

Erebus

for Saxophone Quartet and Computer

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*Submitted in Partial Fulfillment of the Requirements for the
Doctoral Degree in Music Composition.*

Circa Twenty Three Minutes

Preface

Erebus is divided into four movements, each of which is based around the symmetric pitch collection [D, Eb, F#, G, A, Bb, C#, D], its transpositions, and its component trichords and tetrachords (and their respective transpositions). This pitch structure is then combined with an independent computer voice based on sonic clouds – abstract formations of sounds created using probability formulas as a method of determining a number of simultaneous events within a given span of time (see Xenakis’ *Formalized Music*, Chapters 1 and 13) – to create an aggregate of order and chaos represented by the quartet and the computer, respectively. Over the course of the work, this dichotomy gradually resolves itself into a duet of equal forces, with a formal climax in the chorale of the final movement, when the two separate entities resolve into one.

The individual movements generally follow a ternary structure, with the addition of introductions and codas. The exception to the rule is the third movement, *Ghost Winds*, which is rhapsodic. This decision was based on my previous experimentations with formless music, none of which produced any satisfying results. The choice of ternary form is not based on tonal centers, but on the relative speed, density, and rhythmic similarities of the sections within the movements.

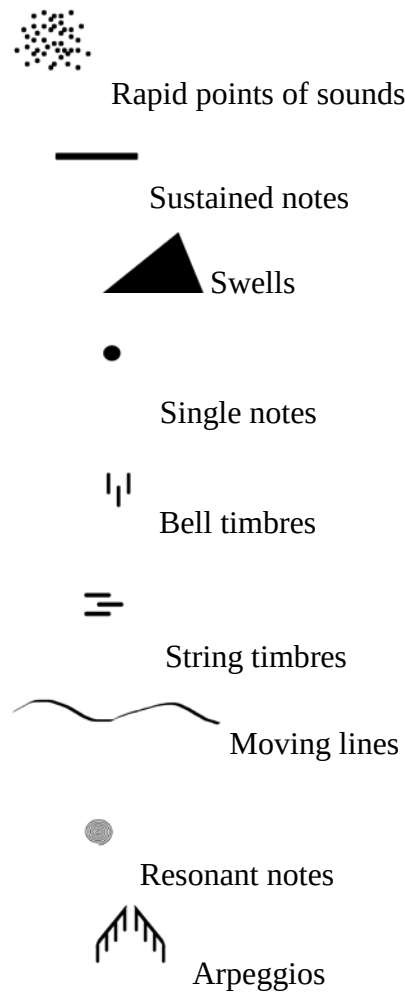
The computer part was created using a combination of Reason 4.0.1, Pro Tools LE8.0cs2, and Pure Data Extended 0.40.3. To perform the piece, the latest version of Pure Data or Pure Data Extended is required. They can be found at <http://crca.ucsd.edu/~msp/software.html> or <http://puredata.info/downloads> respectively. The latency settings will need to be adjusted to suit the computer and avoid static. As a general rule, Windows users should use ASIO drivers, MAC users should use the CORE Audio drivers, and Linux users should use their own customized JACK settings using either ALSA or OSS drivers.

Additionally, a keyboard foot pedal, while not strictly necessary, is highly recommended to cue the computer parts. As they are not widely available, a fifth person can be used to manually cue the computer using the zero key (ASCII code 48) on either the numeric pad, or the keyboard. However, if you would like to create your own pedal, a tutorial is available on the Cycling ‘74 website at <http://www.cycling74.com/story/2007/10/16/1252/3782>. Pedals can also be purchased from the composer for a nominal fee.

Finally, two speakers and a mixer are required for the performance. The speakers should be placed on either side of the stage, roughly at the same height as the performers.

Notation

In writing *Erebus*, and through consultations with Jeff Loeffert and Ricardo Lorenz in order to determine the best manner to represent aspects of the computer part, I have come to the conclusion that a literal rendition of the computer is neither possible, nor necessary. As such, I have created a graphical representation of only the most audibly prominent portion of the computer part using the following symbols.



