Circadian Cycles

for sinfonietta, electroacoustic sound and real-time signal processing

duration 20´10

Natasha Barrett 1999

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for sinfonietta, electroacoustic sound and real-time signal processing

'Circadian Cycles' are patterns of biological activity that occur on a 24-hour cycle. They are important biological regulators in virtually every living creature.

The main materials for the composition 'Circadian Cycles' were extracted from data brought home from a sound recording research trip to the Costa Rican rain forests. These data consist of spatial, temporal, and spectral information. 4-track recordings allowed me to accurately locate the position of animal calls up to 50 meters away, and this information has been interpreted through the location of instruments in the ensemble, and through the spatialisation of live signal processing (executed on the live instrumental sound). Short-term temporal data have been extracted from the discrete articulation of some animals calls, contributing to rhythmic motives and short-term phrasing, while long-term temporal data such as 24-hour spectral contours contribute to the long term structuring of the work. Spectral data yielded perhaps the most interesting material for compositional interpretation: the short term spectral analysis clearly indicated that every band of the frequency spectrum was occupied by an animal sound of some kind. From 20Hz to 20KHz, the frequency range was chocker-block with a diverse variety of repeating or irregular spectral shapes. This material was developed, sometimes independently from the source, through the 20 minute duration of the work.

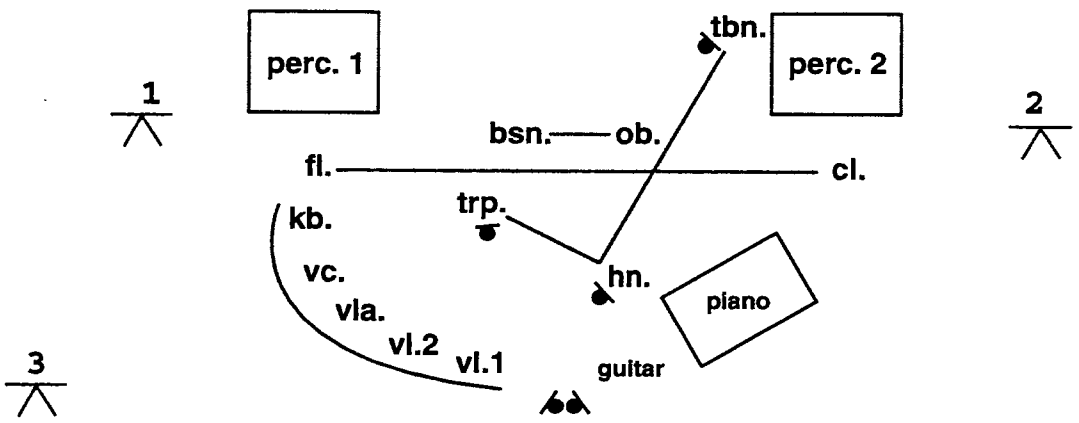
From an extra-musical standpoint, inspiration, along with extracts of text used in the electroacoustic materials, were taken from the English translation of "The Popol Vuh", which is the Sacred Book of Creation of the ancient Quiche' Maya community.

> 'Then they made the small wild animals,
> the guardians of the woods, the spirits of the mountains,
> the deer, the birds, pumas, jaguars, serpents, snakes, vipers,
> guardians of the thickets.
>
> And the Forefathers asked: "Shall there be only silence and calm,
> under the trees, under the vines?
> It is well that hereafter there be someone to guard them.
>
> " '..... "'Speak, cry, warble, call, speak each one according to your
> variety, each, according to your kind." '

'Circadian Cycles' involves a large amount of electroacoustic sound material, which is triggered from a computer in synchrony with the instrumental performance. Live signal processing binds acoustic and electrocoustic materials together in the same space, intending to interrelate sometimes opposite materials into the same 'ecosystem'.

This work was realised in the electroacoustic music studio in Tromsø, at NoTAM, and in the composers private studio. The work was commissioned by the Oslo Sinfonietta, with funds from Norsk Kulturråd.

Instrument, loudspeaker and microphone positions



The ensemble should be positioned as above. Important features are the positional relationships between the horn, trumpet and trombone, the symmetrical, widely spaced percussion, flute and clarinet and the sweeping arc of the strings.

Microphones ● are used to feed the audio input to the computer (and effects unit) for real–time signal processing. For this purpose spot microphones are used for the horn, trumpet and trombone, and a frontal stereo pair for capturing the general ensemble. The stereo pair can also be used to amplify the ensemble for projection over the loudspeakers, although this should be used very subtly and sparingly.

Loudspeakers ⋉ should be positioned as indicated. It is important for (a) one pair of loudspeakers to be placed at the rear of the ensemble, (b) one pair to the front of the ensemble (and this pair should be of a high audio quality) (c) one pair to the sides and one pair to the rear. If the venue is equipped with a pair hanging from the ceiling above the ensemble, these can also be used. Note that reasonable quality loudspeakers are as important as using the correct acoustic instruments.

See technical set–up for more details.

5 6

7 8

The electroacoustic and computer parts

A mixing desk to control instrumental amplification and computer volume should be placed in the audience in an ideal listening position.

Equality in volume level should be maintained between the acoustic and electroacoustic materials.

