Hypnagogia

for nine musicians and electronics

Scott Rubin

2013

duration: 15 minutes

Hypnagogia

for nine musicians and electronics
composed in 2013 for the Contemporary Music Ensemble at McGill University

Scott Rubin

Program note:

Hypnagogia refers to the experience of transitional states to and from sleep. During sleep, our brain traverses a predictable cycle from consciousness to rapid eye movement (REM) sleep while transitioning through the intermediary stages of non-REM cycles. Through the course of a night, our brains perform this cycle repeatedly, each time altering the periodicity and pattern of the stages.

The work's structure loosely interprets and highlights the fluctuating periodicity of the sleep cycle, and the musical identity of each stage is twisted and morphed through the course of the piece. In the work, the ensemble is broken up into three spatialized trios, each of which represents a sleep stage. The material itself is not inspired by sleep, but the sonic behavior of each stage is developed according to the aforementioned cycles.

Instrumentation:

Flute
Bass Clarinet in B-flat

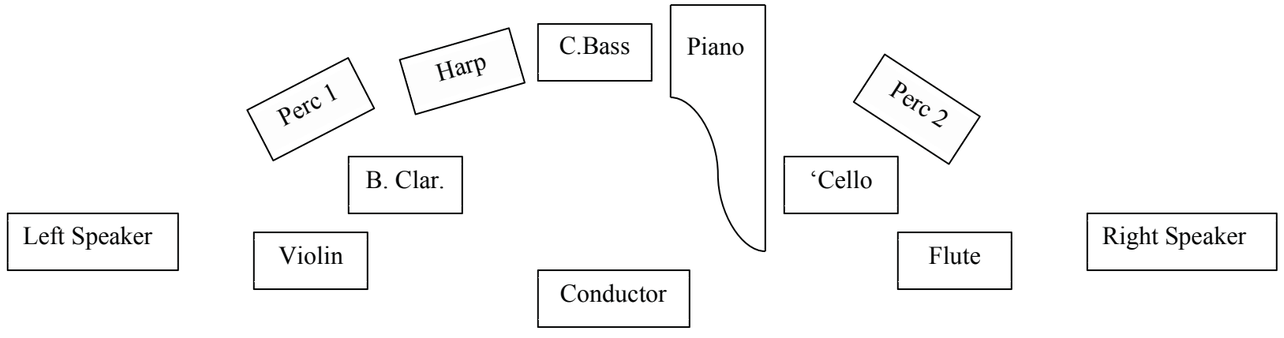
2 Percussion 1: cajon set (cajon (may be mounted), mounted guiro, 2 temple blocks of different pitch), auxiliary percussion: bass drum, 2 suspended cymbals of different pitch
2: metal set (mixing bowl struck with kick pedal, small gong mounted to a small tom and struck with a kick pedal, metal sheet, cymbal, and brake drum), auxiliary percussion: splash cymbal, suspended cymbal, ride cymbal, spring drum
Piano with wax paper, wallet, plastic card, heavy textbook to mute lowest register (D#1 to B1)
Harp with wax paper, crumpled copy paper

Violin
Violoncello
Contrabass with wax paper

Electronics: cued soundfiles diffused to stereo loudspeakers

Score in C, contrabass will sound an octave lower than written,
bass clarinet will sound a major 9th lower than written
Duration: 15 minutes

Stage setup: The orchestration of *Hypnagogia* focuses on the interaction of three spatialized trios: piano + harp + contrabass // violin + bass clarinet + percussion 1 // flute + cello + percussion 2



Configuration of electronics:

The electronics consist of 29 stereo sound files triggered during the piece by a computer running Max/MSP. The program and sound files are available from the composer. According to the cues written in the score, these sound files are triggered by the conductor using a foot pedal. Click tracks are used with certain sound files. These are triggered simultaneously through Max/MSP, but should be configured to be played into headphones worn by the conductor. A technician stationed at a mixing desk in the audience is required to adjust the sound file levels accordingly and diffuse the amplification of the cello and contrabass.

The contrabass and cello should be subtly amplified using contact microphones whose signal is sent to a mixing table in the center of the hall. The speaker diffusing the sound should be placed near the musicians' chair facing the audience, and the amplification should NOT be sent to the main speakers diffusing the sound files. Instructions dictation amplification are notated in the score. When setting levels, the cello should be balanced with the percussion and flute at rehearsal C, and the bass should be balanced with both percussionists at rehearsal S.

