic shape with short figures connecting broad sustained notes provides an aural analog to a rising river. Rising melismas at cue 1-18 on the word 'surge' and before cue 1-26 on the word 'flood' function similarly. Significantly, these figures serve to animate the feeling of forward motion and overflowing exuberance that characterize the main theme of this poem.

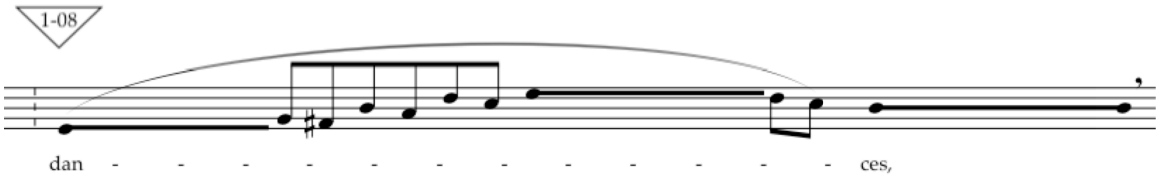


Figure 4: Melisma on 'dances.'

In the second song, “Threshold” (*Gitanjali* 95), text painting is nearly absent. Due to the narrative and reflective nature of the text in this poem, there are few opportunities for text painting. The single example of text painting, however, does perform an important structural and rhetorical role. At cue 2-10 the text 'cries out' appears on an extended melisma that moves across the range of a full octave, shown in figure 5. This clearly articulates the climax of the text while also illustrating its central point. Since the text deals with the unknown nature of existence prior to birth and after death, the depiction of the nursing child's cry functions as a fundamental and crucial image.

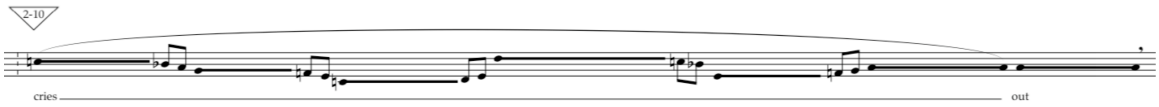


Figure 5: Melisma on 'cries out' at the climax of “Threshold.”

The text of “My Song” (*The Crescent Moon* 38) features several descriptive words and images, many of which are set with appropriate text painting. The majority of text painting throughout this song functions on a purely local level. However, given that this poem deals directly with the ephemeral nature of music as a primary theme, these examples could be seen as fulfilling a conceptual role. At cue 3-08 the text 'and whisper in your ear' occurs with a soft dynamic and in a lower register, painting the idea of a whisper. At cue 3-09 the text 'when you are in the crowd' occurs with a crescendo. While subtle, this gesture helps to mimic the intensity and business of a crowded public place. At cue 3-11, delay and recorded voice provide a quality of detachment to the text 'it will fence you about with aloofness.' The extended melisma on 'wings' at cue 3-12 clearly brings up associations of flight. Likewise, the extended sustain on 'unknown' immediately preceding cue 3-15 gives an essence of vastness and mystery. The climax of the song, however, does fulfill a functional role as it animates a sudden change of character, shown in figure 6. At 3-19 on the text 'and when my voice is silent in death' the accompaniment abruptly cuts off on the word 'death,' providing a simple but direct depiction of the text while also providing the structural bridge to the other main theme of the cycle.

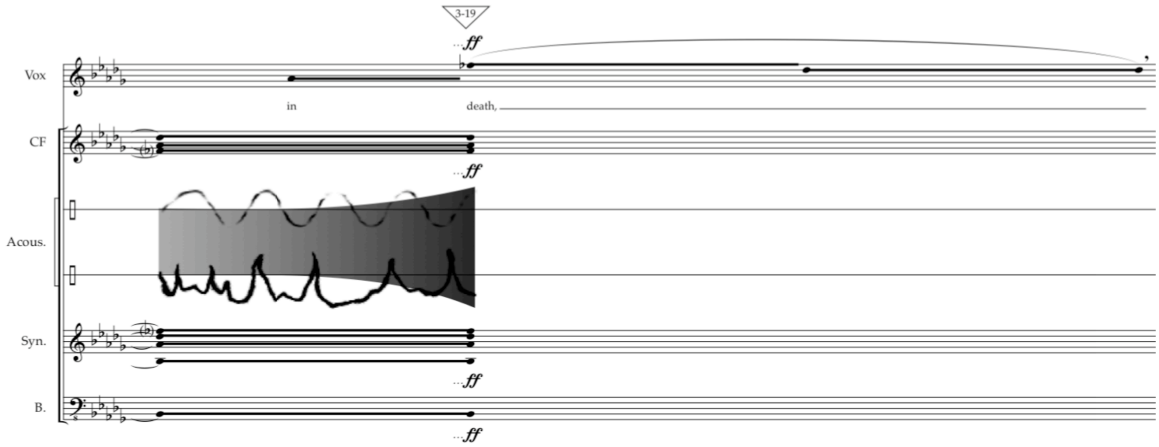


Figure 6: Climax of “My Song” on the text 'in death.'

Text painting appears somewhat more seldom in “Brink of Eternity” (*Gitanjali* 87), but provides important illustrations of the main poetic point. At cue 4-04 on the text 'but infinite is thy mansion' the word 'infinite' occurs with a significantly broader sustain, providing an appropriate depiction of the idea. The same approach is used at cue 4-06 on the text 'I have come to the brink of eternity,' with 'eternity' held significantly longer than the remainder of the line. Finally, this same strategy reaches its fullest expression at the final line of text immediately preceding cue 4-09, 'in the allness of the universe.' Notably, these three occurrences all depict the central theme of this poem – that of the human experience with the infinite.

“Ocean of Forms” (*Gitanjali* 100) once again includes examples of localized text painting. The melisma on 'swells' in 'where swells up the music of toneless strings' after cue 5-07 depicts the swelling music, as does a melisma on 'harp' of 'I shall take this harp of my life' before cue 5-08. The falling melisma on 'sobbed' in 'when it has sobbed out its last utterance' after cue 5-08 depicts the actual gesture of sobbing. Interestingly, this association is often seen throughout much of the canon, with falling melodic figures often signifying crying or sadness. However, the same approach used in “Brink of Eternity” also figures significantly in this song.

Here the texts 'depth of the ocean of forms' at cue 5-02, 'the perfect pearl of the formless' at cue 5-03, 'into the deathless' at cue 5-06, 'the fathomless abyss' after cue 5-07, 'the notes of forever' at cue 5-08, and 'at the feet of the silent' before cue 5-09, all appear on lengthy melismas. These serve to animate the main idea of the text while also providing the melodic material that functions as the musical goal of the cycle.

Structural Aspects

Over the course of the work, longer melismas do begin to appear more frequently, and the text setting in general becomes more embellished. This structural feature is most apparent in the melodic connection between the third and fifth songs. This highlights the thematic connections between these poems as well as the overall narrative created by the ordering of the individual poems. The third poem introduces the theme of music directly, interpreting it as a means to transcend temporal and spatial boundaries. The fifth poem takes this idea to its logical conclusion, relating death to the silencing of an instrument, with its sound continuing to resonate. Musically, these two sections are tied together in terms of melody. In the third song, the repeating text 'my song' or 'this song' always occurs with a particular melodic pattern. The second and final section of the fifth song features the return of this pattern, thus emphasizing this thematic connection. This pattern, consisting of a stepwise descent spanning a fifth followed by an upward leap of a sixth, is highly recognizable while remaining quite malleable. It also highlights the tonal structure in which it occurs, making each appearance distinct yet readily recognizable. This continuous change in the particular character of each appearance therefore provides a means to musically dramatize the textual connection and thematic development throughout the cycle. Essentially, the musical transformation hinted at in the third song reaches its completion in the fifth.

Structurally, this musical dramatization and foreshadowing has several important

precedents. Perhaps most notably, Richard Wagner used such a device in *Tristan und Isolde*[22], with Isolde's *liebestod* recycling the same melodic material from the duet at the end of Act II, Scene 2 as the thematic ideas it first presented reach their logical dramatic conclusion. Likewise, Richard Strauss uses a similar device in *Salome*.[23] Salome's love song to Jochannan in Scene 3 foreshadows her song to his severed head in Scene 4. Notably, both of these examples do take love as an important theme, despite their wildly differing viewpoints regarding the subject. The incorporation of foreshadowing supports the thematic and dramatic connections in *Ocean of Forms*.

[22] Richard Wagner, *Tristan und Isolde* (New York: Dover, 1973).
[23] Richard Strauss, *Salome* (New York: Dover, 1981).

Synthesis, Algorithmic Music, and Electroacoustic Sound

As a song cycle, the primary difference between *Ocean of Forms* and more traditional examples of the genre is its use of synthesized and electroacoustic sound, made possible by the use of computer accompaniment. While fixed media can easily include synthesized and electroacoustic sound, the use of computer accompaniment allows for the inclusion of algorithmically determined music. This has a significant impact on the performance of the work, allowing for a more flexible and variable interpretation than that possible with a fixed media accompaniment. Synthesized and electroacoustic sounds also provide a rich and nearly inexhaustible timbral palette. This broadened palette offers many more opportunities to integrate timbre with the illumination and expression of the text. Electroacoustic sound, in particular, provides for significant possibilities in this realm, as the actual sound referenced by the text may be used to create a rich tapestry of musico-textual associations. While this makes the electroacoustic sound in *Ocean of Forms* especially important in its relationship to the text, synthesized sound also plays a significant part.

Algorithmic Music

Throughout *Ocean of Forms*, much of the accompaniment is determined algorithmically at performance time, rather than being realized in a concrete form. Two primary motivations account for this fact. First, the use of algorithmic music allows a certain amount of indeterminacy to be inherent throughout the work. Second, algorithmically determined music allows for more flexibility in performance and interpretation, ceding more responsibility to the performer in the realization of each performance.

Interactive computer music often uses the computer as a switch, changing between preset sound processing settings and playing back sound files when prompted at each cue. Though much work has been devoted to score following and computer listening, these paradigms remain

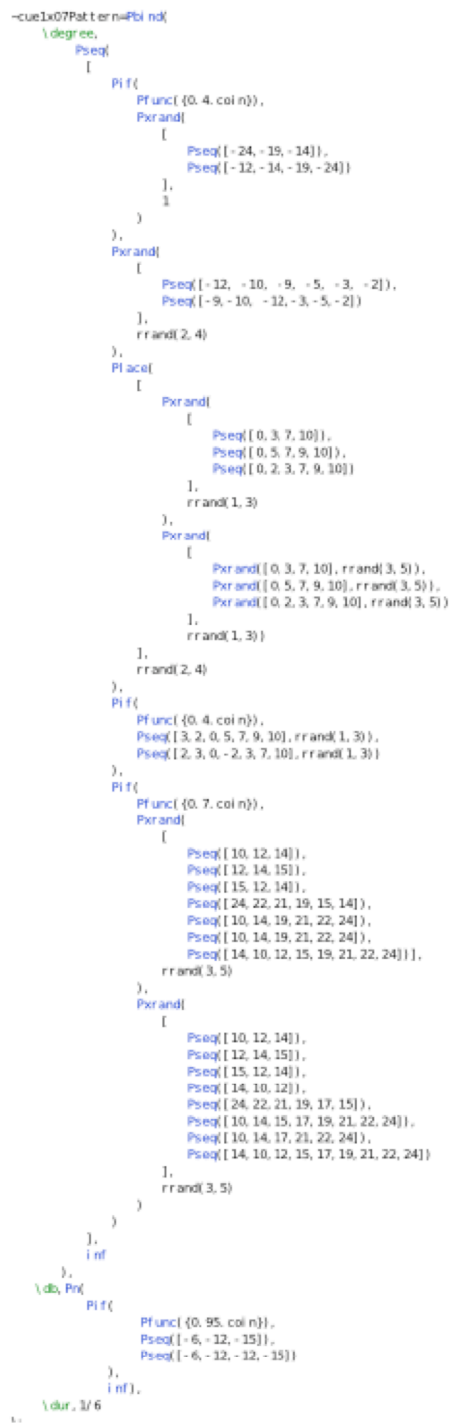
notoriously unreliable for all but the most ideal performance situations. Moreover, these machine listening and score following programs often devote significant amounts of processing power and computer resources to a task that is easily performed by a human technical assistant or the performer. Lastly, the end result of such machine listening or score following is seldom much more than that achieved with a simple switch or cue advance.

