Rand Steiger

Cryosphere

commissioned by the Fromm Music Foundation at Harvard University

and the American Composers Orchestra

chamber orchestra

with digital audio signal processing

Premiere:

February 20, 2009; Zankel Hall, New York City
American Composers Orchestra; George Manahan, conductor
Miller Puckette, computer music programming

Program Note:

The Earth's cryosphere (all of the surfaces where water is frozen) plays a critical role in the global climate system. Global warming is now reducing these surfaces precipitously, and we face great peril in the future if this process is allowed to continue. This piece draws inspiration from the cryosphere, particularly the way glaciers and icebergs form and dissolve. It embraces the beauty and mystery of these structures, while also lamenting their increasingly rapid and unnatural loss.

Cryosphere is scored for flute, oboe, bass clarinet, bassoon, horn, trumpet, trombone, 3 percussion, harp, electronic harpsichord, and chamber string orchestra. Real-time audio signal processing is deployed on all of the instruments enriching the natural sound of the orchestra with various transformations including spatialization, resonance, delay, and just intonation harmonizing.

Cryosphere was commissioned by the Fromm Music Foundation at Harvard University and the American Composers Orchestra, to whom I express my deep gratitude for this opportunity. I would also like to express my gratitude to Jody Steiger and Carlos Bonilla, and to Bill and Allene Plant, for their hospitality during crucial stages of my work on this piece.

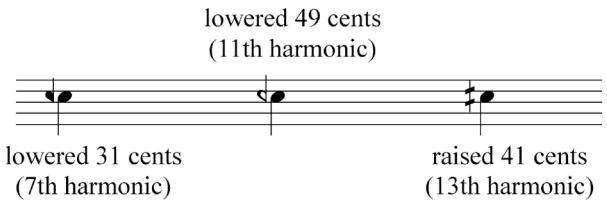
Dynamics:

The dynamic marking ***n*** is frequently used to indicate notes that begin imperceptibly and gradually fade in over the length of the indicated crescendo. Similarly, decrescendos that end at a rest without a dynamic marking indicate a complete diminuendo to silence. Please note the starting and ending points of these transitions precisely.

Accidentals and Microtonality:

Accidentals carry through the length of the bar, but only in the octave in which they appear.

The following special accidentals are used to indicate specific micro-intervals for just tuning. In the case of the horn and trombone, these pitches are to be realized by playing natural notes.



Horn: All glissandos are to be played as harmonic glissandos. All microtonal pitches specified are to be played as "natural tones" in the corresponding series. For example, F with a 49-cent quarter flat (see above) indicates playing the 11th harmonic in the series of B, while F with a 31-cent flat indicates the 7th harmonic in the series of G.

Trombone: Glissandos are to be played with the slide, unless the indication "Harm." appears above the gliss., indicating a harmonic glissando. All trills are to be played as lip trills to the pitch indicated, or to the next highest partial. As in the horn parts, microtonal notes are to be played as natural tones.

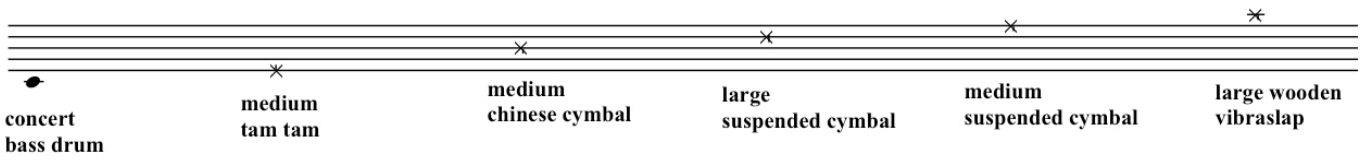
Keyboard: The electronic harpsichord part is played on an 88 key midi keyboard that controls a laptop with sample playback software. The lowest octave of the keyboard does not trigger audible notes, but rather indicates to the computer program a fundamental frequency to which other notes of the keyboard are then adjusted in a just relationship. Therefore the notes produced will not all be tempered, as they appear in the score. A hybrid just tuning scheme is deployed, where the intervals of the tritone (11th harmonic -49 cents), minor sixth (13th harmonic, +41 cents), and minor seventh (7th harmonic, -31 cents) are modified. For example, if the lowest note (A) is depressed, until another note in the lowest octave is depressed, all D#'s will be lowered 49 cents, all g's will be lowered 31 cents, and all F's will be raised 41 cents. ***When a diamond shape note head (like those used to indicate string harmonics) appears in the left hand of the keyboard part, it is to be played ONE OCTAVE LOWER THAN NOTATED, and it indicates the playing of one of the silent fundamental notes explained above.*** The only exception to this process is when A0 is depressed, which provides an equal tempered arrangement (this is used in measures 140 through 172).