Requirements: 1 computer, audio interface, mixer, 2 loud speakers, ear buds for the conductor, 2 contact microphones, 2 smaller speakers for diffusion of the amplified instruments (Mackie SRM-150s were used for the premiere)

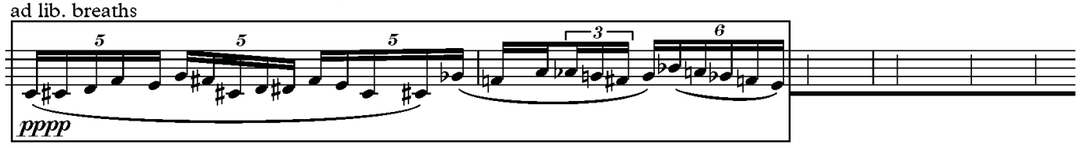
Performance notes:

As mentioned in the program notes, each sleep stage is represented by a trio of instruments: piano/harp/contrabass; violin/bass clarinet/percussion 1; and flute/cello/percussion 2. In addition to operating within the collective ensemble, the musicians in each trio should strive to function together as an intimate chamber group.

There are passages in the score that call for the musician to improvise rhythm. In these cases, the music is written without rests. While it is necessary for the musician to keep track of their place in the music, they need not be concerned with the meter, but should instead perform *free* of the meter.

Performance symbols:

All: very breathy sound, improvise random fingerings in lower register, fast slurred fluctuating chromatic movement, ad lib. breaths



Box notation: improvised in the style of the notated music for the specified amount of time. Follow the notated instructions dictating changes to the playing style. Specific pitches do not matter unless specified. Instead, focus on the general character of the improvisation.

Accidentals carry through the bar and are specific to the octave. All trills are half-step unless specified otherwise.

Upbeat or pickup beat from conductor (during unmeasured passages) *always followed by:* Downbeat from conductor

Mute all resonance

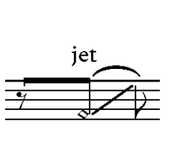
l.v. Let vibrate/resonate

Winds:

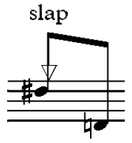
□ ⟷ R ⟷ gr

breathy tone regular tone growl tone (vocalize into the instrument to produce a dark, guttural, and gritty timbre.

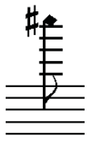
Flute: For detailed explanations of techniques, please refer to “Mats Möller – New sounds for flute” at http://www.sfz.se/flutetech/ or “Extended techniques for flute” at http://www.flutecolors.com/



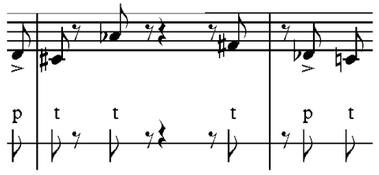
jet whistle



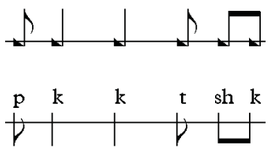
slap tongue



diamond notehead
breathy harmonic
half-noise



Beatboxing: always with a percussive and breathy tone, voice the specified consonants into flute. Sometimes, the scores calls for improvised consonants.



Pitchless beatboxing

tongue ram

Short, percussive, nonpitched burst of air

Bass clarinet:

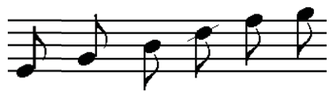
growl multiphonic

All other extended playing techniques are explained in the score.

Percussion:

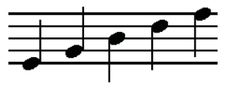
Cajon set notation:

- high temple block
- low temple block
- guiro slide
- snare slap
- ghost tone
- bass slap



Metal set notation:

- metal sheet
- cymbal
- brake drum
- mixing bowl
- small gong



About the metal set: the small gong should be mounted to a small tom, and the gong (like the mixing bowl) should be struck with a kick pedal. The metal sheet, cymbal, and brake drum should all be placed on a table and muted with a towel or cloth. The cymbals should be mounted over the metal set. In short, the entire setup should mimic the appearance of a drum kit.

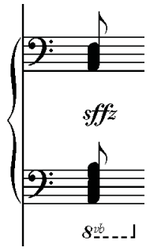
Piano:

Scrape horizontally over the white keys with the indicated object.

Scrape horizontally over the black keys with the indicated object.

Knock on the top of the piano with either palm (p) or knuckle (k).