The pedal cue line is intended to be performed by the Alto 1 performer. However, if that is impractical, a fifth person can be used to cue the computer. A pedal is not strictly necessary as the zero key on either the numeric pad, or on the keyboard, can be used to trigger the cues.

Additionally, as the decision was made to play from scores due to the complexity of the piece, all multiphonic fingerings have been removed in favor of “K” numbers. These correspond to the multiphonic fingerings in Daniel Kientzy’s *Les Sons Multiples aux Saxophones*. The number next to the K in the score indicates which fingering diagram should be used for a particular saxophone, so that **K51** in an alto saxophone would indicate alto diagram 51 in the Kientzy book. The fingerings are also included (with K numbers) in Appendix 1.

Appendix 1

Saxophone Multiphonic Chart

	Multiphonic	Fingering	Multiphonic	Fingering	Multiphonic	Fingering	Multiphonic	Fingering	Multiphonic	Fingering	Multiphonic	Fingering
Alto Sax.	K 14	1 2 3 Bb 4 5 Ta 7	K 16	1 C2 2 3 Bb 4 5 7	K 45	1 2 3 B 4 5 Tf 6	K 51	1 2 3 B 4 6 Tc 7	K 57	2 3 B 4 5 6	K 79	1 2 3 C# 4 6 C3 7
Tenor Sax.	K 86	1 2 3 B 4 Tf 5 C5	K 13	1 2 3 Bb 4 C5 6 7 Tf	K 15	1 2 3 Bb 5 Tc 6 7	K 43	1 2 3 Bb 4 C3 5 C5 6 7	K 72	1 2 3 B 4 5 6	K 56	1 C1 2 3 Bb
Baritone Sax.	K 23	1 2 3 A 5 C3 6	K 8	1 2 3 Bb 4 5 7	K 24	1 3 A 4 C3 5 6	K 7	1 2 3 Bb 4 5 6	K 49	2 3 B 5 6 (Eb) 7	K 28	1 2 A 4 C3 5 7

Due to the fact that many multiphonics are rather temperamental and can be impossible to play depending on the equipment used, it is also possible to substitute any of the notated multiphonics with the following fingering in order to achieve the timbral effect desired.

- 1
- 2
- 3
- 5
- 6
- 7

Appendix 2

Footnotes

Footnotes are indicated in the score at the first instance of a technique that needs additional explanation. All similar instances should be performed in the same manner.

‡1: All glissandi should be performed vocally (through oral cavity and embouchure changing), as much as possible. Where they cannot be performed vocally, they should be performed as chromatic, fingered glissandi.

‡2: When “sing” is indicated over notes with a long duration, vocalize as close to the written pitch as possible. When the notes indicated with “sing” are short, sing a constant pitch while playing the indicated notes.

‡3: Start with a straight tone, then gradually transition to flutter tongue.

‡4: Use a very slight vibrato, except when playing solo lines.

‡5: Begin this glissando immediately, performing it as smoothly as you possibly can.

‡6: Begin subtone, gradually meld to regular tone by the time you reach measure 192.

Program Notes

In Greek mythology, Khaos was the primordial state of existence from which the gods emerged. The first born of these was Erebus, the embodiment of the primordial shadow from which order was eventually born. Over the course of time, Erebus began to be seen as a sort of antechamber to Hades rather than a deity, eventually becoming a synonym for the land of the dead. Within this work, I have attempted to create this idea in sound over the course of the four movements, highlighting various aspects of the evolution of this mythology.

Insect Noises begins with the computer relegated to a supporting role as a drone, symbolizing the essential nothingness of the primordial state. Over this, the saxophones take on the dominant role, creating chaotic and distorted sounds interspersed with solo lines and a brief chorale in measure 50. The saxophones then continue in a slightly less distorted manner, employing a greater number of multiphonics before a brief coda that recalls the amorphous introduction.