For these reasons, the computer accompaniment to *Ocean of Forms* functions by advancing through preset cues, prompted by the performer activating a MIDI switch/button or a technical assistant pressing the appropriate advance button on the computer keyboard. However, the inclusion of algorithmically determined musical structures helps to create at minimum an illusion of interaction between computer and live performer. A particular cue may not ever be repeated exactly the same way between each performance, so the performer is forced to listen and adjust her performance accordingly. Likewise, algorithmic processes can proceed indefinitely after being initiated, only concluding at the prompting of the next cue. This allows the performer freedom to determine how long a particular process may unfold, giving them significant power over the pacing and temporal flow of a particular performance.

In *Ocean of Forms*, algorithmic methods are most prominent in the first, "Light" (*Gitanjali* 57); second, "Threshold" (*Gitanjali* 95); and the fourth, "Brink of Eternity" (*Gitanjali* 87) songs. In "Light" (*Gitanjali* 57), an algorithmically determined arpeggio, performed with a synthesized string-like sound, begins at cue 1-07. Figure 7 demonstrates the SuperCollider code that realizes this arpeggio. In this code, pitches are notated with scale degree numbers, which are not bounded by an octave. This allows pitch sequences to specify both pitch class and octave. The code primarily consists of a sequence of stochastic functions which determine the occurence, order, and repetition of sub-sequences of pitches. This arpeggiation continues, unaltered, through cue 1-14, where an algorithmically determined melody is superimposed upon the rolling

arpeggios. These processes rely on algorithms for both their pitch as well as their rhythmic articulation. The arpeggios primarily occur with an ascent from the sub-bass through the middle register, ending in the treble. However, the sub-bass register may be skipped entirely, and the number and exact pitch of notes occurring within each section of the arpeggio is determined by a series of weighted probabilities. Likewise, the rhythm is typically articulated in groups of three, but occasionally appear in a group of four, dependent again on a weighted probability. Thus, a complex of compound and simple beat groupings is created within a large number of possibilities for each cycle of the arpeggio. This creates an always changing and never repeating complex of pitch and rhythmic combinations in which the likelihood of two identical repetitions is highly improbable. As rhythm and pitch are determined independently, overlap between the two further decreases the likelihood of exact repetition.

The melody superimposed over this complex at cue 1-14 functions in much the same manner. The precise number and pitch of notes is determined by one set of weighted probabilities, while the rhythmic articulation is determined by another. The arpeggio occurs at the rate of eighth-note triplets, while the melody moves in sixteenth notes. The weighting and overlap between arpeggio and melody, as well as the overlap between pitch and rhythm within each, results in a highly complex and continuously changing texture. However, the algorithmic processes at work function within relatively narrow constraints, adhering to pre-determined possibilities within set stylistic and musical boundaries. Therefore, while the individual notes and rhythms are highly unpredictable, the overall texture is relatively static and unsurprising.



```
~cue1x07Pattern=Pbind(
    \degree,
        Pseq(
         [
            Pif(
                Pfunc({0.4.coin}),
                Pxrand(
                    [
                        Pseq([-24, -19, -14]),
                        Pseq([-12, -14, -19, -24])
                    ],
                    1
                )
            ),
            Pxrand(
                [
                    Pseq([-12,  -10,  -9,  -5,  -3,  -2]),
                    Pseq([-9, -10,  -12, -3, -5, -2])
                ],
                rrand(2, 4)
            ),
            Place(
                [
                    Pxrand(
                        [
                            Pseq([0, 3, 7, 10]),
                            Pseq([0, 5, 7, 9, 10]),
                            Pseq([0, 2, 3, 7, 9, 10])
                        ],
                        rrand(1, 3)
                    ),
                    Pxrand(
                        [
                            Pxrand([0, 3, 7, 10], rrand(3, 5)),
                            Pxrand([0, 5, 7, 9, 10], rrand(3, 5)),
                            Pxrand([0, 2, 3, 7, 9, 10], rrand(3, 5))
                        ],
                        rrand(1, 3))
                ],
                rrand(2, 4)
            ),
            Pif(
                Pfunc({0.4.coin}),
                Pseq([3, 2, 0, 5, 7, 9, 10], rrand(1, 3)),
                Pseq([2, 3, 0, -2, 3, 7, 10], rrand(1, 3))
            ),
            Pif(
                Pfunc({0.7.coin}),
                Pxrand(
                    [
                        Pseq([10, 12, 14]),
                        Pseq([12, 14, 15]),
                        Pseq([15, 12, 14]),
                        Pseq([24, 22, 21, 19, 15, 14]),
                        Pseq([10, 14, 19, 21, 22, 24]),
                        Pseq([10, 14, 19, 21, 22, 24]),
                        Pseq([14, 10, 12, 15, 19, 21, 22, 24])],
                    rrand(3, 5)
                ),
                Pxrand(
                    [
                        Pseq([10, 12, 14]),
                        Pseq([12, 14, 15]),
                        Pseq([15, 12, 14]),
                        Pseq([14, 10, 12]),
                        Pseq([24, 22, 21, 19, 17, 15]),
                        Pseq([10, 14, 15, 17, 19, 21, 22, 24]),
                        Pseq([10, 14, 17, 21, 22, 24]),
                        Pseq([14, 10, 12, 15, 17, 19, 21, 22, 24])
                    ],
                    rrand(3, 5)
                )
            )
        ],
        inf
    ),
    \db, Pn(
            Pif(
                    Pfunc({0.95.coin}),
                    Pseq([-6, -12, -15]),
                    Pseq([-6, -12, -12, -15])
                ),
                inf),
    \dur, 1/6
),
```

Figure 7: SuperCollider code for algorithmic arpeggio at cue 1-07 of “Light.”

Due to the flexible nature of algorithmic music, both the arpeggio and melody are able to

transpose immediately and synchronously at the key change immediately prior to cue 1-15. This texture continues until after cue 1-17, where an electroacoustic texture serves as the accompaniment. At the key change after cue 1-23, a similar arpeggio returns. Here, there is a single element in the texture, but the algorithms used are largely similar to those discussed previously. The primary differences result from stylistic changes relevant to this new section, including an emphasis on simple beat groupings, a wider range, and more erratic leaps. This texture continues to the end of the song at cue 1-26.

In "Threshold" (*Gitanjali* 95), the accompaniment is largely algorithm driven. The majority of the accompaniment throughout the song takes place in a compound-duple meter. However, up to cue 2-04, there are rests between each appearance of the accompanimental figure. The length of these rests is determined randomly within a minimum and maximum constraint. This unpredictability provides an opportunity for interplay and reaction between the vocalist and the computer. After cue 2-04, the accompaniment follows a strict meter, but the vocal line remains unmetered. The necessary changes to the accompaniment occur at the indicated cue points, with the accompaniment continuing in its pattern until a cue change is received. This allows the vocalist complete freedom in the pacing of her own line as well as the changes in the accompaniment. Essentially, the performer (or technical assistant, following the performer) acts as conductor to the accompaniment by shaping the pacing and growth of the performance as it happens. This opens up considerable possibilities for interpretation and expression of the text.

The fourth song, "Brink of Eternity" (*Gitanjali* 87) uses algorithmic processes in much the same manner as the second. The accompaniment in this section consists of synchronized rhythmic pulses that outline prime number divisions of the beat. Five different 'streams' of pulses beat continuously immediately following the conclusion of the electroacoustic interlude at

cue 4-03 to cue 4-07. All the pulses begin synchronously. New subdivisions are introduced by a rhythmic acceleration of a single stream. In order to maintain synchronicity, the individual streams are controlled by their own clocks, each of which is synchronized to a master clock. The acceleration of each pulse stream takes place over a randomized period of time, again within a minimum and maximum range. The acceleration takes place at each cue, with the vocalist entering after the acceleration has ended. The overall rhythmic complex remains static between each cue, allowing for the same freedom of phrasing and pacing as the second song.

A significant aspect of the work involves the use of electroacoustic drones as a background texture. In order to function properly within an interactive and algorithmic environment, these drones require the capability to sustain indefinitely. To this end, overlapped and windowed playback of pre-recorded sound files is used for the sustained drones. This technique imposes an amplitude envelope on the sound file, ramping its volume up and down at the beginning and end while simultaneously overlapping multiple copies of the soundfile. This is accomplished by synchronizing the file and envelope playback to a master clock, then offsetting each copy of the file by the appropriate amount of phase offset (0%, 25%, 50%, and 75%, in this case). The end result is that the central portion of the sound file is heard continuously. Thus, a rich and complex, yet relatively static, sound can be prepared in advance and still function as a drone for as long as needed. Essentially, this technique is the exact same process used in granular synthesis and time-stretching, the primary difference being that the overlaps occur at consistent temporal intervals, whereas the temporal distance is normally varied with granular-based time-stretching. All of the background electroacoustic sounds throughout *Ocean of Forms* are prepared and performed in this manner.

Overall, the use of algorithmic procedures, no matter how simple, allows for a freer and more immediate performance interpretation. Accompaniment patterns that repeat indefinitely

but change at the appropriate cues allow for pacing and phrasing to be determined by the individual performer's tastes and interpretation. This freedom broadens the options available for interpretation, which should ideally enhance the expression of the text and elevate the role of the performer to a more collaborative and artistic position, rather than that of a mere executant.

Electroacoustic Sound

Electroacoustic sound plays a critical role throughout *Ocean of Forms*. The variety and complexity of real-world recorded sound provides the work with an important sonic element. Furthermore, the nature of electroacoustic sound creates rich intertextual meanings when combined with the text of the work. Electroacoustic sound is present in every song in *Ocean of Forms*, and often forms the entirety of the accompaniment.

One important aspect of electroacoustic sound is its inherent complexity. Unlike purely synthesized sound, real-world sound is intrinsically complex due to a number of factors. Everything from the physical nature of the sound producing object itself to its reverberation and dispersion in real acoustic space ingrains the complexity of the physical world to a sound captured by a microphone. This is especially noticeable in relation to synthesized sound, to which complexity must be added in order to even approximate real-world sound. This inherent complexity provides the composer with an interesting palette from which to work, and creates much of the inherent sonic interest and beauty of electronic music. The richness of electroacoustic sound is integral to the sound world and conception of *Ocean of Forms*. Throughout the work, electroacoustic sound provides a rich and intricate sound world, which is used to provide elements that function musically on the entire spectrum, from foreground to background materials. However, electroacoustic sound provides the majority of the background materials throughout the composition, while synthesized sounds often are used to create foreground gestures. This helps to unify the sound world and blur the distinctions between live

performer, synthesized sound, and electroacoustic sound.