Strings: All natural harmonics sound where they are notated. All indicated dyads are to be played non divisi (as double stops) by all players except when otherwise indicated. From measure 136 through 138 the violins and violas are to gradually introduce overpressure until the sound becomes completely distorted (by the OP mark), remaining that way until the bracket ends, and ord. is indicated. The bass part is always indicated one octave higher then sound, including in treble clef, except for harmonics, which are indicated in treble clef, *suono reale*.

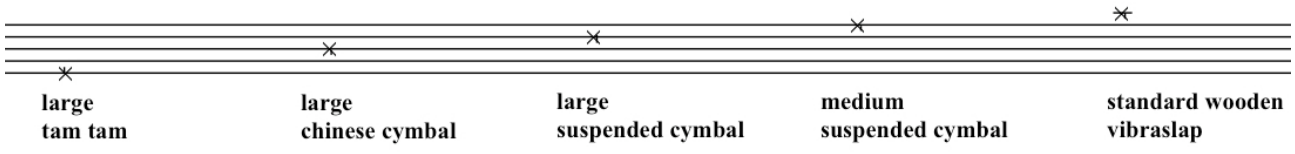
Percussion:

Cymbals, bass drums, and tam tams should always be allowed to ring unless otherwise indicated. Mallets are usually left to the discretion of the performer. Conventional bass drum and tam tam mallets should be used for those instruments, unless otherwise indicated. Cymbal rolls are to be performed with soft mallets. Wood sticks are sometimes indicated for single notes on the cymbals, and in this instance, medium weight, wood tipped drum sticks are recommended. When an **S** is indicated above a cymbal or tam tam note this indicates scraping with a light triangle beater, for the full length of the note.

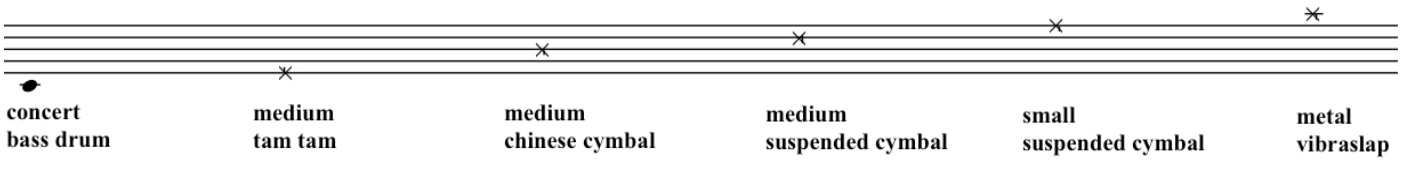
Percussion 1: Vibraphone and these non-pitched instruments:



Percussion 2: Crotales (standard two-octave set) and these non-pitched instruments:

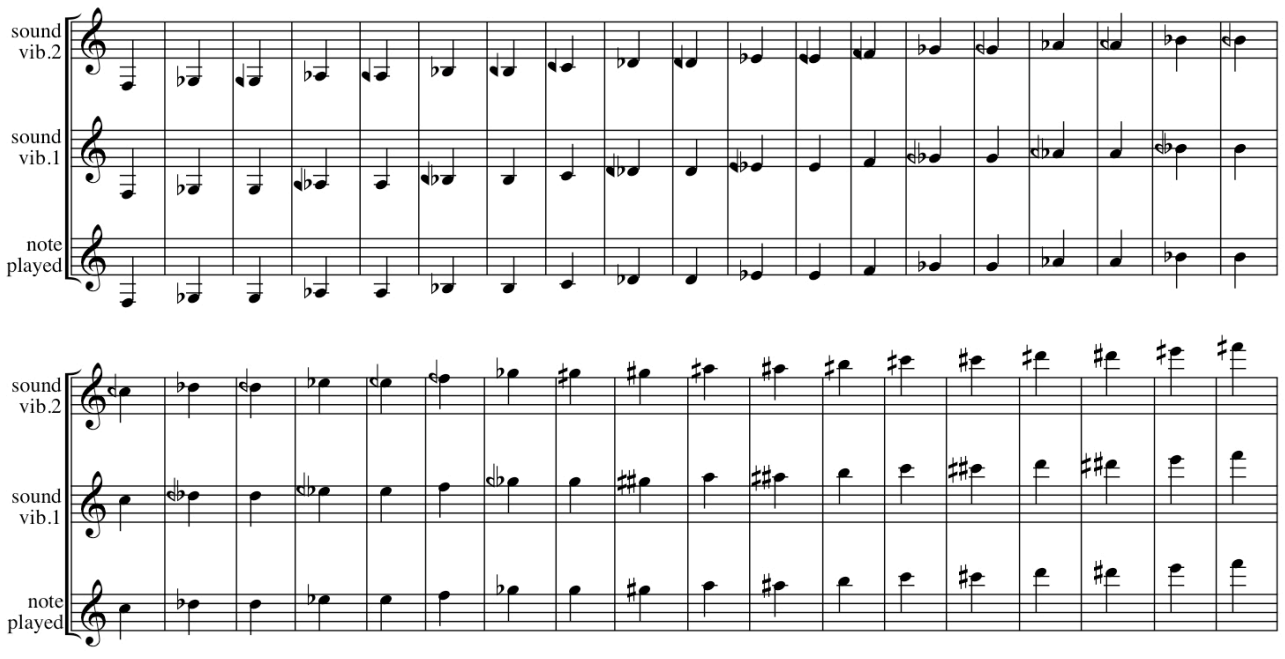


Percussion 3: Vibraphone and these non-pitched instruments:



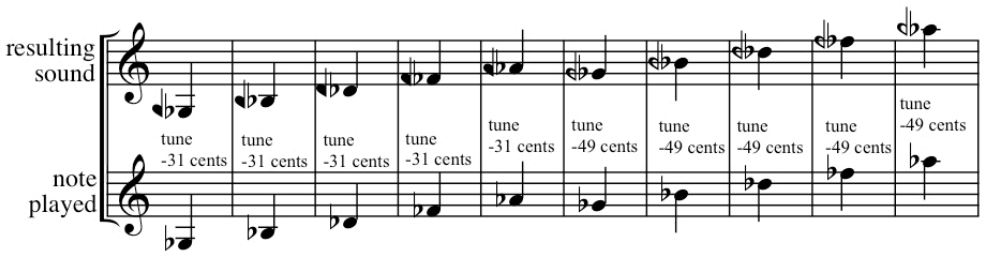
Vibraphones:

The two vibraphones must be the Musser M-55 Pro Vibe model. The composer will supply a custom tuned set of bars to replace one set on each instrument (diatonic set on Vibraphone 2 and chromatic set on vibraphone 1). The following chart shows the actual sound this will produce for each played note (see chart above for the definition of the microtonal accidentals used here):



Harp:

The harp part is *Sempre L.V.* unless otherwise indicated. Harmonics sound an octave higher than the notated pitch. The harp part also has a microtonal tuning adjustment. The following chart indicates the 10 strings that are to be alternatively tuned (the remaining strings should all conform to conventional tuning):



Electronics:

A laptop computer running Miller Puckette's **Pd** software is used to signal process the sound of the instruments in a variety of ways throughout the piece. Hypercardioid microphones are to be used on the winds and brass instruments, and the harp (and routed directly into the computer audio interface). A stereo mix of the string section, and mono mixes of each percussion station should also be routed, through the house mixer, into the computer audio interface. Six channels of processed sound are then returned to the house system. Channels 1 and 2 are amplified through a pair of speakers located at the foot of the stage in front of the strings (one near the back of the violin section, the other near the back of the cello section). The remaining four channels are to be amplified through house speakers in the conventional quadraphonic arrangement. Great care is to be taken when setting the level of the signal processing amplification. The sound from the speakers should not be louder than the original acoustical sound of the instruments. Ideally, the listener will hear the natural sound of the orchestra, along with a "halo" of transformed sound, blending together equally. Monitor speakers are not necessary for the performers. The orchestra should follow the indicated dynamics and balance and tune in the usual manner. The electronic processing follows the performance, and therefore the conductor has complete interpretive freedom.

Stage Diagram:

The ensemble is to be set up in the configuration indicated below (behind the conventional string arrangement). Percussion 2 and Bassoon are to be centered, Harp and Percussion 1 should be as far right as possible, and keyboard and percussion, as far left, using as much of the stage width and depth as possible to avoid instruments blending into each others microphones.