Harp:



Thunder effect: open hand strike in the lowest register. Half-pedal one of the strings in the register to create a dark metallic buzz. Be sure to follow instructions regarding resonance.

Knock on the body of the harp with either palm (p) or knuckle (k).

Scrape strings vertically with crumpled paper in the right hand. Scrapes may be long or short, depending on the rhythm.

Half-pedal: position the pedal so the string vibrates harshly against the tuning mechanism. Should produce a buzzy metallic sound.

Foot stomp

Strings: Bow placement: molto sul ponticello - - - sul ponticello - - - normal - - - sul tasto
MSP SP N ST

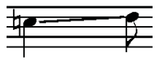
Bow pressure: flautando/airy tone - - - regular - - - scratch tone
□ R ■

Play highest note possible on specified string.

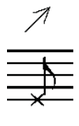
Mute the specified string with the left hand at the approximate note. If notehead is on an open string, the string should be generally muted

cl Col lengo (tratto)

Slide up or down from a note after the attack. Length of the slide does not matter, just as long as it's more than a whole step.



Glissando from one note to the next. If there is no slur, articulate the second note.

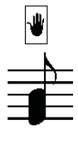


Swipe the bow vertically down the string col lengo tratto.

Light left-hand finger pressure

clb Col lengo battuto, applies to all notes until stated otherwise.

Action is done behind the bridge. This symbol only applies to the note it is placed on.



Slap muted strings on fingerboard with open hand

ric. Ricochet bow

s Strum pizzicato using thumb

Bartok pizzicato

jeté Thrown bow. This symbol only applies to the note it is placed on.

for the Contemporary Music Ensemble at McGill University

Hypnagogia

Scott Rubin
January - August 2013

SCORE IN C

Flute
Bass Clarinet in B♭
Percussion 1
Percussion 2
Piano
Harp
Violin
Violoncello
Contrabass
Electronics