Microphone technique, recording technique, sample preparation, digital signal processing, mixing, and spatialization are all integral to the creation of effective electroacoustic sound. For the sounds used in *Ocean of Forms*, two kinds of recording setups were used. Sounds which were easily reproduced in a studio were recorded as such. For sounds that could not be easily reproduced in the studio, a portable digital recorder (Sony PCM-50) was used to gather field recordings. The studio recordings included various paper sounds, the sound of a small metal ring, finger cymbals, and vocal sounds. The paper sounds include tearing, rubbing, shaking, snapping, and crumpling. The ring sounds include spinning and dropping the ring on both hard and relatively soft surfaces. Field recordings include the sound of wind through the leaves of a tree, an AC cooling tower, two separate water fountains, a large grate being stepped upon, traffic sounds, electric lights, and ambient nighttime sounds. During recording, any sounds that could be reproduced at will were recorded multiple times. This allowed for multiple versions of the same sound, each with slightly different characteristics. Of all the sounds collected, the vocal, paper, and fountain sounds appear most prominently throughout *Ocean of Forms*.

All samples were recorded at a bit depth of 24 bits and a sample rate of 48kHz. Microphone technique varied considerably between the two setups. The portable digital recorder has internal microphones that could be configured in a 90º angle, in approximation of an X-Y microphone arrangement, or at a 120º angle, roughly approximating an ORTF or wide-stereo arrangement. In order to capture as much spatial separation as possible between the two stereo channels, the 120º setting was used for the field recordings. With the studio recordings, two different microphone arrangements were used. Vocal sounds were recorded with a Studio Projects B1 model large diaphragm condenser microphone. All other sounds were recorded with

a stereo pair of AKG C214 large diaphragm condenser microphones. All these sounds were captured using close-miking techniques, with the microphones in an X-Y configuration. X-Y technique was used as it provides a strong sense of directionality while preserving the sonic detail when close-miking relatively small sounds.

Once the recordings were gathered, the raw recordings were spliced in order to isolate individual sounds and processed to obtain maximum sound quality. Care was taken during recording, especially with the studio recordings, to isolate each sound. This allowed for an easier extraction of the individual sounds. Sounds were spliced with their attacks as close to the beginning of the sound file as was reasonably possible. This was done to allow for easy alignment of transients between multiple sounds. To ensure that the entire decay portion of the sound remained, a short amount of silence was left at the end of every sound file. Once the sound files were spliced, minimal processing was applied to ensure a consistent sound quality across all the separate files. With a 24 bit depth recording, the dynamic range was quite high. In order to reduce extraneous noise, care was taken during recording to use as much of this dynamic range as possible. For that reason, normalization was only applied to sounds that did not peak above -6dB, which constituted only a handful of the available sound files. Sounds that displayed a wider dynamic range were not normalized. Several of the field recordings displayed a low frequency rumble or background hum. Noise reduction and equalization were applied to these sounds in order to better isolate the desired components of the sound.

Once the raw sounds were recorded and edited, they were manipulated in order to obtain interesting and musically useful sounds. This primarily consists of the application of digital signal processing to the raw sounds in order to enhance, extract, or highlight some aspect of the sample. Two primary methods were used to obtain this processing. The first is through the

Csound audio processing environment, the second is through a DAW (Apple's Logic Express)[24] using various audio processing plugins. The primary advantage of Csound is the degree of customizability and specificity possible. However, unlike most DAW plugins, which almost always feature GUI controls and real-time operation, Csound requires a certain amount of expertise, as well as considerably more time in order to obtain the desired results. Every aspect of audio processing must be specified from the ground up in Csound. Furthermore, Csound is entirely text-based, requiring a higher level of specificity, and by default renders audio outside of real-time. GUI controls are available, especially through front-ends such as Mac Csound, Qute Csound, and Cecilia, but their control specifications must still be programmed to the appropriate parameters in the Csound orchestra and score files.

Several kinds of processing were used in Csound for *Ocean of Forms*. Given the particularity of working with Csound, it was reserved mostly for more advanced processing techniques. Granular synthesis, classic vocoding, time-stretching, phase vocoding, envelope following, comb filtering, and string resonance simulation comprise all the use of Csound in the work.

Granular synthesis is especially important to the overall sound world of the work. Sound granulation provides a means to create dense and complex textures from shorter and less complex sounds. This processing technique was used frequently, particularly on the vocal sounds found throughout the work. The second movement makes extensive use of this technique to generate the entire background texture. To create these textures, individual recordings of a voice sweeping through the five pure vowel sounds, a-ɛ-i-o-u, were sampled. Each recording featured a different fundamental pitch and the vowel sweep was timed so as to align with the

[24] Apple, Inc., "Logic Express 8," http://www.apple.com/logicpro/ (Accessed March 5th, 2012).

other recordings. These individual recordings, when layered and mixed together, then created a chord with a precise vowel sweep. Some standard effects, such as chorus and stereo widening were added to this mix in order to broaden and thicken the sound. Each background chord was then mixed together as described in order to obtain all the chords needed for the song. These chords were then processed with granular synthesis using relatively large grain size, relatively small grain overlap, and no transposition to the original sound. Precise settings of the granular synthesis parameters were determined through weighted random numbers that slowly fluctuated at random intervals. As the vowels were aligned in each sweep, this granulation resulted in a dense, chordal chorale texture with randomized vowel formants.

In addition to granular synthesis, classic vocoding plays a significant role in the work. Classic vocoding applies the spectral envelope of one sound to another. The most recognizable example of this technique is the 'singing synthesizer' technique, heard in popular music of the 1970's, in which the spectral envelope of a singing voice is applied to a synthesizer, thus creating the illusion that the synthesizer is actually singing. This same technique was used in many of the sounds in *Ocean of Forms*. Given the emphasis on both the voice and pitch throughout the work, it naturally provided ample opportunities to use vocoding. This allowed the pitch accuracy and stability of synthesized sounds to be combined with the expressive spectral characteristics of vocal and other electroacoustic sounds. In order to create the desired vocoder sounds, a 32-band vocoder was created in Csound. The relatively high number of bands allowed for very narrow bandwidths without sacrificing overall frequency response, resulting in a highly accurate and articulate vocoder instrument.

Many of the vocoder sounds throughout *Ocean of Forms* were mixed with their original sounds. The common spectral envelope helps to create an aural illusion wherein a non-pitched sound appears to have a stable pitched component. This is especially prevalent in the first song.

Here, the sound of paper being torn often appears as a short interlude between vocal phrases. This sound is mixed with a vocoded version of itself, combining the characteristic frequency sweep of the torn paper with a synthesized chord. This approach was used for many other sounds throughout the piece, especially vocal sounds, such as those in the first and second movements.

In general, a significant amount of the processing used in *Ocean of Forms* bridges the divide between pitched and unpitched sounds. The processes of granular synthesis and vocoding, as described above, allow the exploration of the spectrum between these extremes, and granular synthesis allows a single sound, pitched or unpitched, to be transformed into an entire texture. Granular processes can even create pitched sounds from non-pitched sounds. Likewise, vocoding allows unpitched sounds to incorporate pitched content, and much of the other processing was used with similar goals. Envelope following is applied much like classic vocoding, the primary difference being that the amplitude envelope of a sound is applied to a synthesized sound rather than its spectral envelope. Comb filtering and string resonance simulation also work in a similar manner, by using the original sound to excite a fixed set of harmonic resonances. This effectively applies a definitively pitched and strongly harmonic spectral envelope to the original sound. The end result of this extensive processing is that all the sounds heard within *Ocean of Forms* function relative to both the harmonic structure as well as the sound world of the piece.

This all-encompassing sound world also includes the live voice, as another advantage of computer music accompaniment is the application of signal processing to the live performer. Throughout *Ocean of Forms* there are several kinds of processing applied to the vocal part, including string resonance simulation, delay, harmonization, and reverberation. The string resonance serves two functions. First, it provides the vocalist with a means to immediately

assess her intonation as the string resonance will maximize when she is in tune. Secondly, it bridges the gap between the performer and electronics by resonating the voice in a similar manner. Harmonization serves a similar role, adding additional pitch and timbral information to the live part. While these processes blur the timbre and pitch distinction between vocalist and computer, delay helps to blur the temporal differences between the two. For example, the final line of the third song is performed with a long and heavily recursive delay. This effectively creates an electroacoustic-style texture from the live part, blurring the distinction between the two.

Lastly, reverberation is especially important to the sound world of the work. All sounds, whether live, synthesized, or electroacoustic, are processed through the same reverberation. This helps to create the illusion of a real acoustic space in which the performance takes place. However, there are several places in the work where the perceived space is changed by altering the reverberation in some way. This change of space highlights formal aspects and illuminates the text where it occurs.

Like all other aspects of the work, the computer accompaniment relates primarily to the text. It does this in two ways. First, it creates an atmosphere that reflects the overall mood and tone. Second, the electroacoustic and synthesized sound create associations with the text. In this way, the computer part provides text painting, musically generating the imagery and emotions found within the poems.

Word Painting in "Light" (Gitanjali 57)

As its title suggests, the primary imagery in "Light" (*Gitanjali* 57) revolves around the idea of light and its associations. This is portrayed in two basic ways, one focuses on the bright, aggressive, and interruptive nature of light, especially the idea of a beam of light breaking through darkness. The second idea deals with a more soft and diffuse interpretation of light, like

the all-encompassing brightness one experiences outdoors on a sunny day. Within this song, both interpretations relate to different aural content. The resonant synth sounds throughout this song, produced with a physical model of a vibrating string, timbrally evoke the bright and aggressive characteristics of a ray of light. Likewise, the tearing paper sounds and spinning ring sounds, and especially their noisy and chaotic sweep through the frequency spectrum, provide another analog to an aggressive burst of light. Notably, it is the gesture and shape of these sounds that create this association, not anything about the actual source of the sound. In contrast, the granulated vocal sounds in this song help to evoke the softer and more ambient aspects of light. The overlapping and constantly shifting textures created through granular synthesis provide a thick soundscape that permeates the mix while also supporting it. The warmth of the original vocal samples helps to add a soft and indistinct quality to this texture.

Other sounds provide more direct associations. Immediately preceding cue 1-18, all of the synthesized sound drops out and the sound of paper being crumpled takes over the texture. The fluttering and chaotic gestural characteristics of this sound reflect the text quite literally. It appears on the words "the butterflies spread their sails on the sea of light," effectively portraying similar gestural qualities to that of a butterfly's flight. Beginning at cue 1-18, this sound is processed with comb filtering. This added harmonicity reflects the sense of all-encompassing light in the text, accompanying the lines "lillies and jasmines surge up on the crest of the waves of light/the light is shattered into gold on every cloud, my darling,/and it scatters gems in profusion."

Word Painting in "Threshold" (Gitanjali 95)

In "Threshold" (*Gitanjali* 95), the word painting is much more subtle, reflecting the primary idea of the song and its structural meaning rather than specific words. This is accomplished through the use of contrasting acoustic spaces made possible with artificial

reverberation. This song deals with the idea of existence, and its boundaries, or lack thereof, in respect to human life. The 'threshold' between the time prior to birth and birth itself is portrayed through contrasting acoustic spaces and textures. The song begins with a large and reverberant space. The middleground and background of the texture are formed by the synthesized accompaniment and the granulated vocal sounds, respectively. This ambience and textural arrangement continues up to cue 2-09. At this point, the foreground and background switch roles and the ambience changes to a relatively small and dry space. The synthesized accompaniment increases in speed, eventually becoming more of a blur of notes, while the granulated vocal sounds become more distinct and separated. This continues until cue 2-10, where at the line "the child cries out" the previous large and reverberant ambience returns. Finally, at cue 2-11, the synthesized accompaniment gradually regains its prior clarity. These changes reflect the idea of the crossing of a threshold between spaces, the prominent theme in the text.

