Eclipses and penumbra

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ABSTRACT

“Eclipses” orchestrates the movements of human beings as celestial bodies—as wandering beings that emit waves, cycle in orbit, and create shadows. Subtle microtonal movements, or retunings of the same pitch, tell the story of gradual planetary motion leading to the drama of the eclipse. In the dimmed light of a solar eclipse, even the most familiar surroundings seem unfamiliar and strange.

The harmonic material of “Eclipses” was composed using the Rainbow Harmony Matrix, a MaxMSP-based mouse and keyboard interface designed for real-time interaction with a 2D colorized pitch space defined by Just Intonation ratios. The most difficult coding in this patch was completed thanks to the generous help of Jean-François Charles. The spatialization and color-coding of Just Intonation pitches provided by the Rainbow Harmony Matrix proved invaluable to organizing harmonic and melodic material. Elements of rhythm, timbre, and articulation were largely left to the ear’s intuition.

“Penumbra” magnifies the shadow cast when one celestial body partially obscures the light from another. Moments from “Eclipses” are revisited through a telescopic lens, such that the small whole number relations hiding in the harmonies are magnified, into the field of rhythm. Small gestures orbit each other in wandering motion, building a web of cause and effect.

The harmonic material from “Penumbra” is extracted from two chords occurring in measures 41-43 of “Eclipses.” The small whole number frequency
ratios governing the cross-relations of these two chords are magnified and modified to create polyrhythms that cycle over several minutes.
“Eclipses” orchestrates the movements of human beings as celestial bodies—as wandering beings that emit waves, cycle in orbit, and create shadows. Subtle microtonal movements, or retunings of the same pitch, tell the story of gradual planetary motion leading to the drama of the eclipse. In the dimmed light of a solar eclipse, even the most familiar surroundings seem unfamiliar and strange.

“Penumbra” magnifies the shadow cast when one celestial body partially obscures the light from another. Moments from “Eclipses” are revisited through a telescopic lens, such that the small whole number relations hiding in the harmonies are magnified, into the field of rhythm. Small gestures orbit each other in wandering motion, building a web of cause and effect.

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TABLE OF CONTENTS

PERFORMANCE NOTES ..................................................................................................................... vii
ECIPSES and PENUMBRA .............................................................................................................. 1
   Eclipses ........................................................... 1
   Penumbra .......................................................... 13
REFERENCES ............................................................................................................................. 20
### PERFORMANCE NOTES

#### FUNCTION OF THE ACCIDENTALS

**3-LIMIT (PYTHAGOREAN) INTERVALS**

- notate 35 pitches from the series of untempered perfect fifths (3/2) = ± 702.0 cents;
- perfect fifth (3/2); perfect fourth (4/3); major whole tone (9/8)

![3-limit intervals](image)

**5-LIMIT (PTOLEMAIC) INTERVALS**

- notate an alteration by one syntonic comma (81/80) = ± 21.5 cents;
- major third (5/4); minor third (6/5); major sixth (5/3); minor sixth (8/5);
- minor whole tone (10/9)

![5-limit intervals](image)

- notate an alteration by two syntonic commas
- (81/80)·(81/80) = ± 43.0 cents;
- augmented fifth (25/16); diminished fourth (32/25)

- notate an alteration by three syntonic commas
- (81/80)·(81/80)·(81/80) = ± 64.5 cents;
- minor diesis (128/125)

**7-LIMIT (SEPTIMAL) INTERVALS**

- notate an alteration by one septimal comma (64/63) = ± 27.3 cents;
- natural seventh (7/4); septimal whole tone (8/7);
- septimal diminished fifth (7/5); septimal tritone (10/7);
- septimal minor third (7/6); septimal quartertone (36/35)

![7-limit intervals](image)

- notate an alteration by two septimal commas
- (64/63)·(64/63) = ± 54.5 cents;
- septimal sixth tone (49/48)

**11-LIMIT (UNDECIMAL) INTERVALS**

- notate an alteration by one undecimal quarter tone
- (33/32) = ± 53.3 cents;
- undecimal augmented fourth (11/8); undecimal diminished fifth (16/11)

**13-LIMIT (TRIDECIMAL) INTERVALS**

- notate an alteration by one tridecimal thirteenth tone (27/26) = ± 65.3 cents;
- tridecimal neutral sixth (13/8); tridecimal neutral third (16/13)

**PRIMES IN THE HARMONIC SERIES OCTAVE 16 - 32**

- (5-limit signs are given here relative to "A")
- notate an alteration of the 5-limit accidental by one 17-limit schisma
- (16/17)·(16/15) = (256/255) = ± 6.8 cents;
- Galileo’s “equal-tempered” semitone (18/17);
- 17-limit diminished seventh chord 10:12:14:17

microtonal accidentals designed by Marc Sabat and Wolfgang von Schweinitz, 2004
bow on bridge, parallel to bridge, "white noise"

strike upper half of instrument body with the palm

strike lower half of instrument body with the palm

morph from one technique to another gradually

slow wide vibrato  

tight fast vibrato
Eclipses

\( j = 55 \) senza vib. throughout unless marked

Violin 1

Violin 2

Viola

Violoncello

Vln 1

Vln 2

Vla

Ve.
Eclipses

Vln 1

\[ f \rightarrow pp \]

sul G airy

Vln 2

\[ ppp \rightarrow f \]

L.H. pizz

Vla

\[ pp \]

ord.

Vc.

\[ mp \rightarrow mf \]

poco sul pont.

Vln 1

\[ f \rightarrow ppp \]

\[ pp \]

vib.

Vln 2

\[ arco \]

Vla

\[ ppp \rightarrow f \]

\[ ppp \]

Vc.

\[ f \rightarrow \]

\[ ff \rightarrow mp \]
Eclipses

Vln 1

Vln 2

Vla

Ve.

Vc.

ord.

sul tasto

senza vib.

Vln 1

Vln 2

Vla

Ve.

13

poco s.p.

ord.

17

fp

sul tasto

sul tasto

ord.

poco s.p.

molto s.p.

ord.

p.s.t.

fp

mp

mp

p

mp

f

mp

fp

p

mp

f

mp

p
Eclipses

Vln 1

Vln 2

Vla

Vc.

D

ord.

ord. 5

Vln 1

Vln 2

Vla

Vc.

pizz.

strike lower half with palm

strike upper half with palm

bow on bridge

bow on bridge

bow on bridge

bow on bridge
Eclipses

Vln 1

(poco sul tasto)

Vln 2

Vla

(ordinato)

mf

pp

ord.

Vc.

mf

55

Vln 1

(poco sul tasto)

Vln 2

Vla

ord.

molto s.p.

Vc.

mf

ppp

ppp

ppp

mf

ppp
Penumbra

\[ \text{\( j = 55 \)} \]

- senza vib. throughout unless marked

- bow on bridge

- \( p \)

- \( ppp \)

- \( f \)

- molto s.p.

Chris Otto’s guidance and scores provided valuable information on the ordering and kerning of Helmholtz-Ellis accidentals, particularly the rule that accidentals are ordered from left to right by descending prime limit.


This PDF defines the microtonal accidentals used in these scores, and describes the theoretical and pedagogical rationale for their creation. The accidental definitions printed in the performance notes are sourced from pages 13 of this PDF.