Wasteland reverses the roles of the quartet and the computer from the previous movement. Now the dominant voice, the computer moves from a desolate cloud of sound into a pointed, if arrhythmic, sequence of plucked string timbres created from a synthesis of guitar, mandolin, banjo, and koto. As the movement continues, this section grows to a point before tapering off into a large-scale formal decay, ending with a return to the opening sections formless expansion, and concluding with a figure of repeated vocal sounds.

Ghost Winds is a slow rhapsody for both the computer and the saxophones, creating a *pas de deux* that briefly flirts with synchronicity through the ascending lines of grace notes that meld around the instrumental lines. As the movement progresses, the individual saxophones gradually begin to emulate the computer, creating an ever increasing amount of complex counterpoint.

Electric Night concludes the work by bringing the computer and the quartet into true synchronization, symbolizing the emergence of order from chaos. The computer and quartet gradually become more and more similar, culminating in the central chorale, before a recapitulation of the “blazing” tempo used in the beginning. In this final section the quartet and the computer continue to play off of the other’s part, ending the piece in a massive crescendo of rapid notes and multiphonics.

-Benjamin R. Fuhrman
April 1, 2009.

Q. What happens when you stare into the void?

A. The void stares back

Q. Anything else?

A. If you look hard enough, you may see yourself in it.

To the H₂ Quartet, Ricardo Lorenz, and Mark Sullivan.

Erebus

I - Insect Noises

Senza Misura

Misurato - Dark, violent ♩ = 126

‡1: All glissandi should be performed vocally (through oral cavity and embouchure changing), as much as possible. Where they cannot be performed vocally, they should be performed as chromatic, fingered glissandi.

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[illegible]

‡3: Start with a straight tone, then gradually transition to flutter tongue.

16 Growl

A. Sx. 1

A. Sx. 2

T. Sx.

B. Sx.

Comp.

16

3

K51

ff

5

K51

ff

5

K72

ff

5

K45

sfz

3

3

3

mf

[illegible]

32

A. Sx. 1

A. Sx. 2

T. Sx.

B. Sx.

Comp.

32

K45

K51

K79

5

ff

sfz

fff

mf

mp

Sing

[illegible]

[illegible]

This musical score is for the piece "The Ninth" by John Adams. It features four staves: A. Sx. 1 (Alto Saxophone 1), T. Sx. (Tenor Saxophone), B. Sx. (Baritone Saxophone), and Comp. (Composers). The score is marked with a large "9" in a box, indicating the Ninth movement. The key signature is one flat (B-flat major or D minor). The time signature is 4/4. The score includes various musical notations such as notes, rests, and dynamic markings like *ff* (fortissimo) and *f* (forte). There are also performance instructions like "Sing" and "ffz" (fortissimo zingando). The score is divided into measures, with some measures containing multiple notes and rests. The score is written in a standard musical notation style with a treble clef for the saxophones and a bass clef for the baritone saxophone. The score is marked with a large "9" in a box, indicating the Ninth movement. The key signature is one flat (B-flat major or D minor). The time signature is 4/4. The score includes various musical notations such as notes, rests, and dynamic markings like *ff* (fortissimo) and *f* (forte). There are also performance instructions like "Sing" and "ffz" (fortissimo zingando). The score is divided into measures, with some measures containing multiple notes and rests. The score is written in a standard musical notation style with a treble clef for the saxophones and a bass clef for the baritone saxophone.

The musical score for "The Song of the Shrike" by Charles Ives is presented for Soprano (Sx.), Contrapiano (Comp.), and Piano (P.). The score is written in 4/4 time and features a key signature of one sharp (F#). The tempo is marked "Allegretto".

The score is divided into measures, with some measures containing multiple staves for different instruments. The Soprano part (Sx.) is written in a single staff, while the Contrapiano (Comp.) and Piano (P.) parts are written in multiple staves. The Piano part includes various dynamic markings, including *ff*, *f*, and *sfz*, and features complex rhythmic patterns, including triplets and sixteenth notes. The Contrapiano part is marked with a thick black line, indicating it is to be played very softly.