Word Painting in "My Song" (The Crescent Moon 38)

A similar use of contrasting space occurs in the third song, "My Song" (*The Crescent Moon* 38). At cue 3-10, the reverberation suddenly changes from a wide and open space to a small and tight space. This occurs on the words "When you are in the crowd, it [my song] will fence you about with aloofness." As this line continues, the reverberation is gradually brought back to a wide and open space, thus tying the idea of aloofness to that of inner, psychological space.

Another word painting example found in the first song reappears in "My Song." After cue 3-11, an electroacoustic sound derived from crumpling paper is heard prior to and during the line "my song will be like a pair of wings to your dreams." As in the first song, the fluttering gesture of the crumpled paper creates an association with wings and flight.

This association is not the only one from the first song to reappear. At cue 3-16, a bright,

buzzy synthesized sound emerges with a crescendo from silence on the same pitch as the voice. This sound intensifies to fortissimo, leaps up an augmented fourth, descends a diminished sixth via portamento, and then reaches a mezzo-piano dynamic through a decrescendo. This occurs on the text "it [my song] will be like the faithful star overhead/when dark night is over your road." This renews the association between bright resonant timbres and light, with the timbre and gesture of this sound reflecting the bright starlight mentioned in the text.

Lastly, the final line of this song, "my song will speak in your living heart," occurs entirely a capella, except for some delay added to the voice. Specifically, the delay is added to the words "my song." The length and feedback of the delay is quite long, so that the melisma that occurs on "my song" is transformed into an undulating texture that accompanies the rest of the text. In this way, the text is animated in a way so as to perfectly mirror its verbal meaning. The words "my song" continue to be heard, even as the line continues with "...will speak in your living heart."

Word Painting in "Brink of Eternity" (Gitanjali 87)

The concept of space reaches its fullest expression in "Brink of Eternity." The song opens with a single sine wave impulse exciting an artificial reverb effect. After the reverberation fades away, an accelerating series of impulses excite the reverb again. This continues several times, with the final excitation being extended and becoming the background of the texture throughout the majority of the song. The continuous sense of space helps add to the overall form in the song, being essentially a large crescendo of timbre, rhythm, and dynamics. Finally, at the end of the song at cue 4-09, the undulating rhythmic texture stops several times while the reverberation fades away. However, the final stop occurs abruptly and does not include a reverberant tail. Conceptually, this ties the fourth song to the fifth song in the cycle, with the fifth acting as the 'missing' reverb tail to the crescendo of the fourth.

Word Painting in "Ocean of Forms" (Gitanjali 100)

The electroacoustic and synthesized sounds in "Ocean of Forms" serve primarily to summarize the concepts found throughout the entire cycle. As mentioned above, the background texture of this song is derived from the 'missing' reverb tail of the fourth song. This reverberation is augmented with the sound of a large and small fountain, in order to provide a rich source of wide-band white noise. This broad spectrum noise, in combination with the large and resonant reverb, creates a spacious background texture. As this song continues, this background noise is increasingly processed with comb filtering, gradually transforming the pitchless noise into discreet pitches. This effectively summarizes the associations with light and space found in the text. In addition, bright and resonant synthesized timbres occur frequently throughout the song as interludes between vocal lines. These further reinforce the association with both diffuse and concentrated light. While the computer part in this song does not contain any of the word-specific text painting found in the other songs, the electroacoustic and synthesized sounds do effectively reflect the important themes of the work. Appropriately, this works in conjunction with the trajectory of the text of this song.

Formal Structure

Ocean of Forms' formal structure is determined by the ordering of the individual poems. Poems were chosen according to several criteria, including their thematic relationship to each other, their appropriateness for singing (i.e. succinct, evocative), imagery, mood, language, and flow. An initial selection of twenty-two poems from Gitanjali and The Crescent Moon met these requirements. The prominent themes and/or imagery contained within these poems included distance, time, light, and music. However, love and its many facets are pervasive throughout all the poems. Initially, nine of these twenty-two songs were placed into a structure in order to form a loose narrative. This consisted of three groupings of three songs each, with a roughly parallel narrative running within each group of songs. The initial song of each group dealt with imagery of light and space – often describing a scene such as the sky at night, or dawn in a forest. The middle song of each group dealt with time, particularly the distinction and comparison between eternity and the comparatively miniscule span of a human life. The final song of each group dealt with descriptions and imagery of music. This structure, along with the overall theme of love, resulted in a narrative that outlined music, as an expression of love, as a means to transcend the temporal (and thereby spatial) limitations of our human experience. This theme and narrative provides an interesting extension and reinterpretation of stereotypical song cycle themes, thus grounding the work clearly in the genre.

However, this triple-tryptich structure significantly expanded the scope of the piece, was potentially repetitive or redundant, and detracted from the development of the theme. For these reasons, the nine existing poems were reconfigured into a five-song cycle. This maintained the thematic and narrative aspects of the original order, but excised the redundancies while creating more interesting structural possibilities. The order of these poems now portrayed a much clearer connection and progression between light in the first poem, to time in the second, and music in

the third poem. The fourth poem then revisits time while the fifth poem more fully connects time and music, thus rounding out and clarifying the narrative while simultaneously suggesting a clear dramatic arc.

Harmonic Structure

The overall formal and harmonic structure of the work closely follows this division. Significantly, the work is conceived entirely in just intonation. The entire cycle is therefore entirely tonal in construction. Frequency ratios are specified throughout this essay in order to clearly show the tonal relationships between individual pitches and tonal centers. A ratio of 1:1 creates a unison, 3:2 creates a justly tuned perfect fifth (702 cents, two cents above the equal temperament fifth), 7:4 creates the harmonic seventh (966 cents, thirty-four cents below the equal temperament seventh), and so on. The tonal centers of each song all relate to the home tonic, notated in the score as C. The tonic sonority consists of a justly-tuned minor seventh chord, created by combining the tonic pitch (C, 1:1) with its dominant pitch (G, 3/2). This open fifth is then combined with the harmonic seventh (Bb, 7:4) and the pitch a perfect fifth below that, the minimal third (Eb, 7:6). This sonority, due to it being a combination of two perfect fifths separated by a minimal third, has a settled and transparent, yet distinct, harmonic quality and color. These qualities prompted its use as the tonic and controlling sonority of the work.

	Chromatic Scale Degrees (relative to tonic)											
Tonic	1	2	3	4	5	6	7	8	9	10	11	12
C (1:1)	1:1	28:27	9:8	7:6	5:4	4:3	112:81	3:2	14:9	5:3	7:4	15:8
D (9:8)	1:1	28:27	9:8	7:6	5:4	4:3	112:81	3:2	14:9	5:3	16:9	15:8
Eb (7:6)	1:1	15:14	63:56	7:6	9:7	4:3	112:81	3:2	14:9	12:7	16:9	196:105
G (3:2)	1:1	28:27	9:8	7:6	5:4	4:3	45:32	3:2	14:9	5:3	7:4	448:243
Ab (14:9)	1:1	21:20	9:8	135:112	9:7	4:3	45:32	3:2	14:9	27:16	16:9	15:8
A (5:3)	1:1	21:20	9:8	6:5	5:4	4:3	7:5	3:2	8:5	5:3	16:9	15:8

Figure 8: Initial scale and its alterations relative to each tonal center. Highlighted pitches are the 1:1 tonic.

The interval of the minimal third, the most characteristic interval of the tonic sonority, plays an important functional role throughout the work. Extending justly-tuned fifths both above and below this pitch produces the harmonic seventh (Bb, 7:4) and the septimal minor sixth (Ab, 14:9). Notably, these intervals function as justly-intoned substitutions for their equal-tempered approximations in a minor scale. In order to create greater pitch variety and allow for chromaticism, other just pitches were added. In order to retain some resemblance to a 12-tone equal tempered system (for conceptual purposes, as well as to facilitate rehearsal), other justly-intoned pitches were substituted for their equal-tempered counterparts. Major and perfect intervals relied primarily on Pythagorean (perfect fifth) and/or traditional just temperaments. Other intervals continued with Pythagorean extension from the minimal third. Pythagorean extensions of the tonic resulted in the already-deduced perfect fifth (G, 3:2), the perfect fourth (F, 4:3), and the perfect second (D, 9:8).[25] Extending just major thirds from tonic, subdominant, and dominant pitches yields the major third (E, 5:4), major sixth (A, 5:3), and the just leading tone (B, 15:8), respectively. Since the minimal third plays an important structural role, Pythagorean

[25] The term 'perfect second' is used in just-intonation to distinguish the 9:8 whole step, derived from a succession of 3:2 perfect fifths, from the 10:9 whole step, derived from a 5:3 major sixth followed by a 4:3 perfect fourth.

extension from this pitch yields the tritone (F#/Gb, 112:81) and the septimal half-step (Db, 28:27). Thus, the complete quasi-chromatic tonic scale consists of the following intervals: tonic (1:1), septimal half step (28:27), perfect second (9:8), minimal third (7:6), major third (5:4), perfect fourth (4:3), septimal tritone (112:81), perfect fifth (3:2), septimal minor sixth (14:9), major sixth (5:3), harmonic seventh (7:4), leading tone (15:8), and the octave (2:1). Figure 8 shows this basic scale and the alterations used for the different tonal centers throughout *Ocean of Forms*. Figure 9 shows the equivalent keyboard pitches for each tonal center.

	Equivalent Keyboard Pitch											
Tonic	C	C#/Db	D	D#/Eb	E	F	F#/Gb	G	G#/Ab	A	A#/Bb	B
C	1:1	28:27	9:8	7:6	5:4	4:3	112:81	3:2	14:9	5:3	7:4	15:8
D	1:1	135:128	9/8	7:6	81:64	21:16	45:32	3:2	14:9	27:16	7:4	15:8
Eb	1:1	28:27	49:45	7:6	5:4	21:16	49:36	3:2	14:9	392:243	7:4	49:27
G	1:1	135:128	9:8	7:6	5:4	21:16	112:81	3:2	14:9	27:16	7:4	15:8
Ab	1:1	28:27	35:32	7:6	98:81	21:16	112:81	35:24	14:9	49:30	7:4	15:8
A	1:1	25:24	10:9	7:6	5:4	4:3	25:18	40:27	25:16	5:3	7:4	15:8

Figure 9: Keyboard equivalence of all pitches.

Formally, this scale provides reinforcement of several basic and even common-practice tonal functions. Root movement by fifth is preserved, due to the preponderance of just fifths. The relatively narrow half-steps between minor or lowered scale degrees creates opportunities for strong voice leading and resolution. The combination of normally just intervals with a series based on the minimal third creates a range of dissonant keys, with relatively distant keys that are particularly dissonant. The harmonic equivalent to the German augmented sixth chord in equal temperament is particularly dissonant in this scale. This harmony uses the lowered sixth scale degree as tonic (Ab, 14:9) and consists of a septimal major third (an interval of 9:7, provided by the tonic pitch C, 1:1), a perfect fifth (interval of 3:2, provided by the minimal third Eb, 7:6), and

a Pythagorean seventh (interval of 16:9, provided by the tritone F#, 112:81). The unusually wide septimal major third (9:7, 435 cents) and the narrow tritone between the third and augmented sixth of this chord (112:81, 580 cents) make this chord particularly dissonant and demanding of resolution. Additionally, the double leading tone resolution of the tritone and minor sixth scale degrees to the dominant scale degree is particularly powerful in this case as the Ab moves down and interval of 27:28 (63 cents) while the tritone moves up an interval of 243:224 (140 cents). This justly-tuned version of the German augmented sixth chord provides an important structural and harmonic function in the work. Figure 10 shows the tuning, derivation, and function of all the different pitches used in *Ocean of Forms*.