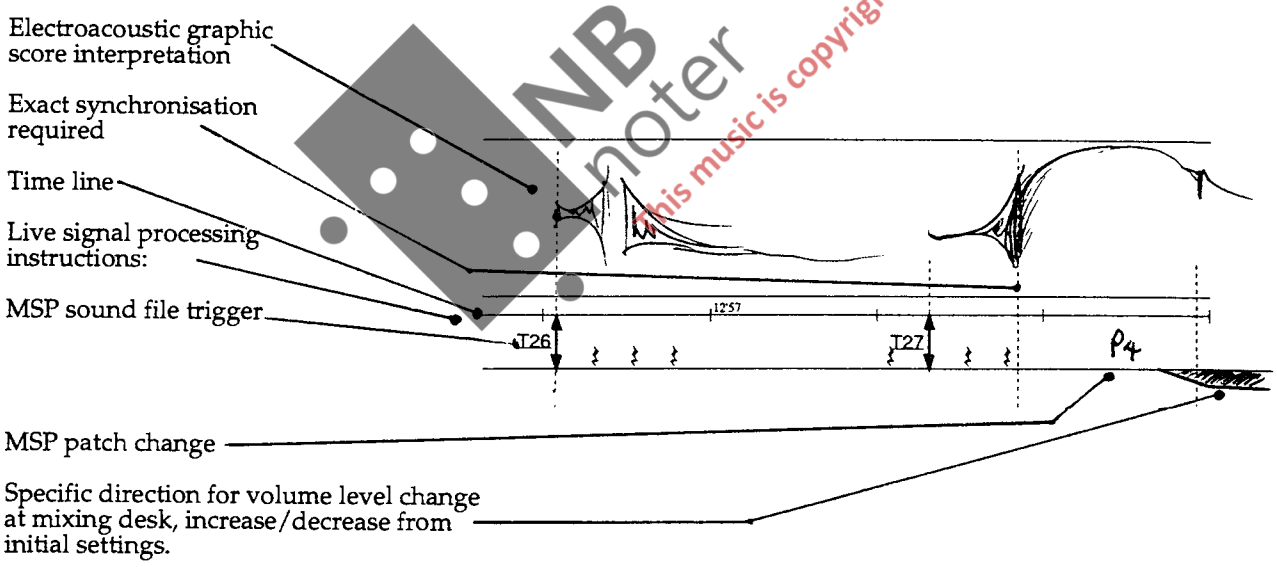
One person performs the computer part and sits in the ensemble. A second person operates the mixing desk controlling sound levels.

The electroacoustic and computer parts are two–fold:

1. Preprepared electroacoustic material is stored on the computer as a series of sound files. These are played back or 'triggered' in an overlapping sequence to create the effect of a continuous tape part. Triggered sound files are used instead of a continuously running DAT or CD so that the orchestra is not rigidly tied to a click track, yet can still maintaining accurate synchronisation with the electroacoustic part. Many of the sound files can be conducted with flexible timing of up to a few seconds if rubato is desired.

2. Live signal processing is performed on the signal picked up from the microphones (see 'Instrument, loudspeaker and microphone positions'). The purpose of the live signal processing is to integrate acoustic and electroacoustic sound–worlds in the one space.

Once the computer outputs are set up correctly (see technical set–up), the MSP patch executes all loudspeaker signal changes.



MSP (MAX signal processing)

The electroacoustic part of this work is divided into two aspects:

1. Pre–prepared electroacoustic sound materials are triggered by the computer performer at the correct points in the score, marked T1, T2, ... T43.

2. Sounds from the acoustic instruments are processed by the computer. Points at which the computer performer must select a new signal processing patch are indicated by P1, P2, ... P7. Instructions on setting up the sound levels to and from the computer are listed on the live performance CDROM (CD number 2).

✱ To obtain a clear impression of the music, the score should be read at the same time as listening to the CD of sound materials (CD number 1). Track 1 is an example realisation of the pre–prepared electroacoustic sound materials as if triggered in performance (resulting in a continuous tape part). Tracks 2 – 44 are the 43 individual sound files, triggered live.

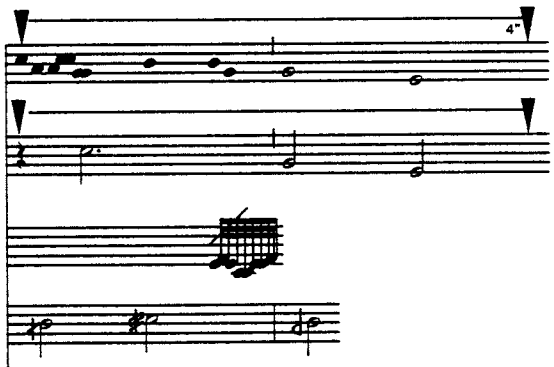
Below are a list of the different signal processing patches so that when reading through the score and listening to track 1 on CD number 1, one understand the effect of the live signal processing.

P1 = granulation and delay on the brass instruments only.
P2 = spatialisation over six loudspeakers, gentle motion, only on the string instruments.
P3 = fast, random spatialisation over eight loudspeakers, on all instruments.
P4 = gentle version of P3
P5 = Microtonal harmonisation to give a 'meaty' sound on brass and wind instruments.
P6a–d = spatialisation over eight loudspeakers, gentle motion, on all instruments (this might change to being only on the wind instruments).
P7 = fast, random spatialisation over eight loudspeakers, on all instruments.

(the last patch change returns to P1)

Notation

General notation (full score is in concert pitch, parts are in written pitch).



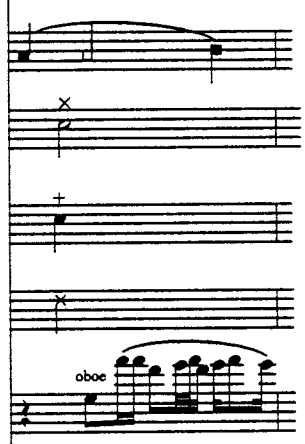
Proportional notation between conducted units. The number (4") gives an approximate indication of the duration of the unit, in seconds.

Parts with normal notation, perform as notated while the other parts perform proportional notation.

As fast as possible.

Quarter sharp, three-quarters sharp, quarter flat. Performers should be careful to execute sustained passages of microtones with accuarte tuning.

Wind



Breath only through instrument.

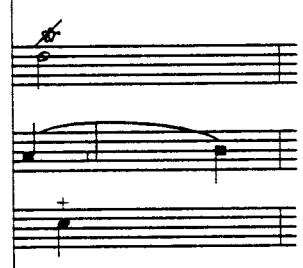
Rapid key clicks, where possible without changing pitch.

't' or 'p' percussive articulation to note.

Single key click.

Very high notes in one phrase, play with a lilting or swaying quality.