Percussion 2

Percussion 1 percussion 3

Harp Flute Oboe Bass Clarinet Bassoon Horn Trumpet Trombone keyboard

Contact:

For further information please contact the composer by email to this address:
rand@ucsd.edu

Additional information may be found on the following web site:
http://rand.info

information about Pd software, may be found on Miller Puckette's website:

http://crca.ucsd.edu/~msp/pdrp/latest/doc/

1/19/09 pre-publication edition. Please contact the composer by email with questions and corrections: rand@ucsd.edu

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Score in C

Cryosphere

Rand Steiger

flute
oboe
B♭ bass clarinet
bassoon
horn
with cup mute (through m.124)
C trumpet
with cup mute (through m.120)
trombone
percussion 1
percussion 2
percussion 3
sempre l. v.
harp
D♮ C♮ B♭ / E♭ F♮ G♭ A♮
electronic harpsichord
violin I a.
violin I b.
violin II a.
violin II b.
viola a.
viola b.
cello 1
cello 2
cello 3
bs.
sul pont.

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10

fl.

ob.

bass cl.

bsn.

hn.

tpt.

trb.

perc. 1

perc. 2

perc. 3

10

vln. I a.

vln. I b.

vln. II a.

vln. II b.

vla. a

vla. b.

vc. 1

vc. 2

vc. 3

bs.

17

accel. ♩= 120

fl.

ob.

bass cl.

bsn.

f

hn.

tpt.

trb.

accel. ♩= 120

perc. 1

perc. 2

perc. 3

pp *mf*

mp

accel. ♩= 120

17

vln. I a.

vln. I b.

vln. II a.

vln. II b.

vla. a

vla. b.

vc. 1

vc. 2

vc. 3

bs. 1

bs. 2

ff *mp*

p

ppp *f*

IV

I

24

rit. ♩= 80

bass cl.

bsn.

rit. ♩= 80

perc. 1

perc. 2

perc. 3

vibraphone

crotales

vibraphone

rit. ♩= 80

hp.

hpschd.

rit. ♩= 80

24

vln. I a.

vln. I b.

vln. II a.

vln. II b.

vla. a

vla. b.

vc. 1

vc. 2

vc. 3

bs. 1

bs. 2

ord.

ord.

31

rit. ♩= 60 ♪=♩=120

bass cl.

bsn.

n mf

ppp(pos.) mf

rit. ♩= 60 ♪=♩=120

perc. 1

perc. 2

perc. 3

Ped. 5:3

rit. ♩= 60 ♪=♩=120

hp.

C♯ E♮ G♯ B♯ F♯ C♮ D♯ B♭

hpschd.

Ped.

rit. ♩= 60 ♪=♩=120

31

vln. I a.

(sul pont.) ppp mp

vln. I b.

(sul pont.) ppp mp

vln. II a.

(sul pont.) ppp mp

vln. II b.

(sul pont.) ppp mp

vla. a

(sul pont.) ppp mp

vla. b.

(sul pont.) ppp mp

vc. 1

ord. II ppp mf

sul pont. ppp mp

vc. 2

ord. III ppp mf

sul pont. ppp mp

vc. 3

ord. III ppp mf

sul pont. ppp

bs. 1

mf

sul pont. IV ppp

bs. 2

mf

sul pont. IV ppp

38

♩= 120

rit. (♩= 60) ♩= 48

fl.

ob.

bass cl.

bsn.

hn.

tpt.

trb.

perc. 1

perc. 2

perc. 3

hp.

hpschd.

38

♩= 120

rit. (♩= 60) ♩= 48

vln. I a.

vln. I b.

vln. II a.

vln. II b.

vla. a

vla. b.

vc. 1

vc. 2

vc. 3

bs. 1

bs. 2

45

accel. ♩= 60

fl.

ob.

bass cl.

bsn.

accel. ♩= 60

hn.

tpt.

trb.

accel. ♩= 60

perc. 1 — vibraphone — mf — Ped.

perc. 2 — crotales — mf

perc. 3 — vibraphone — mp — mf — Ped.

accel. ♩= 60

hp.

hpschd. — Ped. — Ped.