				Function					
Pitch	Derivation	Cents	Hz	C	D	Eb	G	Ab	A
1:1	Unison	0	261.67	Tonic	m7	M6	P4	M3	m3
28:27	7:6 * 16:9	62.9	271.35	m2		m7		P4	
25:24	5:3 * 5:4	70.73	272.58						M3
135:128	9:8 * 15:8	92.2	275.98		LT		TT		
49:45	7:6 * 14:9 * 6:5	147.45	284.93			LT			
35:32	14:9 * 45:32	155.22	286.21					TT	
10:9	5:3 * 4:3	182.39	290.74						P4
9:8	3:2 * 3:2	203.91	294.38	M2	Tonic		P5		
7:6	7:4 * 4:3	266.92	305.29	m3	m2	Tonic	m6	P5	TT
98:81	14:9 * 14:9	329.87	316.59					m6	
5:4	Third	386.31	327.09	M3		m2	M6		P5
81:64	9:8 * 9:8	407.79	331.17		M2				
21:16	3:2 * 7:4	470.78	343.44		m3	M2	m7	M6	
4:3	P4	498.00	348.88	P4					m6
49:36	7:6 * 7:6	533.73	356.16			m3			
112:81	7:4 * 16:9 * 16:9	560.99	361.81	TT			LT	m7	
25:18	5:3 * 5:3	568.73	363.43						M6
45:32	9:8 * 5:4	590.29	367.99		M3				
35:24	14:9 * 15:8	653.15	381.60					LT	
40:27	5:3 * 16:9	680.47	387.66						m7
3:2	P5	701.96	392.51	P5	P4	M3	Tonic		
14:9	7:4 * 16:9	764.97	407.05	m6	TT	P4	m2	Tonic	
75:48	5:3 * 15:8	772.63	408.86						LT
392:243	7:6 * 112:81	827.91	422.13			TT			
49:30	14:9 * 7:4 * 6:5	849.35	427.39					m2	
5:3	4:3 * 5:4	884.39	436.13	M6					Tonic
27:16	9:8 * 3:2	905.87	441.57		P5		M2		
7:4	7th	968.83	457.92	m7	m6	P5	m3	M2	m2
49:27	7:6 * 14:9	1031.77	474.88			m6			
15:8	3:2 * 5:4	1088.27	490.63	M7	M6		M3	m3	M2

Figure 10: Tuning, derivation, and function of all pitches used in the work.

The overall key structure of the work is relatively simple. The harmonic rhythm is quite slow, with harmonic change occurring mostly at important formal divisions. Low-frequency drones throughout much of the work reinforce this static harmonic environment while also

maintaining the overall structural progression. The first song introduces the harmonic progression that controls the rest of the cycle. The second song functions as a stepwise connection to the third song, which is the mediant relation to the home key of the work. Through this mediant, the fourth song moves to the subdominant of this mediant, which is also the augmented sixth of the home key. This augmented sixth represents the furthest harmonic deviation from the structural tonic and functions as the climax of the work. This augmented sixth resolves to the dominant in the fifth song, which finally returns to the tonic.

Harmony in "Light" (Gitanjali 57)

The first song, "Light" (*Gitanjali* 57), begins in the tonic (C, 1:1). Several melodic devices help to establish not only the tonic but also its relation to other important pitches in the cycle. For example, the first words of the cycle, "Light, my light," are sung on an interval of G-Ab-G, establishing the importance of the septimal minor sixth and foreshadowing the focus on the German augmented sixth. This motion is answered by an arpeggio in the synthesizer at cue 1-02, the first three notes of which outline the tonic while the second group of three trace the fifths extending from the minimal third. This clearly outlines the harmonic tension inherent in the tonic scale structure.

The harmony modulates to the submediant (A, 5:3) at cue 1-05. This harmony is maintained until immediately prior to cue 1-15, where the lowered submediant (Ab, 14:9) becomes the new tonic. This harmony continues to cue 1-19 where a prominent F# is added to the tonic triad, creating the German augmented sixth. This augmented sixth harmony resolves to the dominant (G, 3:2) after cue 1-23. The song then ends in the dominant. Overall, this song emphasizes the augmented sixth to dominant resolution with a descending bass from C-A-Ab-G. Figure 11 provides a reduction of the harmonic motion in "Light."

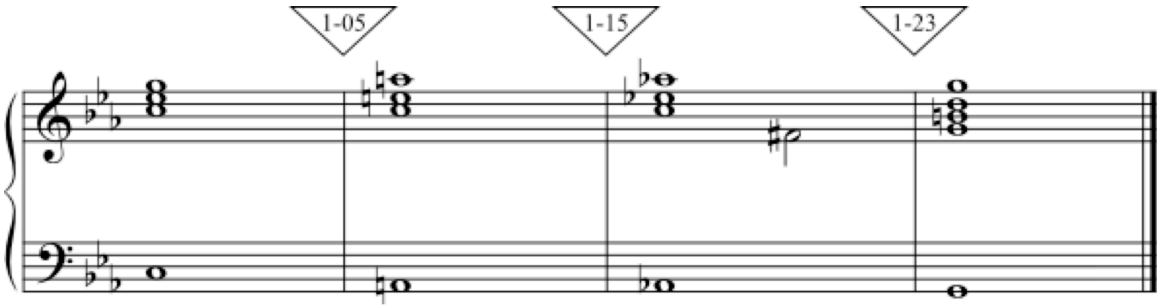


Figure 11: Harmonic reduction of "Light."

Harmony in "Threshold" (Gitanjali 95)

The second song begins centered on the dominant of the dominant (D, 9:8), evoking the string-of-fifths idea while also providing a stepwise melodic connection between the tonic of the first song and the mediant of the third. This song also employs a descending pattern to emphasize the resolution to the dominant. Figure 12 shows the bass motion and voice leading in this song. Starting in D, bass motion outlines a descent from D-C-B-A. This is harmonized as Dm-Am/C-Bm-Bm7/A-D7/A, with Am/C occurring at cue 2-05, Bm at 2-06, Bm7/A at 2-07, and D7/A at 2-08. Following the establishment of D7, a bichordal structure is introduced at cue 2-09 consisting of two dominant seventh chords separated by a tritone. This is accomplished by superimposing an Ab and Eb with the previously established D7. The F# and C of the D7 combine with the Ab and Eb, resulting in an Ab7 superimposed above a D7/A. This superimposition lasts until cue 2-11 where the D7/A changes to a Dm7 and the Ab and Eb pitches begin to decrescendo. This decrescendo has the effect of creating a resolution by subtracting elements, rather than through harmonic motion. The piece then ends as it began, in Dm.

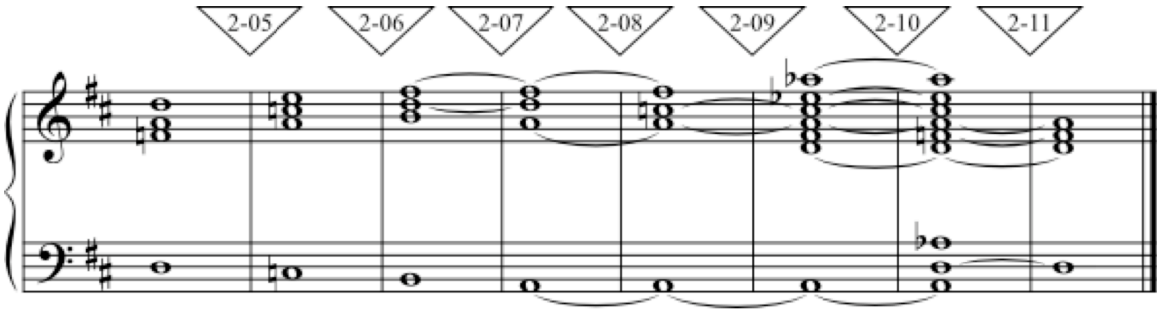


Figure 12: Voice leading and bass motion in "Threshold."

Harmony in "My Song" (The Crescent Moon 38)

This song begins with tonal focus on the minimal third (Eb, 7:6) relative to the original tonic. The scale built on this pitch again focuses on the minor mode built from the minimal third. A reduction is provided in figure 13. An enharmonic modulation to Cb minor (notated as B minor) occurs after cue 3-05. Beginning at cue 3-13, the tonal focus shifts from the Cb tonic to the supertonic chord on Db (spelled C#-E-G# in the score). After cue 3-17, a Bb drone appears under this chord, recontextualizing it into a Bb half diminished sonority. This chord remains the harmonic focus until cue 3-20, where the implied tonic returns to Eb.

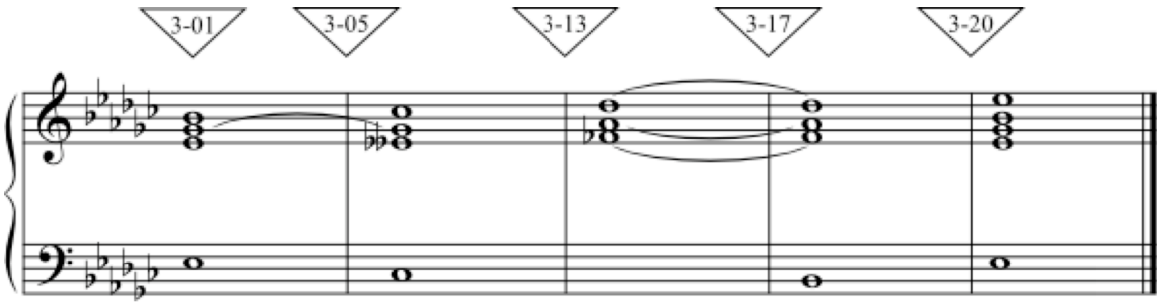


Figure 13: Harmonic reduction of "My Song."

Harmony in "Brink of Eternity" (Gitanjali 87)

This song functions as the climax of the work. From the beginning up to cue 4-08, the harmony consists of a single chord, built on the flat-sixth scale degree (Ab, 14:9) of the home

key. Harmony and rhythm are intertwined throughout this song, with single pitched pulses outlining the harmony and both glissing and accelerating with each new section. Harmonically, the controlling chord throughout this section is an extended version of same German augmented sixth chord that formed the climax of "Light" (*Gitanjali* 95), with the pitched pulses outlining an Ab7 #11 b13 chord. This arpeggiation is reduced in figure 14. Rhythmically, the pulses occur at prime number divisions of the basic pulse, creating a polyrhythmic layer of staggered pulses. This leads to an overall increase in both harmonic and temporal density, leading up to the climax at cue 4-08. Notably, the harmonic and rhythmic content are linked numerically. The pitch describing the appropriate harmonic partial occurs at the rhythmic division matching that partial number. This harmonic and temporal dissonance is resolved at cue 4-08, where the harmonic focus resolves to a G7 harmony and the rhythmic structure reverting to duple and triple subdivisions of the beat.