Brass

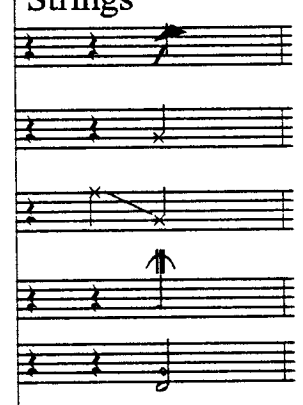


Trill with the valve only half depressed, giving a timbral rather then pitch trill.

Breath only through instrument.

't' or 'p' percussive articulation to note.

Strings



Arco on tail piece.

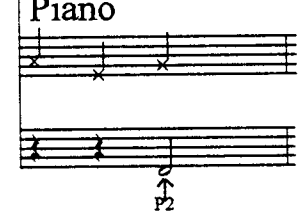
Hit string col legno.

Arco col legno.

Bow behind the bridge.

Artificial harmonic (sounding two octaves higher).

Piano

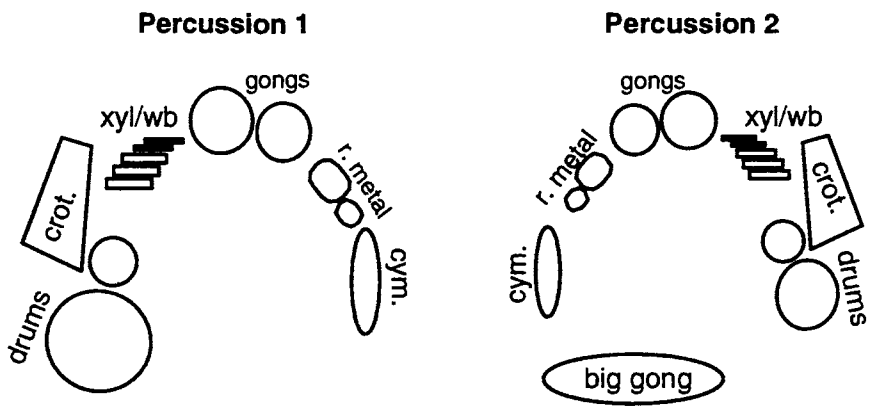


Prepared piano notes: indicated notes dampen either with a rubber covered clothes-peg, or by pressing a rubber object onto the strings by hand.

Sustain notes with middle pedal.

NOTE: all accidentals are cancelled by the bar line

Percussion



The two percussionists are spaced widely, at opposite sides of the stage area.

Xylophone: xylophone notes are used as pitched extensions to the woodblocks. Only the following pitches are used, these can be removed from the main instrument and placed with the woodblocks.

Percussion 1: *Percussion 2:*

Woodblocks:

Percussion 1: high low *Percussion 2:* high low

Crotales: both parts use two octaves. (In some performances, obtaining two full sets of crotales may be problematic. In this case, percussion part 2 can be substituted with a glockenspiel.)

Gongs:

Percussion 1:
two tuned gongs partially dampened.

Percussion 2:
twotuned gong partially dampened; one large gong or tam suspended, with deep tone colour.

Drums:

Percussion 1:
one small with high tone, 'hide' membrane to allow for 'scrape' sound; one large with very deep tone, no clear pitch

Percussion 2:
one small, one medium; each with 'hide membrane to allow for 'scrape' sound.

Cymbal: both parts approx. 18" cymbals. (Do not need to be identical).

Rusty metal: both parts with two rusty, or unusual shaped metal objects. (Each part should use objects which sound different).

General Percussion Notation:

Hit rim of drum

Obtain a thinner sound from the gong

Single 'swish' scrape

Textured 'circling' scrape

Types of sticks: 'stick' = wooden stick; 'mallet' = stick with a head; 'brushes' = metal brushes; 'arco' = with a bow

When 'soft yarn mallet and brush' are directed (bar 29), use the brush on the gongs as much as possible. When 'stick and mallet' are directed, (bar 382) attempt to use the stick on the gongs as much as possible.