The score includes several measures with multiple staves for different instruments, including measures with triplets and sixteenth notes. The Soprano part (Sx.) is written in a single staff, while the Contrapiano (Comp.) and Piano (P.) parts are written in multiple staves. The Piano part includes various dynamic markings, including *ff*, *f*, and *sfz*, and features complex rhythmic patterns, including triplets and sixteenth notes. The Contrapiano part is marked with a thick black line, indicating it is to be played very softly.

II - Wasteland

Out of time, no vibrato throughout

①

Pedal Cues

Alto Sax. 1

Alto Sax. 2

Tenor Sax.

Baritone Sax.

Computer

6"

mp

6"

mp

mp

mp

6"

mp

Hold the assigned note throughout the entire movement, staggering or circular breathing as necessary.

5'00"

The computer plays for five minutes while the saxophones continue to hold their notes. Over the course of the movement, numerous timbres move in and out of focus through the left and right channels. In addition to sustained tones, swells and gradual accumulations of pitches, plucked strings, bells, and vocal inhalations/exhalations are also heard. The computer part ends with a set of unaccompanied vocal inhalations/exhalations.

6"

mp

mp

mp

mp

III - Ghost Winds

Languid, subdued ♩ = 60

Pedal Cues

Alto Sax. 1

Alto Sax. 2

Tenor Sax.

Baritone Sax.

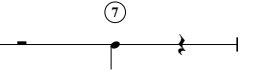
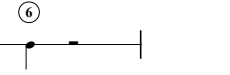
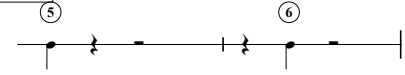
Computer

1 3 4

‡4: Use a very slight vibrato throughout, except when playing solo lines

‡1: All glissandi should be performed vocally (through oral cavity and embouchure changing), as much as possible. Where they cannot be performed vocally, they should be performed as chromatic, fingered glissandi.

2 III - Ghost Winds

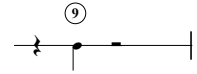
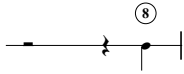


A. Sx. 2

T. Sx.

Comp.

Score for A. Sx. 2, T. Sx., and Comp. measures 14-19. The woodwinds play melodic lines with various dynamics (pp, mf, f). The computer part features a series of horizontal bars and a wavy line.



3

B. Sx.

Comp.

Score for B. Sx. and Comp. measures 23-29. The woodwinds play melodic lines with various dynamics (mf, mp, f, ff, p, pp). The computer part features a series of horizontal bars and a wavy line.

Comp.

[illegible]

This musical score is for the film 'The Great Wall' by John Williams. It features a string quartet (A. Sx. 1, A. Sx. 2, T. Sx., B. Sx.) and a computer-generated sound effect (Comp.). The score is divided into two systems, 8 and 9. System 8 starts at measure 69 and ends at measure 74. System 9 starts at measure 75 and ends at measure 80. The string parts are written in treble and bass staves. The computer part is represented by a series of dots and lines, indicating a rhythmic pattern. The score includes dynamic markings such as *mp* (mezzo-piano), *mf* (mezzo-forte), *f* (forte), and *p* (piano). The tempo is marked 'Allegretto'.

This musical score is for the 'The Wind' movement from Gustav Mahler's Symphony No. 2. It features five staves: Pedal, A. Sax. 1, A. Sax. 2, T. Sax., and B. Sax., and a bottom section for Compositions (Comp.). The Pedal part is marked with a 'Ped.' instruction and a fermata. The A. Sax. 1 part has a '79' marking. The A. Sax. 2 part has a '79' marking and a '17' marking. The T. Sax. part has a '79' marking. The B. Sax. part has a '79' marking. The Comp. part has a '79' marking. The score includes various musical notations such as notes, rests, and dynamic markings like *f*, *mp*, and *f*. The bottom section of the score is a complex arrangement of horizontal lines and dots, likely representing a computer-generated or synthesized sound.