45

accel. ♩= 60

vln. I a. — ord. — ppp — mf

vln. I b. — ord. — ppp — mf

vln. II a. — ord. — ppp — mf

vln. II b. — ord. — ppp — mf

vla. a — ord. — ppp — mf

vla. b. — ord. — ppp — mf

vc. 1 — ppp — mf

vc. 2 — ppp — mf

vc. 3 — ppp — mf

bs. 1 — ppp — mf

bs. 2 — ppp — mf

pizz. (individual rapid aeperiodic repetitions of indicated pitch) — ppp

pizz. (individual rapid aeperiodic repetitions of indicated pitch) — ppp

pizz. (individual rapid aeperiodic repetitions of indicated pitch) — ppp

pizz. (individual rapid aeperiodic repetitions of indicated pitch) — ppp

pizz. (individual rapid aeperiodic repetitions of indicated pitch) — ppp

pizz. (individual rapid aeperiodic repetitions of indicated pitch) — ppp

pizz. (individual rapid aeperiodic repetitions of indicated pitch) — ppp

pizz. (individual rapid aeperiodic repetitions of indicated pitch) — ppp

50

fl.

ob.

bass cl.

bsn.

rit.

perc. 1

perc. 2

perc. 3

rit.

hp.

hpschd.

rit.

50

vln. I a.

vln. I b.

vln. II a.

vln. II b.

vla. a

vla. b.

vc. 1

vc. 2

vc. 3

bs.

mf

ppp

55

(rit.) ♩= 40

fl.

ob.

bass cl.

bsn.

(rit.) ♩= 40

hn.

tpt.

(cup mute)

(rit.) ♩= 40

perc. 1

perc. 2

perc. 3

hp.

hpschd.

55

(rit.) ♩= 40

vln. I

vln. II

vla.

vc.

bs.

arco

62

fl.

ob.

bass cl.

bsn.

hn.

tpt.

(cup mute)

trb.

62

vln. I

vln. II

vla.

vc.

bs.

68

fl.

ob.

bsn.

hn.

tpt.

trb.

68

vln. I

vln. II

vla.

vc.

bs.

75

♩ = 60

fl.

ob.

bass cl.

bsn.

hn.

tpt.

trb.

♩ = 60

perc. 1 — vibraphone

perc. 2 — crotales

perc. 3 — vibraphone

hp. — D♯ C♮ B♭ / E♮ F♯ G♮ A♮

hpschd.

♩ = 60

75

vln. I

vln. II

vla.

vc.

bs.

82

rit. ♩= 40

fl.

ob.

bass cl.

bsn.

hn.

tpt.

hpschd.

Ped.

82

vln. I

vln. II

vla.

vc.

bs.

div.

II

IV

I

89

accel. ♩= 80

rit. ♩= 60

fl.

ob.

bass cl.

bsn.

hn.

tpt.

89

vln. I

vln. II

vla.

vc.

bs.

(f# continues *p*)

96

fl.

ob.

bass cl.

bsn.

hn.

tpt.

trb.

96

vln. I a.

vln. I b.

vln. II a.

vln. II b.

vla.

vc.

bs.

II non div.
I

102

fl.

ob.

bass cl.

bsn.

hn.

tpt.

trb.

102

vln. I a.

vln. I b.

vln. II a.

vln. II b.

vla.

vc.

bs.

IV

108

fl.

ob.

bass cl.

bsn.

hn.

tpt.

trb.

(cup mute)

harm.

perc. 1

perc. 2

perc. 3

vibraslap
(close to mic.)

hp.

hpschd.

108

vln. I a.

vln. I b.

vln. II a.

vln. II b.

vla.

vc.

bs.

114

fl.

ob.

bass cl.

bsn.

hn.

tpt.

(cup mute)

trb.

harm.

harm.

(IV)

perc. 1

perc. 2

perc. 3

hp.

hpschd.

114

vln. I a.

vln. I b.

vln. II a.

vln. II b.

vla.

vc.

(D# continues through change of clef)

bs.

118

fl.

ob.

bass cl.

bsn.

hn.

tpt.

trb.

remove mute

(senza sord.)

perc. 1

bass drum

perc. 2

perc. 3

hp.

(loud and noisy)

118

vln. I a.

vln. I b.

vln. II a.

vln. II b.

vla.

vc.

bs.

123

fl.

ob.

bass cl.

bsn.

hn.

tpt.

remove mute

(senza sord.)

harm.

trb.

harm.

vibraslap

perc. 1

wood sticks

perc. 2

perc. 3

bass drum

hp.

123

vln. I a.

vln. I b.

vln. II a.

vln. II b.

vla.

(III)

vc.

II

bs.

128

fl.

ob.

bass cl.

bsn.

hn.

tpt.

trb.

perc. 1

bass drum

(bass drum mallets)

perc. 2

wood sticks

perc. 3

wood sticks

hp.

128

vln. I a.

vln. I b.

vln. II a.

(III)

vln. II b.

vla.

vc.

bs.