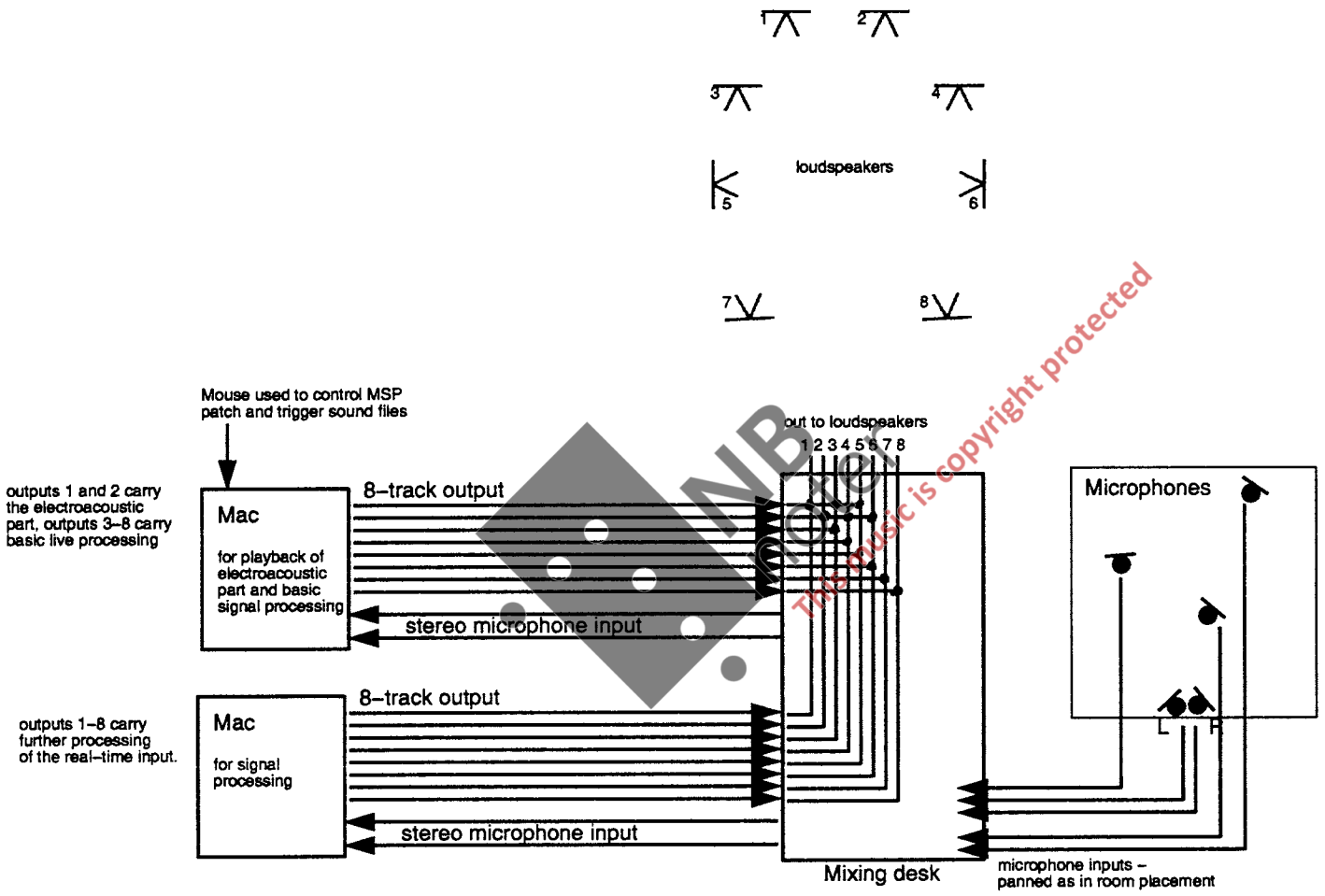
Technical Set–up

Version for two computers

Two versions of the live processing part have been designed. One version uses one macintosh computer and external effects processor, the other version uses two macintosh computers. The main difference between the two versions is in the sophistication of spatialisation techniques and of the cross synthesis of live materials. Two computers are required when using more sophisticated live techniques..

Hardware requirements (slowest options):

2 x Macintosh G3–350Mhz 120mb RAM with 8–track analogue sound card compatible with MAX/MSP software
(Note: using the computer's built–in analogue outputs are possible only for rehearsal. The audio output quality is not suitable for performance)



Relative levels of sound outputs on different loudspeaker combinations:

Electroacoustic part:	high volume on loudspeakers 1, 2, 3, 4, 6db lower on loudspeakers 5, 6, 7, 8. The result is a bias towards the front of the space.
Live computer processing:	Equal level on all loudspeaker. The result is an even distribution throughout the space.

Electroacoustic

Time 0'00 0'16

T1
MAX/MSP P1

♩= 75

Piccolo
8va
f
(fluttertongue)

Oboe

E flat Clarinet
8va
f
(fluttertongue)

Bassoon

Horn
mp
stac.
mp

Trumpet
mf
con sord.
mp

Trombone
mp
f

Tuba

Piano

percussion 1
hard mallets
Xylophone
Woodblocks
f
crotales
Gongs

percussion 2
hard mallets
Xylophone
Wooblocks
f
Cymbal
Gongs

Violin I
sul pont
p
f
p
f

Violin II
sul pont
p
f
p
f

Viola
sul pont
p
f
p
f

Cello
sul pont
p
f
p
f

Bass

Elec.

time

MAX/MSP

0'32

T2

0'48

Picc.

Ob.

Cl.

Bn.

(8va)

mf

f

3

Hn.

Tpt.

Trb.

Tuba

senza sord.

con sord.

mp

Pn.

Xyl.

Wbl.

Crot.

gongs

Cym.

Gongs

vln. I

Vln. II

Vla.

Vc.

Kb.

p

Elec.

(whisper)

time

1'04

MAX/MSP

T3

(8va)

Picc.

Ob.

Cl.

Bn.

Bass Flute

Bass clarinet

mp

p

mp

Hn.

Tpt.

Trb.

Tuba

mf

mf

senza sord.

f

f

mp

mf

Pn.

Xyl.

Wbl.

Crot.

gongs

Xyl.

Wbl.

Cym.

Gongs

vln. I

Vln. II

Vla.

Vc.

Kb.

non vibrato mp

non vibrato mp

non vibrato mp

non vibrato mp

Elec.

time 1'20 1'36

MAX/MSP T4

Bass.Fl. Ob. Bass Cl. Bn.

Hn. Tpt. Trb. Tuba

Pn.

Xyl. Wbl. Crot. gongs

Xyl. Wbl. Cym. Gongs

vln. I Vln. II Vla. Vc. Kb.

Elec.

time

1'52

MAX/MSP

33

Bass.Fl.

Ob.

Bass Cl.

Bn.

Hn.

Tpt.

Trb.

Tuba

Pn.

Xyl.

Wbl.

Crot.

gongs

Xyl.

Wbl.

Cym.

Gongs

vln. I

swaying

Vln. II

swaying

Vla.

swaying

Vc.

Kb.

(F to G#)

(C to Db)

Elec.

time 2'08 2'24

MAX/MSP T5 P1-off

Bass.Fl.

Ob.

Bass Cl.

Bn.

Hn.

Tpt.

Trb.

Tuba

Pn.

Xyl.

Wbl.

Crot.

gongs

Xyl.

Wbl.

Cym.

Gongs

vln. I

Vln. II

Vla.

Vc.

Kb.

Elec.

motion loosely co-ordinated with strings

time

2'40

2'56

T6

MAX/MSP

P2

Bass.Fl.

Ob.

Bass Cl.

Bn.

Hn.

Tpt.

Trb.

Tuba

Pn.

Xyl.

Wbl.

Crot.

gongs

Xyl.

Wbl.

Cym.

Gongs

vln. I

balance with tape

Vln. II

Vla.

balance with tape

Vc.

Kb.

Elec.

time

3'12

MAX/MSP

T7

Bass.Fl.

Ob.

Bass Cl.

Bn.

Hn.

Tpt.

Trb.

Tuba

pp

Pn.

Xyl.

Wbl.

Crot.

gongs

Xyl.

Wbl.

Cym.