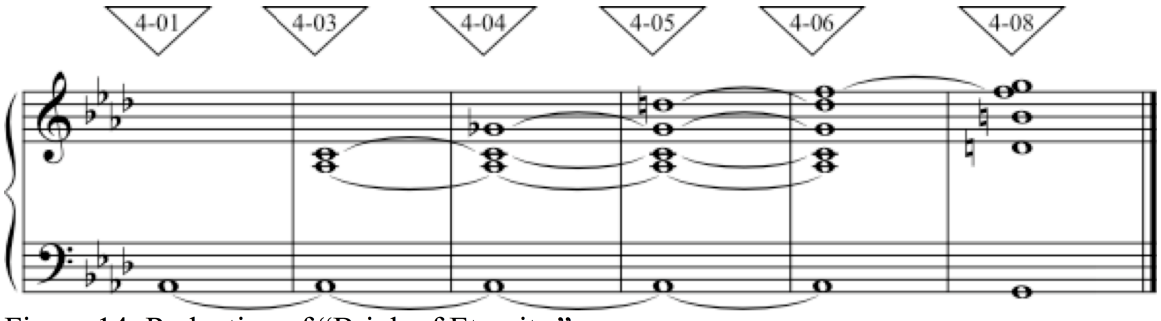


Figure 14: Reduction of "Brink of Eternity."

Harmony in "Ocean of Forms" (Gitanjali 100)

The fifth song functions as a coda for the entire work, and especially to the fourth song. "Brink of Eternity" (*Gitanjali* 87) ends abruptly, by setting up the expectation of a reverb tail without fulfilling that expectation. "Ocean of Forms" (*Gitanjali* 100) functions conceptually as the missing release to the preceding climax. This song begins where "Brink of Eternity"

(*Gitanjali* 87) left off harmonically, with a focus on G (3:2) as the tonic. Functioning much as an actual reverb tail, broad-band noise forms the background of this piece, being placed through moving filters in order to vary its spectral content. Synthesized chords and comb filtering provide a harmonic focus on G minor. At cue 5-07 a C is introduced on top of the G drone in the bass, obscuring the harmonic center and preparing the return to tonic. At cue 5-08, the G drone fades out, leaving only the C. This accomplishes the desired resolution in much the same manner as the return to tonic in "Threshold" (*Gitanjali* 95), where resolution is created by subtraction of dissonant elements, rather than by direct harmonic motion. This helps to maintain the concept of the fifth song as a coda and release of the tension created in the fourth song. The avoidance of harmonic motion blurs the distinctions between harmonic centers and fits with the textual themes present in the fifth song.

Overall, a large scale goal-directed harmonic structure is present throughout this work and controls the local harmonic, melodic material present in each song. However, the softer dissolution of dissonance in the fifth song provides an appropriate musical analog to the textual theme of the work. Resolution is undoubtedly present, but functions somewhat more as a dissolution rather than a goal-directed harmonic sequence. The use of just intonation provides a strong harmonic framework for this overall structure. Individual keys are shaded differently and function differently within this harmonic structure. In this way, the overall key structure maps different and distinct tonal characteristics to the local harmonic and melodic material in accordance with their attendant functional properties. Essentially, the local color and intonation of each song or section plays a definite structural and narrative role within the overall work. This sort of local variation with relation to an overall structure is a natural outgrowth of a pitch-centric intonation system such as just intonation.

Conclusion

Texted works present a special challenge for composers. While ambiguities and disagreements may exist over the precise meaning of a word or phrase, words are still significantly more concrete in their meaning than music. Likewise, while 'pure' music is abstract and ambiguous, certain sounds may create concrete associations. The challenge in crafting an effective texted work lies in navigating both the ambiguous and absolute aspects of words and sounds. *Ocean of Forms* represents a multifaceted solution to the issues raised by the melding of words and music.

Throughout *Ocean of Forms*, the clarity and diction of the text carefully informs the melodic style and text setting. The voice clearly delivers the text while also meaningfully highlighting and animating it. In this way, the production of vocal sounds is significantly and inherently tied to the symbolic meaning of the words they produce. Sounds articulate and reinforce the meaning of the words while at the same time the words clarify and express the meaning of sounds. The end result is a clear and unified expression that benefits from both the clarity of concrete ideas and the emotional impact of abstract concepts.

This melding of words and sound carries through *Ocean of Forms* at all formal levels. The musical structure dramatizes the narrative structure of the text. Musical pacing and growth serve to heighten and magnify the progression and development of the text. Functional structures and relationships in the music illustrate and embody primary thematic elements in the text, thereby intensifying the symbolic and affective content of both. While the words may function separate from the music, their combination provides a new expression that articulates their meaning and sensibility more completely than would be possible otherwise.

Lastly, *Ocean of Forms* uses the breadth of gestural and timbral variety offered by computerized sound production and manipulation. This variety allows for unparalleled

specificity and subtlety in combining words and sound. Associations between sound and concept exist on a spectrum between direct association and full abstraction. This subtlety helps to create an intricate web of meaningful connections between words and sounds.

The depth, breadth, and complexity created by these meaningful connections is the primary source of expression in *Ocean of Forms*. The universal and humanistic themes of life, love, existence, and death, as found in the poetry, are animated, dramatized, and articulated through sound. In this way, the verbal, logical, and objective understanding of the text is coupled to the emotional, symbolic, and subjective experience of sound. Through the careful combination of poetry and music, both the verbal and emotional aspects of the primary concepts are expressed simultaneously, reinforcing and complementing each other in a symbiotic manner. This yields a novel expression in which understanding and feeling are experienced mutually, creating a powerful and impactful experience in which text and sound are greater in their combination than either alone. It is this creation of a whole which is greater and more meaningful than the sum of its parts that provides the primary creative impetus for *Ocean of Forms*.

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PART II

SCORE

Ocean of Forms

for Voice and Computer

L. Scott Price

On texts by

Rabindranath Tagore

Notes for Performance

Ocean of Forms is written entirely in extended seven-limit just intonation. The vocalist must familiarize herself with this intonation system in order to accurately perform the work. Each just intonation scale used in this work consists of twelve unequally spaced pitches that are approximated with traditional notation. Key signatures are used to show tonal function and the predominant mode. Six twelve-note scales are used throughout the piece, with tonics starting on C, D, Eb, G, Ab and A.

The initial key starts in C (minor), the tonic of which should be exactly the same as on an equal temperament, standard tuning (A=440) piano. This pitch remains constant throughout the entire work; all other pitches are defined in relationship to this pitch. This will give the note middle C a frequency of 261.63 Hz. A change in key signature does not necessarily indicate a change of tuning. Some key changes do occur simultaneously with tuning changes, but a key signature change may be used to simplify spelling and indicate a change in tonal focus within the current tuning system. Changes in the current tuning system are indicated in bold underline and show the new tonic as it relates to the initial C tonic in both note name and harmonic ratio. For example, the second song begins with its tonic a Pythagorean second above C and is indicated with "TONIC = D (9:8)." The exact tuning of each scale used throughout the piece is given below. All pitches in both vocal and computer part conform to the following charts. Rehearsal software is provided that will allow the vocalist to play her part in the proper tuning using a basic MIDI keyboard. It is strongly encouraged that the piece be initially learned in just intonation using this software and not learned in equal temperament with the intention of adjusting to the just tuning later.

	Equivalent Keyboard Pitch											
Tonic	C	C#/Db	D	D#/Eb	E	F	F#/Gb	G	G#/Ab	A	A#/Bb	B
C	1:1	28:27	9:8	7:6	5:4	4:3	112:81	3:2	14:9	5:3	7:4	15:8
D	1:1	135:128	9/8	7:6	81:64	21:16	45:32	3:2	14:9	27:16	7:4	15:8
Eb	1:1	28:27	49:45	7:6	5:4	21:16	49:36	3:2	14:9	392:243	7:4	49:27
G	1:1	135:128	9:8	7:6	5:4	21:16	112:81	3:2	14:9	27:16	7:4	15:8
Ab	1:1	28:27	35:32	7:6	98:81	21:16	112:81	35:24	14:9	49:30	7:4	15:8
A	1:1	25:24	10:9	7:6	5:4	4:3	25:18	40:27	25:16	5:3	7:4	15:8

	Chromatic Scale Degrees (relative to tonic)											
Tonic	1	2	3	4	5	6	7	8	9	10	11	12
C (1:1)	1:1	28:27	9:8	7:6	5:4	4:3	112:81	3:2	14:9	5:3	7:4	15:8
D (9:8)	1:1	28:27	9:8	7:6	5:4	4:3	112:81	3:2	14:9	5:3	16:9	15:8
Eb (7:6)	1:1	15:14	63:56	7:6	9:7	4:3	112:81	3:2	14:9	12:7	16:9	196:105
G (3:2)	1:1	28:27	9:8	7:6	5:4	4:3	45:32	3:2	14:9	5:3	7:4	448:243
Ab (14:9)	1:1	21:20	9:8	135:112	9:7	4:3	45:32	3:2	14:9	27:16	16:9	15:8
A (5:3)	1:1	21:20	9:8	6:5	5:4	4:3	7:5	3:2	8:5	5:3	16:9	15:8

The computer part for Ocean of Forms must be advanced at each cue during performance. Each cue is marked in the score with a downward pointing triangle enclosing the cue number. This may be accomplished by a technical assistant sitting at the computer or by the vocalist using a MIDI footpedal or hand-held switch. This choice is left to the performer and may vary depending on the comfort level of the performer and availability of the necessary technology.

Full Score

I. Light

Gitanjali 57

L. Scott Price
Rabindranath Tagore

1-01 1-02 1-03

TONIC = C (1:1)

Broadly, in anticipation

Voice *f* *mf*

Light, my light,

Recorded Voice Sustained Text *mp*

Light,

Acousmatic

Synth String-like Timbre *f* *mf*

Bass *f*

1-04

Vox *p* *f* *p*

the world - - - - - - fill - ing light,

Rec. Vox.

Grain Granulated Voice *mp*

Syn. *p* *f*

B.

Vox
Rec. Vox.
Acous.
Grain
Syn.
B.

p *mf*

1-05

the eye - - - - - - kiss - ing light,

TONIC = A (5:3)

n

3 3 3

mf *mp* 3

mf

1-06

heart - - - - sweet - - - en - ing light!

p *f* *p*

Ah,

1-07

Lightly, playfully

mf

Vox

the light

1-08

dan - - - - - - - - - - - ces,

Acous.

Grain

Algorithmically Determined Arpeggios

Syn.

mf

B.

1-09

whispered, distant

Vox

my dar - - - - ling,

1-10

mf

at the cen - ter of my life;

1-11

Acous.

Grain

Syn.

B.

1-12

1-13

fp *mf*

Vox

Acous.

Grain

Syn.

B.

the light strikes, my dar - ling,

1-14

mp *f*

the chords of my love;

Algorithmically Determined Melody

n *cresc…* *…* ***mf***

1-15

Increasingly excited

1-16

TONIC = A♭ (14:9)

Vox

Syn.

B.

p

mf

Algorithmically Determined Melody & Arpeggios

the sky o - pens,

p cresc…

mf

the wind runs wild,

1-17

f

Vox

laugh - - - - - ter pass - - - es o - ver the earth.

Acous.

Syn.

B.

Wistful, longingly

p

Vox

The but - - - - - ter - flies spread their sails on the sea of light.

Acous.

Syn.

f

B.

1-18

Vox

Lil - ies and jas - mines surge up on the crest of the waves of light.

1-19

CF

n cresc…

… mf

Acous.

Grain

Granulated Voice

mf

B.