132

fl.

ob.

bass cl.

bsn.

hn.

tpt.

trb.

perc. 1

perc. 2

perc. 3

butt of wooden stick
at center of tam tam

wood sticks

butt of wooden stick
at center of tam tam

tam tam mallets

bass drum (bass drum mallets)

hp.

132

vln. I a.

vln. I b.

vln. II a.

vln. II b.

vla.

vc.

bs.

*gradually introduce over-pressure until the sound is completely distorted at the OP marking, continuing through the length of the bracket

137

♪ = 112

fl.

ob.

bass cl.

bsn.

hn.

tpt.

trb.

♪ = 112

perc. 1

soft mallets

wood sticks

(vibraslap close to microphone)

perc. 2

wood sticks

perc. 3

wood sticks

hp.

D♯ C♮ B♭ / E♮ F♮ G♭ A♯

(loco)

hpschd.

137

♪ = 112

OP

saltando

ord.

vln. I a.

vln. I b.

vln. II a.

vln. II b.

vla.

vc.

bs.

142

fl.

ob.

bass cl.

bsn.

hn.

tpt.

trb.

perc. 1

perc. 2

perc. 3

soft mallets

hp.

hpschd.

142

vln. I

vln. II

vla.

vc.

bs.

147

fl.

ob.

bass cl.

bsn.

hn.

tpt.

trb.

harm.

perc. 1

perc. 2

perc. 3

soft mallets

wood sticks

hp.

hpschd.

Ped.

147

vln. I

vln. II

vla.

vc.

bs.

152

fl.

ob.

bass cl.

bsn.

hn.

tpt.

trb.

perc. 1

perc. 2

perc. 3

hp.

hpschd.

152

vln. I

vln. II

vla.

vc.

bs.

157

fl.

ob.

bass cl.

bsn.

hn.

tpt.

trb.

perc. 1

perc. 2

perc. 3

hp.

hpschd.

vln. I

vln. II

vla.

vc.

bs.

163

fl.

ob.

bass cl.

bsn.

hn.

tpt.

trb.

perc. 1

tam tam mallet

soft mallets

wood sticks

soft mallets

wood sticks

perc. 2

tam tam mallet

wood sticks

tam tam mallet

perc. 3

hp.

A♭, E♭, B♭

G♭

hpschd.

Ped.

163

vln. I

vln. II

(tune with horn)

vla.

div. pizz.

div. arco

non div.

vc.

bs.

170

fl.

ob.

bass cl.

bsn.

hn.

tpt.

trb.

perc. 1

perc. 2

wood sticks

perc. 3

tam tam mallet

wood stick

hp.

hpschd.

tam tam mallet

soft mallets

soft mallets

(unis.)

170

vln. I a.

div.

vln. I b.

(unis.)

vln. II

vla.

vc.

bs.

177

rit. ♪ = 48 (♪ = ♩)

fl.
ob.
bass cl.
bsn.

n mf
n mf
n mp
n mf
n mp

rit. ♪ = 48 (♪ = ♩)

hn.
tpt.
trb.

pp(pos.) mf
pp(pos.) mp

rit. ♪ = 48 (♪ = ♩)

perc. 1
perc. 2
perc. 3

p
tam tam mallet
p
soft mallets
ppp p

rit. ♪ = 48 (♪ = ♩)

hp.
hpschd.

rit. ♪ = 48 (♪ = ♩)

177

8va

vln. I
vln. II
vla.
vc.
bs.

mp
mp
pp mp

184

fl.

ob.

bass cl.

bsn.

hn.

perc. 1

perc. 2

perc. 3

hp.

hpschd.

vln. I

vln. II

vla.

vc.

bs.

190

fl.

ob.

bass cl.

bsn.

hn.

perc. 1

perc. 2

perc. 3

hp.

hpschd.

(8va)

190

vln. I

vln. II

vla.

vc.

bs.

196

fl.

ob.

bass cl.

bsn.

hn.

n mf

n mf

n mf

perc. 1

perc. 2

perc. 3

hp.

hpschd.

Ped.

(8va)

196

vln. I

mf pp mf p

vln. II

pp mf

vla.

vc.

(fade out G)

pp mf

bs.

pp mf

202

perc. 1

perc. 2

perc. 3

hp.

hpschd.

(8va)

202

vln. I

vln. II

vla.

vc.

bs.

soft mallets

soft mallets

soft mallets

207

very long (allow percussion sounds to fade completely)

tam tam mallets

soft mallets

tam tam mallets

perc. 1

perc. 2

perc. 3

FINE

14.7.8.1.9.26.13

Del Mar
Escazu
Westwood