Gongs

vln. I

Vln. II

Vla.

high, if not accurate pitch

Vc.

p

Kb.

p

Elec.

time

3'28

3'41

P2-off (auto fade)

MAX/MSP

♩=60

65

Bass.Fl.

Ob.

Bass Cl.

Bn.

p

p

Hn.

Tpt.

Trb.

Tuba

Pn.

Xyl.

Wbl.

Crot.

gongs

Xyl.

Wbl.

Cym.

Gongs

vln. I

ppp

Vln. II

Vla.

Vc.

Kb.

Elec.

time 3'53 4'01 4'09 4'17

MAX/MSP T8 P3 P3 off T9 T10

Bass.Fl. Ob. Bass Cl. Bn.

Hn. Tpt. Trb. Tuba

Pn.

Xyl. Wbl. Crot. gongs

Xyl. Wbl. Cym. Gongs

vln. I Vln. II Vla. Vc. Kb.

Elec.

text

text

time

4'25

4'33

4'41

4'49

MAX/MSP

T11

T12

(plus large reverb.)

Bass.Fl.

Ob.

Bass Cl.

Bn.

Hn.

Tpt.

Trb.

Tuba

Pn.

Xyl.

Wbl.

Crot.

gongs

metal sticks

crotales

Xyl.

Wbl.

Cym.

Gongs

nat.

metal sticks

vln. I

Vln. II

Vla.

Vc.

Kb.

col legno

nat.

sul pont

pizz.

arco

col legno

arco

sul pont

col legno

arco

sul pont

Elec.

text

time 4'57 5'00 5'04 5'08 5'10

MAX/MSP T13 P4 (decrease desk levels on all loudspeakers to 'just heard')

♩= 120

Bass.Fl. 89 *mf* *p* *mf*

Ob. 89

Bass Cl. 89

Bn. 89

2" 8"

Hn. 89

Tpt. 89

Trb. 89

Tuba 89

Pn. 89 8va *mp*

Ped. (on all until ✱)

Xyl. 89

Wbl.

Crot. *mp*

gongs

Xyl. 89 *mp*

Wbl.

Cym.

Gongs

vln. I 89 *arco* *p* *pizz.* *mp*

Vln. II 89 *arco* *p* *pizz.* *mp*

Vla. 89

Vc. 89

Kb. 89

Elec.

time 5'14 5'18 5'22 5'26

MAX/MSP T14

Fl. Ob. Cl. Bn.

10" 10"

Hn. Tpt. Trb. Tuba

8va

p

Pn.

Percussion1 Crot.

Percussion 2 Crot.

Guitar

mp

mp

Vln I Vln II Vla. Vc. Kb.

Elec.

time 5'30 5'33 5'37 5'41 5'45

MAX/MSP

Fl. 105 *pp*

Ob. 105 *pp*

Cl. 105 *pp*

Bn. 105 *pp*

3" 1 4" 8" 2

Hn. 105 breath only *p* con sord. *p*

Tpt. 105 breath only *p* con sord. *p*

Trb. 105 breath only *p* con sord. *p*

Tb. 105 breath only *p* con sord. *p*

Pn. 105 *mf*

Crot. 105 *mf*

Crot. 105 *mf*

Gtr. 105 *f*

Vln I 105 *arco* *mf* *mp*

Vln. II 105 *pizz.* *mf* *mp*

Vla. 105 *pizz.* *mf* *mp*

Vc. 105 *pizz.* *mp*

Kb. 105

Elec.

time 5'49 5'53 5'57 6'01

P4-OFF

MAX/MSP

Fl.

Ob.

Cl.

Bn.

Hn.

Tpt.

Trb.

Tb.

Pn.

ped 2. throughout
second piano staff

piano always clear, but not
dominating

Crot.

Crot.

Gtr.

guitar always clear, but not
dominating.

mf

Vln I

tr

con sord. *p*

Vln. II

Vla.

Vc.

mp

Kb.

Elec.

time 6'05 6'09 6'13 6'17

MAX/MSP

Fl. 121 *p*

Ob. 121 *p*

Cl. 121 *p*

Bn. 121 *p*

Hn. 121

Tpt. 121

Trb. 121

Tb. 121

Pn. 121 *mp*

Crot. 121

Crot. 121

Gtr. 121 *f*

Vln I 121

Vln. II 121 *arco con sord.* *p*

Vla. 121

Vc. 121 *p*

Kb. 121

Elec.

time 6'21 6'25 6'29 6'33

MAX/MSP

Fl. 129

Ob. 129

Cl. 129

Bn. 129

Hn. 129

Tpt. 129

Trb. 129

Tb. 129

Pn. 129

only split chords where necessary

Crot. 129

Crot. 129

Gtr. 129

Vln I 129

Vln. II 129

Vla. 129

Vc. 129

Kb. 129

Elec.

time

MAX/MSP

6'37 6'41 6'45 6'49

I15

Fl. Ob. Cl. Bn.

Hn. Tpt. Trb. Tb.

Pn.

Crot. Crot.

Gtr.

Vln I Vln. II Vla. Vc. Kb.

137

pp

I IV

Elec.

accurate timing required for tape sync.

time 6'53 7'01 7'09

MAX/MSP T16 P5-on

♩= 60

Fl. 145

Ob. 145

Cl. 145

Bn. 145

Hn. 145 senza sord. mf sffz

Tpt. 145 senza sord. mf sffz

Trb. 145 senza sord. mf sffz mp f

Tb. 145 senza sord. mf sffz mp f

Pn. 145 145

Crot. 145

Crot. 145

Gtr. 145 mf ff

Vln I 145

Vln. II 145

Vla. 145

Vc. 145

Kb. 145

elec.

Clarinet sound

rough strings sound

Time 7'13 7'21 7'29 7'37 7'40

MAX/MSP

153 Fl. flute

153 Ob.

153 Cl. b flat clarinet

153 Bn.

153 Hn.

153 Tpt.

153 Trb.

153 Tuba

153 Pn.

percussion 1 Rusty metal

153 Wbl.

153 Crot.

153 Cymbal

153 Gongs

percussion 2 Rusty metal

153 Wbl.

153 Crot.

153 Cym.

153 Gongs

hard mallets

hard mallets

153 Gtr.

153 Vln. I

153 Vln. II

153 Vla.

153 Vc.

153 Kb.

arco

elec.