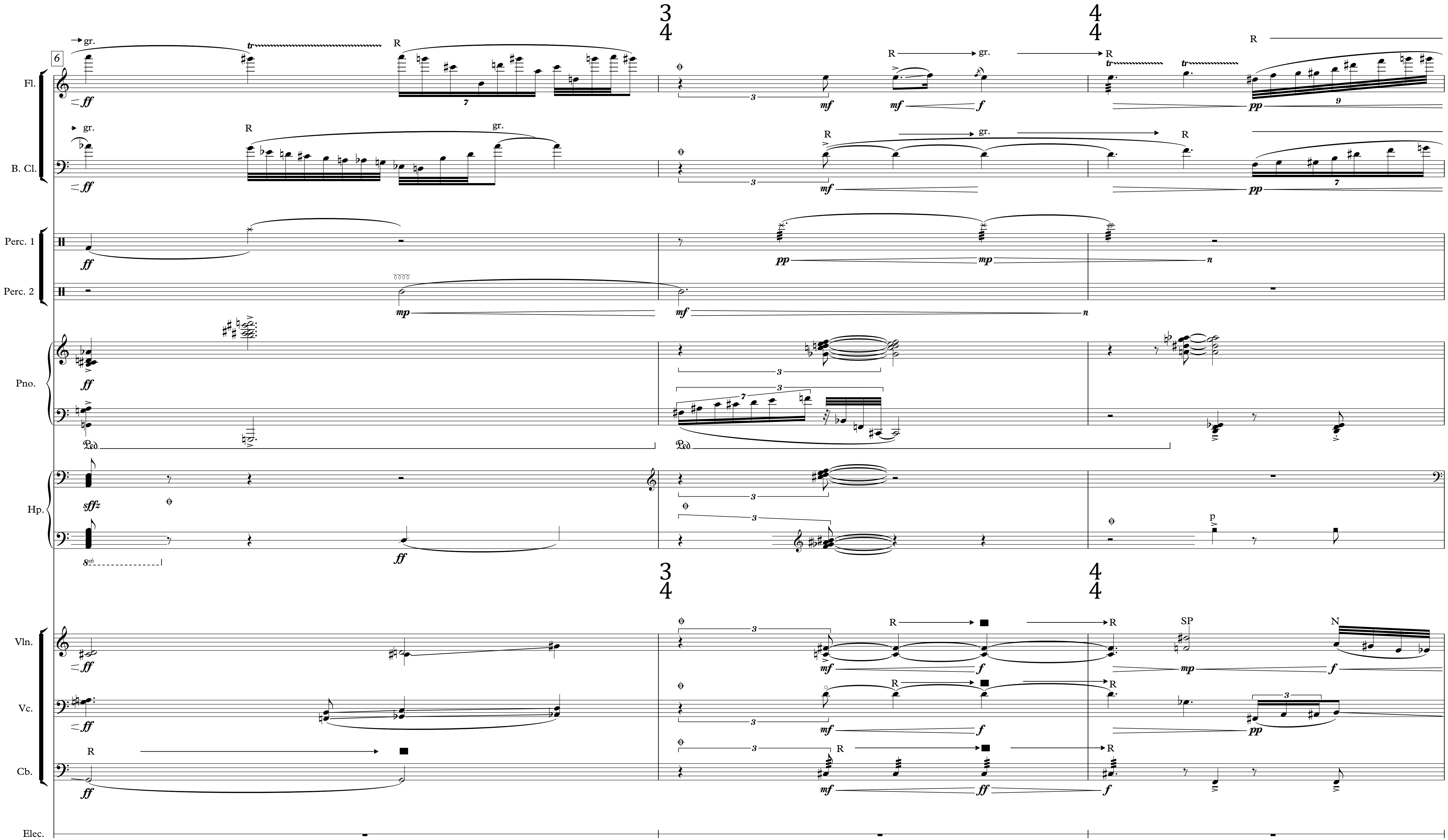
aux perc

beaters sus. cym.
B.D.
rotating spring drum
higher pitched cymbal

All rests are silent unless specified otherwise.

paper scrape
scrape with R
mute with L

pizz.
arco


6
Fl.
B. Cl.
Perc. 1
Perc. 2
Pno.
Hp.
Vln.
Vc.
Cb.
Elec.
gr.
tr
R
SP
N
Ped.
ff
sffz
mf
f
pp
mp
n

9

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

Vc.

Cb.

Elec.

gr.

R

Cajon set

hands

Metal set

hard mallets

Ped.

12

A

♩ = 192

Fl.

B. Cl.

Perc. 1

Perc. 2

aux perc

beaters

Pno.

slam lid down

silently open lid

prepare lowest section of piano with heavy book

gradually raise pedal

Hp.

h-p

Vln.

Vc.

Cb.

put bow down

pizz.

Elec.

BASS MIC ON

CUE 1

22

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

plastic card

ff

hit top of piano lid with palm (p)

p

f

(prepared notes)

slam lid down

ff

silently open lid

p

knuckle (k)

Ped.

gradually raise pedal

p

Hp.

ff

ff

h-p

ff

Vln.

Vc.

Cb.

CUE 2

Elec.

32

B

♩ = ♪. ♩ = 144

Fl.

B. Cl.

Improvise rhythm
based on position of note
within the bar.

ppp

p

mf

tr

breath

key clicks

Perc. 1

Cajon set

finger nails
always play softer than
violin and bass clarinet

ppp

f

ppp

Perc. 2

Pno.

(same pulse as ♩ = 192, but transcribed in ♩ = 144)

Hp.

(same pulse as ♩ = 192, but transcribed in ♩ = 144)

Vln.

improvise rhythm
based on position of note
within the bar

p

mp

mf

SP

Vc.

Cb.

(same pulse as ♩ = 192, but transcribed in ♩ = 144)

mp

Elec.

CUE 3

39

Fl.

B. Cl.

(play written rhythms)

gr.

(improvised rhythm)

pitched slap

(play written rhythms)

gr.

(improvised rhythm)

Perc. 1

Perc. 2

splash cymbal l.v.

Pno.

Hp.

Vln.

N

SP

(play written rhythms)

MSP

N

(improvised rhythm)

N

jété

(play written rhythms)

jété

(improvised rhythm)

Vc.

Cb.

BASS MIC OFF

Elec.

46

C

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

Vc.

Cb.

Elec.

unpitched slap

breathy sound

flz.

slap

sh

f

t

k

Metal set

clb

N

CUE 4

CELLO MIC ON

53

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

Vc.

Cb.

Elec.

jet

flz.

slap

flz.

slap

jet

k t

k

ch k p

p t

t

sh t k

k

t

(tr)

SP

cl

clb

cl

clb

clb

clb

jété

cl

clb

jété

clb

61

5/8 4/4 **D**

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

5/8 4/4

Vln.

Vc.

Cb.

Elec.

CUE 5

72

Fl.

B. Cl.

Improvise rhythm
based on position of note
within the bar.