1-20

whispered, distant

1-21

Broadly, confident

mf

Vox

The light is shat - tered in - to gold on ev' - ry cloud,

CF

Acous.

Grain

B.

1-22

whispered, distant

1-23

mf

Vox

my dar - - - ling, and it scat - ters gems in pro - - - fu - sion.

CF

Acous.

Grain

B.

Exuberant, joyful

TONIC = G (3:2)

f

Vox

Mirth spreads from leaf to leaf,

Acous.

Algorithmically Determined Arpeggios

Syn.

f

B.

f

1-24

1-25

f

Vox

my dar - ling, and glad - - - ness with - - - out meas - ure.

Acous.

Syn.

B.

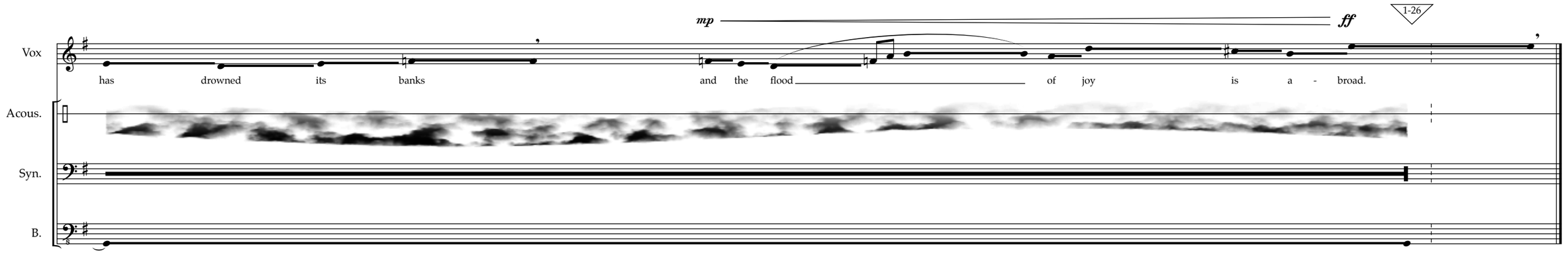
Vox

The heav - - - - - - - - - - - - - en's riv - - - - - - - - - - er

Acous.

Syn.

B.


mp
ff
1-26
Vox
has drowned its banks and the flood of joy is a - broad.
Acous.
Syn.
B.

II. Threshold

Gitanjali 95

2-01

TONIC = D (9:8)

2-02

Mysterious, searchingly

2-03

Vox

Grain

Syn.

p

I was not a - ware of the mo - - - ment

Granulated Vowel Sounds

Accompaniment Pattern Continues Throughout

Vox

Grain

Syn.

when I first crossed the thresh - - - - - old of this life.

2-04

2-05

Vox

Grain

Syn.

What was the pow - - - - - - - - er

Vox
that made me o - - - - pen out in - to this vast

Grain

Syn.

Vox
mys - - - ter - y like a bud in the fo - - - - rest at mid - - - - - - - - night!

Grain

Syn.

2-06

Broad, assertive

Vox
When in the morn - ing I looked u - pon the light

Grain

Syn.

Vox
I felt in a mo - - - - ment that I was no stran - - - - ger in this world,

Grain

Syn.

2-07

Vox

that the in - scru - - - - - - ta - ble with - - - out name and form

Grain

Syn.

Vox

had tak - - - - - - - - - - en me in its arms

Grain

Syn.

2-08

Vox

in the form of my own moth - - - - - - - - er.

Grain

Syn.

2-09

Vox

Grain

Syn.

Reflective, introspective

Vox

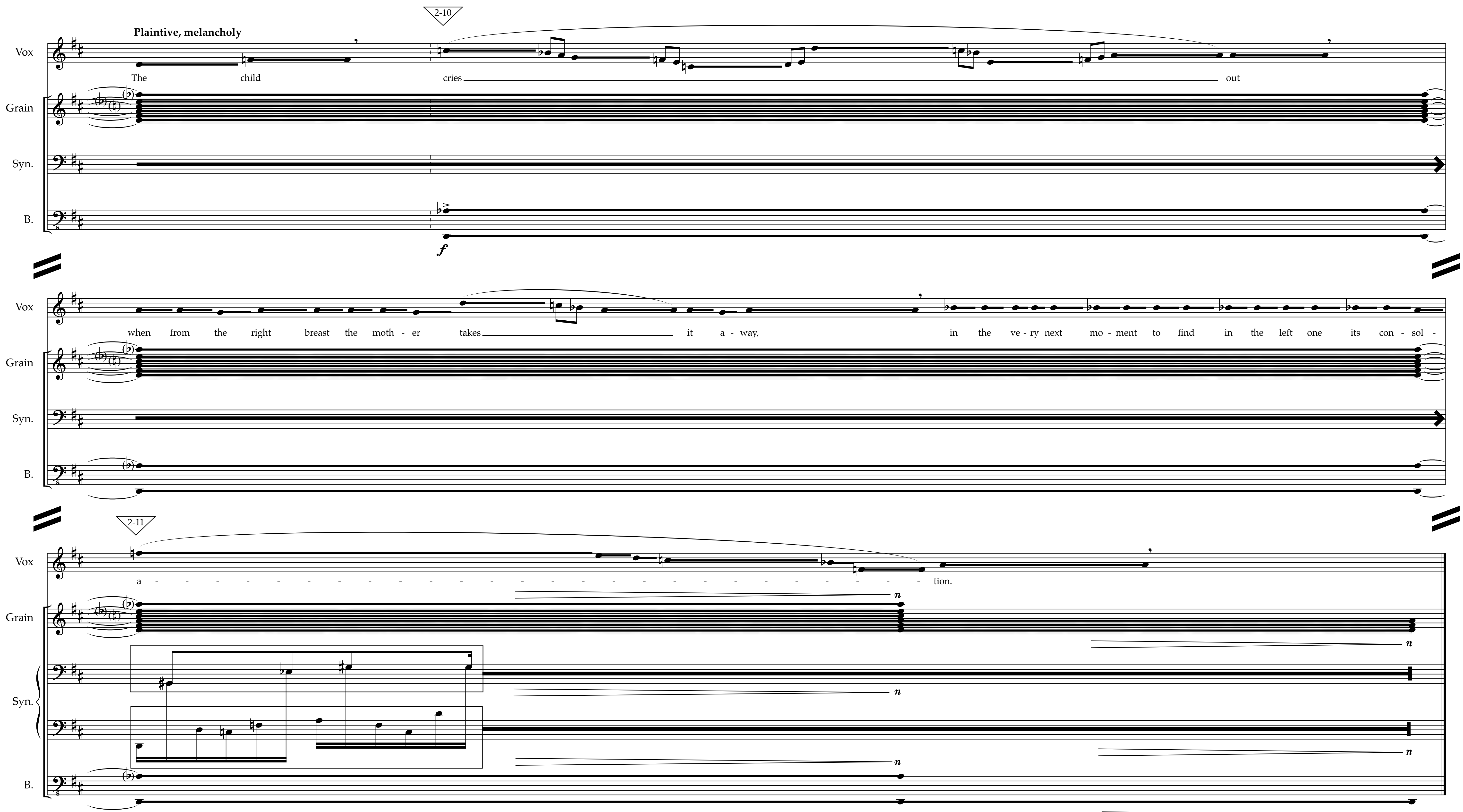
Grain

Syn.

E - ven so, in death the same un - - - known will app - ear

as e - ver known to me. And be - cause I love this life,

I know I shall love death as well.


Plaintive, melancholy
2-10
Vox
The child cries out
Grain
Syn.
B.
f
Vox
when from the right breast the moth - er takes it a - way,
in the ve - ry next mo - ment to find in the left one its con - sol -
Grain
Syn.
B.
2-11
Vox
a - tion.
n
Grain
n
Syn.
n
n
B.
n
n

III. My Song

The Crescent Moon 38

3-01

TONIC = E♭ (7:6)

Warm, inviting

Vox

f *mp*

This song of mine

Acous.

Metallic Ringing Timbre

3-02

p cresc… …*f*

Vox

will wind its mu - - - sic a - - - - - round you,

Acous.

3-03 3-04 3-05

mf decresc… …*p*

Vox

my child, like the fond arms of love.

Acous.

mf *f* *mp* *p*

Vox

This song of mine will

Sustained String/Organ Timbre

Syn.

n *mp*

3-06

3-07

Vox

mp

touch your fore - head like a kiss of bless - ing.

Acous.

mp

Syn.

Direct, assertive

p cresc…

…f

mp

Vox

When you are a - lone it will sit by your side

Syn.

3-08

3-09

mp cresc…

…f

Vox

and whis - per in your ear, when you are in the crowd

Acous.

Syn.

3-10

3-11

G.P.

Vox

mf *mp*

it will fence you a - bout with a - loof - ness.

Rec. Vox.

p *n*

Ah,

Syn.

n *p* *n*

B.

mp *n*

Vox

Acous.

Wistful, longingly yet distant

3-12

mf *mp* *f* *mf* *f*

Vox

My song will be like a pair of wings

Acous.

3-13

Introspective

mf

Vox

to your dreams, it will trans - - - port your heart

CF

n *cresc…*

Acous.

3-14

mp

f

3-15

Vox

to the verge of the un - known.

CF

*…**f** decresc…*

Acous.

Vox

CF

*… **n***

n *cresc…*

Acous.

Calm, assuringly

Vox

It will be like the faith - - - - - ful star o - - - ver - head

CF

Acous.

3-16

Vox

when dark night is o - - - - ver your road.

CF

Acous.

Syn.

Bright, Buzzy Timbre

n *cresc…*

3-17

Broadly, confident

Vox

CF

Acous.

Syn.

B.

mf *f*

My song

n *mf* *n*

ff *mp*

mf

will sit in the pu - pils of your eyes, and will car - ry your sight in - to the heart of things.

3-18

Urgent, agitated

Vox

p cresc…

And when my voice is si - - - - - lent

CF

p cresc…

Acous.

Full, Warm Timbre

Syn.

p cresc…

B.

cresc…

3-19

Vox

…ff

in death,

CF

…ff

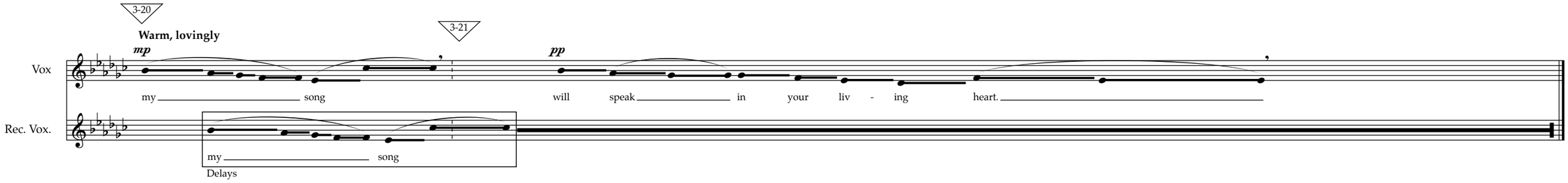
Acous.

Syn.