Bassoon sound

melodic sways

F#

time

7'46 7'49 7'57 8'05 8'13

MAX/MSP

I17

Fl.

Ob.

Cl.

Bn.

Hn.

Tpt.

Trb.

Tuba

Pn.

Rm.

Wbl.

Crot.

Cym.

Gongs

Rm.

Wbl.

Crot.

Cym.

Gongs

Gtr.

Vln. I

Vln. II

Vla.

Vc.

Kb.

stac. nat. brushes just audible

elec.

time 8'21 8'29 8'37 8'45

MAX/MSP

Fl.

Ob.

Cl.

Bn. *p*

Hn.

Tpt.

Trb. *con sord.* *p*

Tuba

Pn.

Rm.

Wbl.

Crot.

Cym.

Gongs

Rm.

Wbl.

Crot.

Cym.

Gongs

Gtr.

Vln. I *f* *mp* *f* *mp* *p* *con sord.* *p*

Vln. II *mp* *f* *mf* *p* *con sord.* *p*

Vla. *mp* *f* *f* *mp* *con sord.* *p*

Vc. *f* *mp* *f* *p* *con sord.* *p*

Kb. *f* *mp* *f* *mp* *con sord.* *p*

elec.

SILENCE

time 8'53 9'01 9'09 9'17

MAX/MSP

Fl. Ob. Cl. Bn.

Hn. Tpt. Trb. Tuba

Pn.

Rm. Wbl. Crot. Cym. Gongs

Rm. Wbl. Crot. Cym. Gongs

Gtr.

Vln. I Vln. II Vla. Vc. Kb.

elec.

time 9'25 9'33 9'41 9'49

MAX/MSP LIVE FADE MSP AT DESK (Tape part normal levels) T18

Fl. 185

Ob. 185

Cl. 185 *pp*

Bn. 185

Hn. 185

Tpt. 185

Trb. 185 *ppp*

Tuba 185

Pn. 185

Rm. 185

Wbl. 185

Crot. 185

Cym. 185

Gongs 185

Rm. 185

Wbl. 185

Crot. 185

Cym. 185

Gongs 185

Gtr. 185 *mf* *mp*

Vln. I 185

Vln. II 185

Vla. 185

Vc. 185

Kb. 185

elec.

time 9'57 10'05 10'13 10'21

MAX/MSP T19 T20

Beat frequency ~ 3Hz

Fl. 193 sfz pp pp

Ob. 193

Cl. 193 sfz pp pp

Bn. 193

Hn. 193

Tpt. 193 con sord. pp

Trb. 193

Tuba 193

Pn. 193 sfz

Rm. 193

Wbl. 193

Crot. 193 arco

Cym. 193

Gongs 193

Rm. 193

Wbl. 193

Crot. 193 arco

Cym. 193

Gongs 193

Gtr. 193

Vln. I 193 non vibrato pizz.

Vln. II 193 non vibrato pp

Vla. 193 non vibrato pp

Vc. 193 non vibrato

Kb. 193 non vibrato

elec.

time 10'29 10'37 10'45 1053

MAX/MSP T21

Beat frequency ~ 7Hz

Fl. 201 *pp*

Ob. 201

Cl. 201 *pp*

Bn. 201 *pp*

Hn. 201 *con sord.* *pp*

Tpt. 201

Trb. 201 bass trombone *con sord.* *pp*

Tuba 201

Pn. 201

Rm. 201 *nat.* *arco* *nat.* *arco*

Wbl. 201

Crot. 201

Cym. 201

Gongs 201

Rm. 201

Wbl. 201

Crot. 201 *nat.* *arco* *nat.* *arco*

Cym. 201

Gongs 201

Gtr. 201

Vln. I 201 *arco*

Vln. II 201

Vla. 201

Vc. 201

Kb. 201

elec.

time 11'01 11'09 11'17 11'25

MAX/MSP

Beat frequency ~ 20Hz

Fl. 209 *p*

Ob. 209 *p* *f* *mf*

Cl. 209 *p* *f* *pp* *mf*

Bn. 209 *p*

Hn. 209 *p* *mp*

Tpt. 209

Trb. 209 *p*

Tuba 209

Pn. 209

Rm. 209

Wbl. 209

Crot. 209 *p* *nat.* *arco* *mf*

Cym. 209

Gongs 209

Rm. 209

Wbl. 209

Crot. 209 *p* *nat.* *arco* *mf*

Cym. 209

Gongs 209

Gtr. 209

Vln. I 209 *p* *mp* *mf*

Vln. II 209 *p* *mp* *mf*

Vla. 209 *p* *mf*

Vc. 209 *p* *mf*

Kb. 209 *p* *mf* *senza sord.*

elec.

time 11'33 11'41 11'49 11'57

MAX/MSP

217

Fl.

Ob.

Cl. *mf*

Bn.

f

sfz

Hn. *mf*

Tpt. *con sord.* *f*

Trb. *f*

Tuba *con sord.* *f*

Pn.

Rm.

Wbl.

Crot.

Cym.

Gongs

Rm.

Wbl.

Crot.

Cym.

Gongs

Gtr.

Vln. I *senza sord.* *cresc.* *ff*

Vln. II *senza sord.* *cresc.* *ff*

Vla. *senza sord.* *f*

Vc. *senza sord.* *f*

Kb. *f*

Elec.

time 12'01 12'11

T22 P5-OFF P6a

MAX/MSP

♩ = 120

Fl. 225 *mf* *pp* *f* *pp* *mf* *p*

Ob. 225 *mf* *pp* *f* *pp*

Cl. 225 bass Cl b flat cl N *sfz*

Bn. 225 *mf* *pp*

Hn. 225

Tpt. 225

Trb. 225

Tb. 225 *con sord.* *p*

Pn. 225 *f*

percussion 1

Rm. 225 *mp* wr *arco*

Wbl. 225

Drums 225

Cym. 225

gongs 225

percussion 2

Rm. 225 *mp* *arco* hard sticks

Wbl. 225

Drums 225

Cym. 225

Gongs 225

Vln. I 225 *sul pont* *f* *pp* *mf*

Vln. II 225 *sul pont* *f* *pp* *mp* pizz.