[illegible]

IV - Electric Night

Antiphonal - Senza misura ♩ = 60

Pedal Cues

Alto Sax. 1

Alto Sax. 2

Tenor Sax.

Baritone Sax.

Computer

6"

Wait until the computer dies away, then immediately proceed.

Wait until the computer dies away.

G.P.

Misurato - Blazing ♩ = 138

1

pp sfz p

④



T. Sx.

B. Sx.



A. Sx. 1

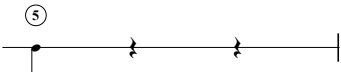
A. Sx. 2

T. Sx.

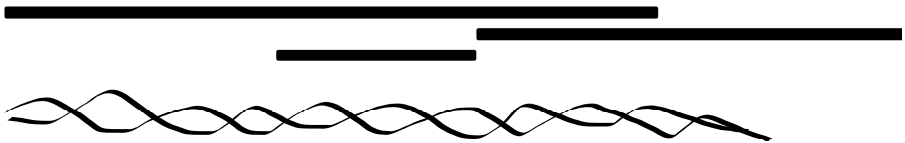
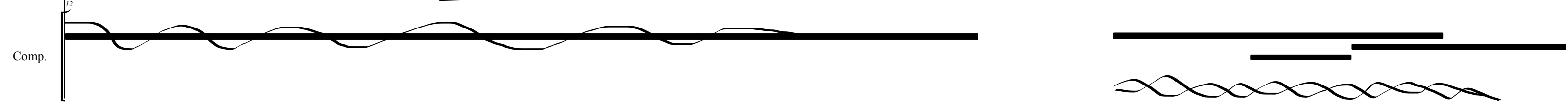
B. Sx.



⑤



Comp.



IV - Electric Night

5

This musical score is for the piece 'The Wind' by Gustav Mahler, specifically the section from measures 22 to 29. The score is arranged for a woodwind ensemble and a computer (Comp.).

The parts included are:

- Ped.** (Pedal): A single line of music with a few notes and rests.
- A. Sax. 1** (Alto Saxophone 1): A line of music with a few notes and rests.
- A. Sax. 2** (Alto Saxophone 2): A line of music with a few notes and rests.
- T. Sax.** (Tenor Saxophone): A line of music with a few notes and rests.
- B. Sax.** (Baritone Saxophone): A line of music with a few notes and rests.
- Comp.** (Computer): A line of music with a few notes and rests.

The score is written in 4/4 time and features a key signature of one sharp (F#). The tempo is marked 'Allegretto'.

The score is divided into two systems. The first system contains measures 22 to 26, and the second system contains measures 27 to 29. The score is written in a standard musical notation with a treble clef and a key signature of one sharp (F#).

The score includes various musical notations such as notes, rests, and dynamic markings (e.g., *mf*, *ff*). The score is also marked with measure numbers (22, 23, 24, 25, 26, 27, 28, 29) and rehearsal marks (6, 7, 8).

A. Sx. 2

B. Sx.

Comp.

32

32

9

ff

mf

The image shows a musical score for three parts: A. Sx. 2, B. Sx., and Comp. The score is written on a grand staff with three staves. The A. Sx. 2 part is in treble clef and has a measure number of 32. The B. Sx. part is in treble clef and has a measure number of 32. The Comp. part is in bass clef and has a measure number of 9. The score includes various musical notations such as notes, rests, and dynamic markings like *ff* and *mf*. A large black triangle is positioned over the bottom staff, starting from the left and extending towards the right. The triangle is filled with a solid black color and has a sharp point on the right side.