…ff

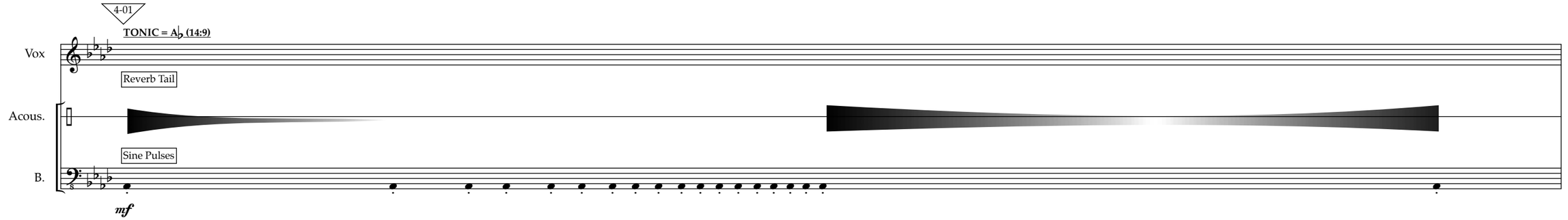
B.

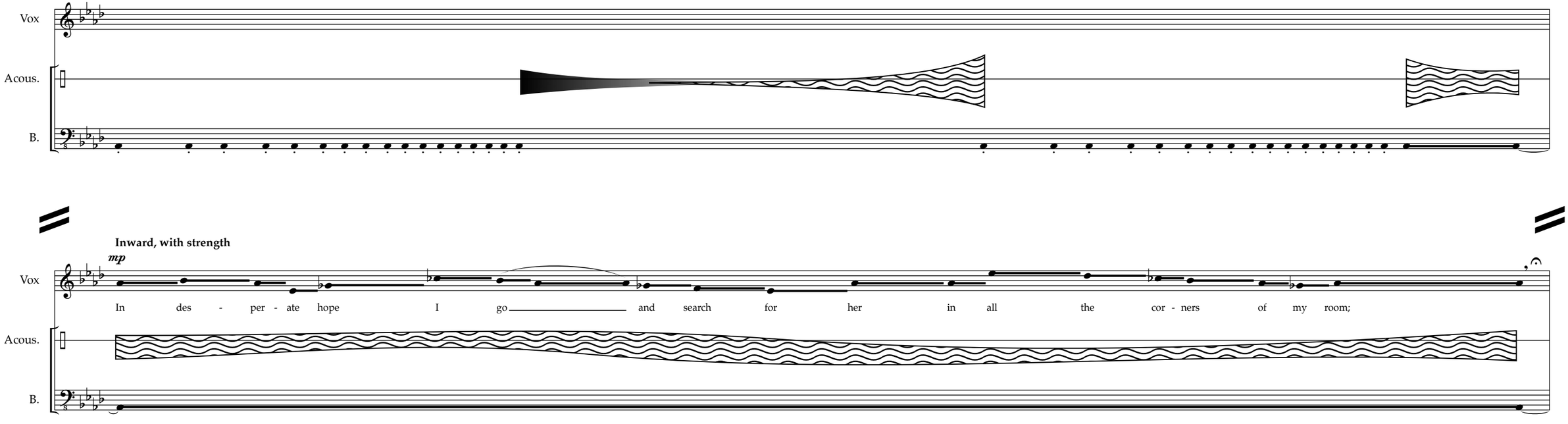
…ff


3-20
Warm, lovingly
mp
3-21
pp
Vox
my song will speak in your liv - ing heart.
Rec. Vox.
my song
Delays

IV. Brink of Eternity

Gitanjali 87





4-02

Plaintive, consolingly

4-03

Vox

I find her not.

Acous.

Syn.

mf

B.

Vox

Acous.

B.

Vox

Acous.

B.

Vox

Acous.

Sine Pulses

Syn.

Accel & Gliss

5

B.

Direct, increasingly strong and agitated

mf

Vox

My house is small and what once has gone from it can ne - ver be re - gained.

Acous.

Syn.

B.

4-04

mp *f*

Vox

But in - - - - - - - - - - - - - - - - - - fin - ite

Acous.

Syn.

Accel & Gliss

7

B.

Vox

Acous.

Syn.

B.

mp

is thy man - - - sion, my lord,

mp

and seek - ing her I have to come to thy door.

4-05

Accel & Gliss

11

mf cresc…

…f

I stand un - der the gold - - - - - en can - o - py of thine eve' - - - ning sky

Vox

Acous.

Syn.

B.

p *f* *p*

and I lift my ea - ger eyes to thy face.

4-06

mf

I have come to the brink

Accel & Gliss

13

f

of e - ter - - - - - - - - - - - - ni - ty from which no - - - - - - - - - - -

Vox

- - thing can van - - - - - - - ish

p

no hope,

Acous.

Syn.

B.

mf

Vox

no happ - - - - - - - - - - i - ness,

f

no vi - sion of a face

Acous.

Syn.

B.

4-07

Vox

seen through tears.

Acous.

Syn.

B.

4-08 **TONIC = G (3:2)**

Exuberant, strong, joyful

ff *sempre*

Vox

Oh,

Oh,

Acous.

Syn.

B.

Vox

Oh,

dip

my

emp - - - tied

Acous.

Syn.

B.

Vox

life

in - - - to

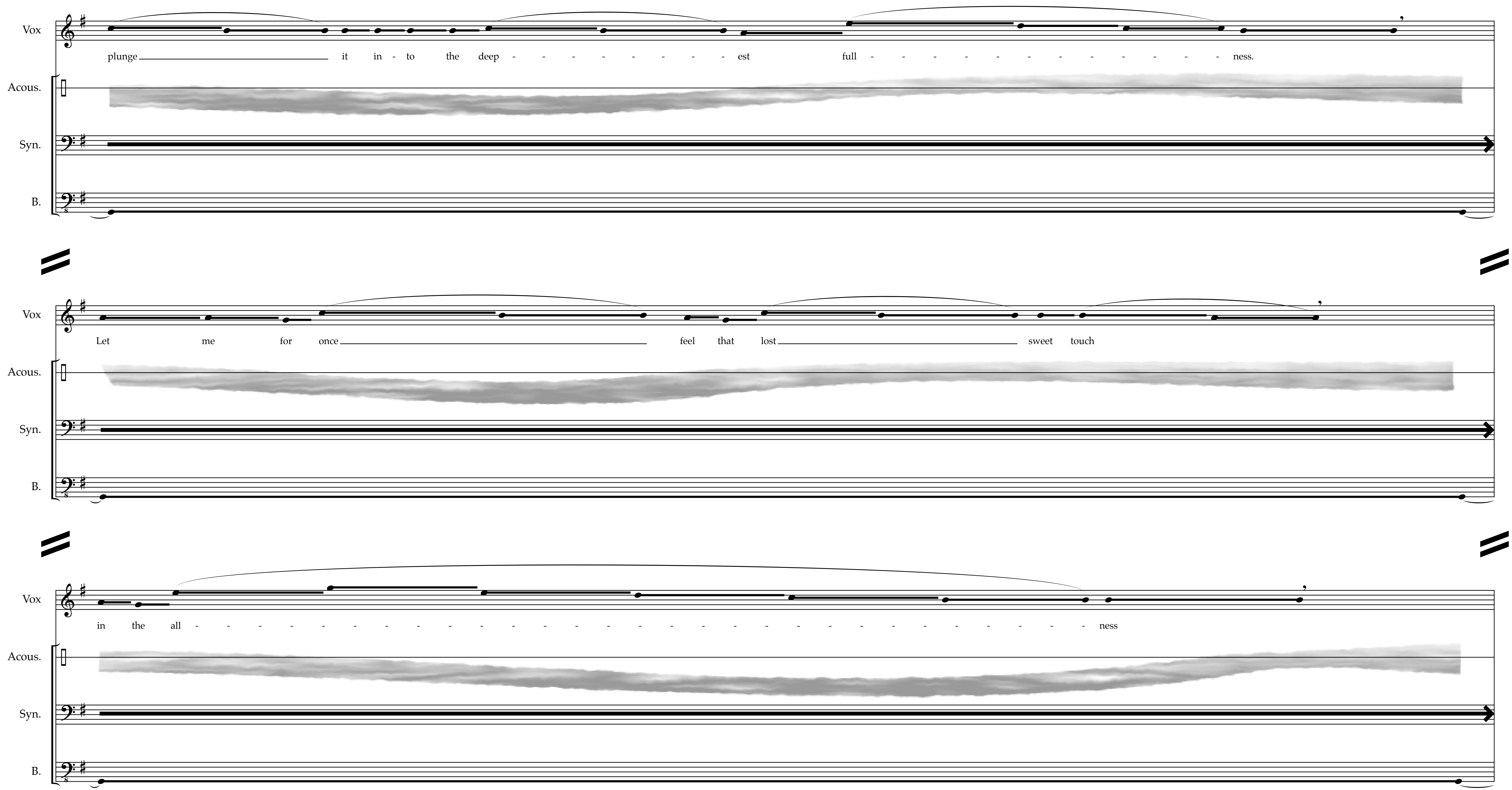
that

o - - - - - - - - - - - cean,

Acous.

Syn.

B.


Vox
plunge it in - to the deep - - - - - - - - est full - - - - - - - - - - - - ness.
Acous.
Syn.
B.
Vox
Let me for once feel that lost sweet touch
Acous.
Syn.
B.
Vox
in the all - ness
Acous.
Syn.
B.

4-09

Vox

of the u - - - - - - - - ni - - - - - - - - - verse.

Acous.

Syn.

B.

Vox

Acous.

Syn.

B.

Vox

Acous.

Syn.

B.

V. Ocean of Forms

Gitanjali 100

5-01

TONIC = G (3:2)

Vox

Acous.

Syn.

B.

Clear, Crystalline Timbre

f

p

Calm, with a sense of inevitability

mf

I dive down

5-02

in - - - - to the depth of the o - cean of forms,

Vox

hop - - - ing to gain the per - fect pearl of the form - - - - -

Acous.

Syn.

B.

5-03

Vox

- - - - - - - - - - - - - less.

Rec. Vox.

mp

Ah,

Acous.

Syn.

Harmonic Pulses

B.

Moving, agitated

Vox

No more sail - - - - - - ing from har - - - - - bor to har - - - - bor

Acous.

B.

5-04

Vox

with this my weath - - - - er - - - - beat - - - - en boat.

Acous.

B.

Calm, plainly

Vox

The days are long passed when my sport was to be tossed on waves.

Acous.

B.

5-05

Vox

Acous.

Syn.

B.

Vox

Acous.

Syn.

B.

Vox

Acous.

Syn.

B.

Inward, calm, direct

Vox

And now I am ea - - - ger to die

Acous.

B.

5-06

Vox

in - - - - to the death - - - - - - - - - - - - - less.

Acous.

B.

5-07

Vox

Rec. Vox.

Granulated Voice

cresc…

Ah,

Acous.

Syn.

n *cresc…*

B.

Vox

Rec. Vox.

…f

Acous.

Syn.

…f

n

B.

Vox

Rec. Vox.

decresc…

*… **n***

Acous.

Syn.

n

n

B.

Broad, plaintive yet reassuring

Vox

In - to the aud - i - ence hall by the fath - - - - - - - - - - om - less a - - - byss

Acous.

B.

Vox

where swells up the mu - - - sic of tone - less strings

Acous.

B.

Vox

I shall take this harp

Acous.

B.

5-08

Vox

of my life.

Acous.

non decresc.

B.

decresc…

*… **n***

TONIC = C (1:1)

Vox

I shall tune it to the notes of for - ev - - - - - - - - - er,

Acous.

B.

Vox

and when it has sobbed

Acous.

B.

Vox

Acous.

B.

out its last utt - er - ance, lay down

Vox

Acous.

B.

my si - - - - - - - - - - - - - lent harp at the

Vox

Acous.

B.

5-09

feet of the si - - - - - - lent.