Vla. 225 *mp* pizz.

Vc. 225 *mp* pizz.

Kb. 225 *con sord.* *pp* *mp* pizz.

Elec.

time

MAX/MSP

p66 T23

12'21

12'31

Fl.

Ob.

Cl.

Bn.

Hn.

Tpt.

Trb.

Tb.

Pn.

knock inside piano

perc.

Rm.

Wbl.

Drums

Cym.

gongs

Gongs

hard sticks

Vln. I

Vln. II

Vla.

Vc.

Kb.

arco

con sord.

senza sord.

Elec.

(main articulations only).

time

12'41

MAX/MSP

T24 P6c

Fl.

Ob.

Cl.

Bass Cl.

Bn.

Hn.

Tpt.

Trb.

Tb.

Pn.

perc.

Rm.

Wbl.

Drums

Cym.

gongs

Rm.

Wbl.

Drums

Cym.

Gongs

Vln. I

Vln. II

Vla.

Vc.

Kb.

Elec.

time 12'49 12'57

MAX/MSP P6d T25 T26 T27

♩= 150

Fl. 249 *mf* *mp* *p*

Ob. 249 *mf* *mp*

Cl. 249 *mp* *mp*

Bn. 249 *mf* *p* *sffz* *mp*

Hn. 249

Tpt. 249

Trb. 249

Tb. 249

Pn. 249 *mf*

perc. 249

Rm. 249

Wbl. 249

Drums 249 soft beaters

Cym. 249

gongs 249

Rm. 249

Wbl. 249

Drums 249 hard sticks

Cym. 249

Gongs 249

Vln. I 249 *col legno* *f* *pizz.* *col legno*

Vln. II 249 *col legno* *f* *pizz.* *col legno*

Vla. 249 *col legno* *f* *pizz.* *col legno*

Vc. 249 *col legno* *f* *col legno*

Kb. 249 *col legno* *f*

Elec.

time 13'03.4 13'09.4 13'15.4

MAX/MSP T28

♩= 120 ♩= 150

257

Fl. *mp* *p* *mf*

Ob. *mp* *p* *mf*

Cl. *mp* *stacc.* *p* *mf* *mf*

Bn. *mp* *stacc.* *p* *f* *mf*

Hn.

Tpt.

Trb.

Tb.

Pn. *mf*

perc.

Rm.

Wbl.

Drums hard sticks *f*

Cym.

gongs

Rm.

Wbl.

Drums hard sticks

Cym.

Gongs *f*

Vln. I *arco* *mp* *mf* *pizz.* *mp* *f* *pizz.*

Vln. II *arco* *mp* *mf* *mp* *f* *pizz.*

Vla. *arco* *mf* *mp* *f* *pizz.*

Vc. *arco* *mf* *mp* *f* *pizz.*

Kb. *arco* *mf* *pizz.* *mp* *f* *pizz.* *pizz.* *arco*

Elec.

time

MAX/MSP

T29

13'23.4

T30

♩= 120

265

Fl.

Ob.

Cl.

Bn.

tr

sfz

3

p

p

p

Hn.

Tpt.

Trb.

Tb.

p

f

p

Pn.

perc.

Rm.

Wbl.

Drums

Cym.

gongs

pp

Rm.

Wbl.

Drums

Cym.

Gongs

pp

3

Vln. I

Vln. II

Vla.

Vc.

Kb.

col legno

mp arco

arco

mp

Elec.

time

MAX/MSP

13'33.4

P6 off

13'37.4

P7

T31

P7 off

♩=120

♩ = 150

Fl.

Ob.

Cl.

Bn.

Hn.

Tpt.

Trb.

Tb.

con sord.

Pn.

perc.

Rm.

Wbl.

Drums

Cym.

gongs

Rm.

Wbl.

Drums

Cym.

Gongs

Vln. I

Vln. II

Vla.

Vc.

Kb.

arco

sul pont

Elec.

time

MAX/MSP

13'52.2

T32

Fl.

Ob.

Cl.

Bn.

Hn.

Tpt.

Trb.

Tb.

Pn.

perc.

Rm.

Wbl.

Drums

Cym.

gongs

Rm.

Wbl.

Drums

Cym.

Gongs

Vln. I

Vln. II

Vla.

Vc.

Kb.

Elec.

time 14'02.2 14'12.2

MAX/MSP

289

Fl. *mp* *f*

Ob. *f* *mp*

Cl. b flat cl. *mf*

Bn. *mf*

Hn. (as fast as possible) *con sord.* *mp*

Tpt. *con sord.* *mp*

Trb.

Tb. *con sord.* *mp*

Pn. *pp* *mf*

perc.

Rm.

Wbl.

Drums

Cym.

gongs *mp*

Rm.

Wbl.

Drums

Cym.

Gongs *mp*

Vln. I

Vln. II

Vla.

Vc.

Kb.

Elec.

time

MAX/MSP

14'22.2

14'32.2

297

Fl.

Ob.

Cl.

Bn.

Hn.

Tpt.

Trb.

Tb.

Pn.

perc.

Rm.

Wbl.

Drums

Cym.

gongs

Gongs

Vln. I

Vln. II

Vla.

Vc.

Kb.

mp *mf* *f*

Elec.

time

correction to 14'42
14'42.2

MAX/MSP

T33

Fl.

Ob.

Cl.

Bn.

Hn.

Tpt.

tenor trombone

Trb.

Tb.

Pn.

perc.

Rm.

Wbl.

Drums

Cym.

gongs

soft mallets

Gongs

Vln. I

Vln. II

Vla.

Vc.

Kb.

senza sord.

pizz.

Elec.

time

14'52

15'02

MAX/MSP

313

Fl.

Ob.

Cl.