This musical score is for the film 'The Great Wall' by John Williams. It features four staves: A. Sx. 1, A. Sx. 2, T. Sx., and B. Sx., along with a 'Comp.' (Computer) track. The score is in 4/4 time and G major. The string parts (A. Sx. 1, A. Sx. 2, T. Sx., B. Sx.) play a melodic line with various articulations and dynamics, including *ff* (fortissimo). The computer track (Comp.) features a complex, wavy, and oscillating sound pattern, likely representing the Great Wall itself. The score is marked with a '42' at the beginning of the first staff and a '10' at the beginning of the computer track.

The musical score is for "The Great Wall" by John Williams. It features four staves: A. Sx. 1, A. Sx. 2, T. Sx., and B. Sx. (string quartet), and a fifth staff labeled "Comp." (computer-generated sound). The score is divided into two systems. The first system (measures 1-11) shows the string quartet playing a melodic line with a key signature of one sharp (F#) and a time signature of 4/4. The computer-generated sound is represented by a series of black dots and a wavy line. The second system (measures 12-13) shows the string quartet playing a more complex melodic line with a key signature of one flat (Bb) and a time signature of 4/4. The computer-generated sound is represented by a series of black dots and a wavy line. The score is marked with "50" at the beginning of the first system and "12" and "13" at the beginning of the second system.

The musical score for 'The Great Wall' by John Williams, measures 63-72, is presented in a standard orchestral format. The score includes parts for Pedal, A. Sax. 1, A. Sax. 2, T. Sax., B. Sax., and Compressor. The key signature is one flat (B-flat major/D minor). The tempo is marked 'Allegretto' and the time signature is 3/4. The score features various musical notations including dynamics (mf, fff, sfz), articulation (accents), and performance instructions (Ped., Comp.).

This musical score is for the piece "The Great Wall" by John Adams. It is a full orchestral score with a computer-generated section. The score is written for the following parts:

- A. Sx. 1** (Alto Saxophone 1)
- T. Sx.** (Tenor Saxophone)
- B. Sx.** (Baritone Saxophone)
- Comp.** (Computer-generated section)

The score is in 4/4 time and features a complex arrangement of woodwinds and strings. The computer-generated section is represented by a thick black line and a wavy line. The score includes various musical notations such as notes, rests, and dynamic markings (e.g., *sfz*, *fff*, *p*). The score is divided into measures, with some measures containing multiple notes and rests. The score is written in a standard musical notation style, with a key signature of one sharp (F#) and a time signature of 4/4. The score is a full orchestral score, including parts for woodwinds, strings, and a computer-generated section.

87

T. Sx.

B. Sx.

Comp.

96

18

19

Ped.

A. Sx. 1

A. Sx. 2

B. Sx.

Comp.

105

A. Sx. 1

A. Sx. 2

T. Sx.

B. Sx.

Comp.

20

A. Sx. 1

A. Sx. 2

T. Sx.

B. Sx.

Comp.

121

4

Chorale, as if underwater

A. Sx. 1

A. Sx. 2

T. Sx.

B. Sx.

Comp.

130

♯6: Begin subtone, gradually meld to regular tone by the time you reach measure 192.

A. Sx. 2
 T. Sx.
 Comp.

Musical score for measures 146-150. The score includes dynamics like *mp*, *p*, and crescendo/decrescendo markings.

163

A. Sx. 1

mf

A. Sx. 2

mp *p*

T. Sx.

p *mp* *p* *mp* *p* *mp* *p* *mp*

B. Sx.

mf *p* *mp* *p* *mp* *p* *mp* *p* *mp*

Comp.

163

181

A. Sx. 1

A. Sx. 2

T. Sx.

B. Sx.

Comp.

181

181

Blazing  = 138

24

This musical score segment covers measures 217 to 225. The parts are as follows:

- Ped.**: Pedal part, starting with a half note G4 and a whole note F#4.
- A. Sax. 1**: Alto Saxophone 1, starting with a half note G4 and a whole note F#4.
- A. Sax. 2**: Alto Saxophone 2, starting with a half note G4 and a whole note F#4.
- T. Sax.**: Tenor Saxophone, playing a continuous eighth-note pattern.
- B. Sax.**: Baritone Saxophone, playing a continuous eighth-note pattern.
- Comp.**: Comp. part, indicated by a thick black line.

226

A. Sax. 1

A. Sax. 2

T. Sax.

B. Sax.

Comp.

The musical score is for a piece titled "The Rose Tree". It features four vocal parts: A. Sx. 1, A. Sx. 2, T. Sx., and B. Sx., along with piano accompaniment. The score is divided into measures 26 and 27.

Measure 26:

- A. Sx. 1:** Treble clef, key signature of one sharp (F#). The melody starts with a quarter rest, followed by a quarter note G#4, and then a quarter note A4. The dynamic is *ff*. The measure ends with a quarter rest.
- A. Sx. 2:** Treble clef, key signature of one sharp (F#). The melody starts with a quarter rest, followed by a quarter note G#4, and then a quarter note A4. The dynamic is *ff*. The measure ends with a quarter rest.
- T. Sx.:** Treble clef, key signature of one sharp (F#). The melody starts with a quarter rest, followed by a quarter note G#4, and then a quarter note A4. The dynamic is *sfz*. The measure ends with a quarter rest.
- B. Sx.:** Treble clef, key signature of one sharp (F#). The melody starts with a quarter rest, followed by a quarter note G#4, and then a quarter note A4. The dynamic is *sfz*. The measure ends with a quarter rest.
- Piano Accompaniment:** The piano part consists of a single chord, K57, in the right hand and a single chord, K45, in the left hand. The dynamic is *ff*.

Measure 27:

- A. Sx. 1:** Treble clef, key signature of one sharp (F#). The melody starts with a quarter rest, followed by a quarter note G#4, and then a quarter note A4. The dynamic is *ff*. The measure ends with a quarter rest.
- A. Sx. 2:** Treble clef, key signature of one sharp (F#). The melody starts with a quarter rest, followed by a quarter note G#4, and then a quarter note A4. The dynamic is *ff*. The measure ends with a quarter rest.
- T. Sx.:** Treble clef, key signature of one sharp (F#). The melody starts with a quarter rest, followed by a quarter note G#4, and then a quarter note A4. The dynamic is *sfz*. The measure ends with a quarter rest.
- B. Sx.:** Treble clef, key signature of one sharp (F#). The melody starts with a quarter rest, followed by a quarter note G#4, and then a quarter note A4. The dynamic is *sfz*. The measure ends with a quarter rest.
- Piano Accompaniment:** The piano part consists of a single chord, K57, in the right hand and a single chord, K45, in the left hand. The dynamic is *ff*.

The score includes various musical notations such as dynamics (*ff*, *sfz*, *mf*), articulation (accents), and chord symbols (K57, K56, K45, K7). The key signature is one sharp (F#).

248

A. Sx. 1

A. Sx. 2

T. Sx.

B. Sx.

Comp.

IV - Electric Night

28

This musical score is for the piece "The Great Wall" by John Williams. It is arranged for a large ensemble, including strings, woodwinds, and a computer-generated section. The score is written in G major and 4/4 time. The key signature has one sharp (F#). The tempo is marked "Allegretto" with a metronome marking of 100. The score is divided into two systems, each starting at measure 256. The first system includes staves for A. Sx. 1, A. Sx. 2, T. Sx., and B. Sx. The second system includes staves for A. Sx. 1, A. Sx. 2, T. Sx., B. Sx., and a "Comp." (Computer) section. The string parts (A. Sx. 1, A. Sx. 2, T. Sx., B. Sx.) are written in treble clef. The woodwind parts (T. Sx., B. Sx.) are written in bass clef. The computer section is written in treble and bass clef. The score includes various musical notations such as notes, rests, beams, slurs, and dynamic markings (ff, sfz, sf). The computer section features a complex, wavy line representing a digital sound effect. The score is a page from a larger manuscript, with the page number 256 visible at the top left of the first system.