Bn.

f

mp

Hn.

Tpt.

Trb.

Tb.

Pn.

perc.

Rm.

Wbl.

Drums

Cym.

gongs

mp

Gongs

arco

p

f

Vln. I

Vln. II

Vla.

Vc.

Kb.

con sord.

ppp

nat.

arco

f

Elec.

time

15'12

MAX/MSP

Fl.

Ob.

Cl.

Bn.

mf *p* *mf* *fffz*

Hn.

Tpt.

Trb.

Tb.

Pn.

perc.

Rm.

Wbl.

Drums

Cym.

gongs

Rm.

Wbl.

Drums

Cym.

Gongs

Vln. I

Vln. II

Vla.

Vc.

Kb.

nat. *nat.* *p*

Elec.

time 15'22

MAX/MSP

Fl. 329

Ob. 329

Cl. 329

Bn. 329

Hn. 329

Tpt. 329

Trb. 329

Tb. 329

Pn. 329

329

perc. 329

Rm. 329

Wbl. 329

Drums 329

Cym. 329

gongs 329

Rm. 329

Wbl. 329

Drums 329

Cym. 329

Gongs 329

Vln. I 329

Vln. II 329

Vla. 329

Vc. 329

Kb. 329

tr (f#)

time
MAX/MSP
15'32
15'42
P1
T34
Fl.
Ob.
Cl.
Basn.
Hn.
Trpt.
Tbn.
Tb.
Pn.
percussion 1
Xyl.
Wbl.
rm.
drums
cymbal
gongs
percussion 2
xyl.
wb.
rm.
drums
cymbal
gongs
vln.I
vln.II
Vla.
Vc.
Kb.
mp
p
pp
tr (f#)
nat.
3

time
MAX/MSP
15'52
T35
16'02
342
Fl.
Ob.
Cl.
Basn.
mp
3
Hn.
Trpt.
Tbn.
Tb.
con sord.
mp
Pn.
f
p
Xyl.
Wbl.
rm
drums
cymbal
gongs
hard mallets
xyl
wb
vln. I
Vln. II
Vla.
Vc.
Kb.
nat.
pp

time

MAX/MSP

16'12

T36

Fl.

Ob.

Cl.

Basn.

Hn.

Trpt.

Tbn.

Tb.

Pn.

Xyl.

Wbl.

rm

drums

cymbal

gongs

xyl

wb

rm

drums

cymbal

gongs

vln. I

Vln. II

Vla.

Vc.

Kb.

mf

mp

pp

con sord.

brushes

Flute

time

MAX/MSP

16'22

I37

16'32

Fl.

Ob.

Cl.

Basn.

Hn.

Trpt.

Tbn.

Tb.

Pn.

Xyl.

Wbl.

rm

drums

cymbal

gongs

xyl

wb

rm

drums

cymbal

gongs

vln. I

Vln. II

Vla.

Vc.

Kb.

time

16'42

MAX/MSP

Fl.

Ob.

Cl.

Basn.

mp

Hn.

Trpt.

Tbn.

Tb.

Pn.

ff

Xyl.

Wbl.

rm

drums

cymbal

gongs

sticks

mp

xyl

wb

rm

drums

cymbal

gongs

mp

sticks

vln. I

Vln. II

Vla.

Vc.

Kb.

senza sord.

mp

p

time
MAX/MSP
Fl.
Ob.
Cl.
Basn.
Hn.
Trpt.
Tbn.
Tb.
Pn.
Xyl.
Wbl.
rm
drums
cymbal
gongs
xyl
wb
rm
drums
cymbal
gongs
vln. I
Vln. II
Vla.
Vc.
Kb.

16'52
17'02
T38
senza sord.
senza sord.
senza sord.
dampen manually with rubber
mp

time

MAX/MSP

17'12

17'22

Fl.

Ob.

E flat clarinet

Cl.

Basn.

Hn.

Trpt.

Tbn.

Tb.

senza sord.

Pn.

Xyl.

Wbl.

rm

drums

cymbal

gongs

hard mallets

xyl

wb

rm

drums

cymbal

gongs

stick + hard mallet

vln. I

Vln. II

Vla.

Vc.

Kb.

sim.

time

MAX/MSP

17'32

T39

T40

Fl.

Ob.

Cl.

Basn.

Hn.

Trpt.

Tbn.

Tb.

Pn.

Xyl.

Wbl.

rm

drums

cymbal

gongs

xyl

wb

rm

drums

cymbal

gongs

vln. I

Vln. II

Vla.

Vc.

Kb.

sfz

P2

time
MAX/MSP
17'42
17'52
T41
T42
Fl.
Ob.
Cl.
Basn.
Hn.
Trpt.
Tbn.
Tb.
Pn.
Xyl.
Wbl.
rm
drums
cymbal
gongs
xyl
wb
rm
drums
cymbal
gongs
vln. I
Vln. II
Vla.
Vc.
Kb.
398
sfz
P2

time

MAX/MSP

18'02

406

Fl.

Ob.

Cl.

Basn.

Hn.

Trpt.

Tbn.

Tb.

Pn.

P2

Xyl.

Wbl.

rm

drums

cymbal

gongs

xyl

wb

rm

drums

cymbal

gongs

vln. I

Vln. II

Vla.

Vc.

Kb.

ff

time 18'12 18'22

MAX/MSP

Fl.

Ob.

Cl.

Basn.

Hn.

Trpt.

Tbn.

Tb.

Pn.

P2 P2 P2 P2 P2

Xyl.

Wbl.

rm

drums

cymbal

gongs

xyl

wb

rm

drums

cymbal

gongs

vln. I

Vln. II

Vla.

Vc.

Kb.

time

MAX/MSP

18'32

T43

Electroacoustic part continues
to end (~20'10)

Fl.

Ob.

Cl.

Basn.

Hn.

Trpt.

Tbn.

Tb.

Pn.

P2

Xyl.

Wbl.

rm

drums

cymbal

gongs

xyl

wb

rm

drums

cymbal

gongs

vln. I

Vln. II

Vla.

Vc.

Kb.