Perc. 1

Perc. 2

always play softer than
violin and bass clarinet

Pno.

Hp.

Vln.

Vc.

Cb.

Elec.

improvise rhythm
based on position of note
within the bar

80

E

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

Vc.

Cb.

Elec.

jet

flz.

slap

h-p

jété

clb

cl

strike body with palm

CUE 6

87

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

Vc.

Cb.

Elec.

jet

flz.

slap

sh t t ch k p

t sh t

k t

ch k p

plastic card

(prepared note)

h-p

strike body with palm

scrape with nail

strike with palm

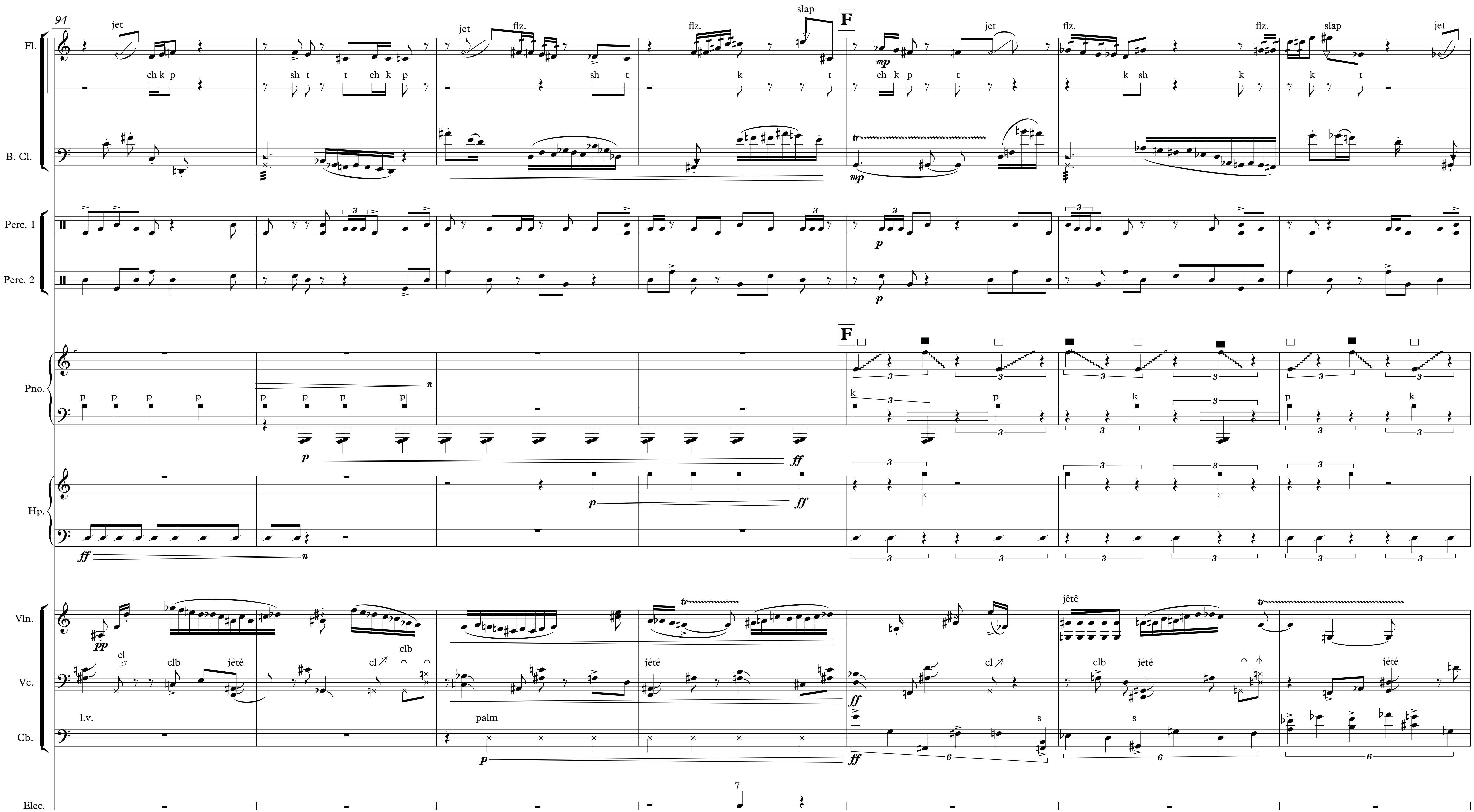
pizz.

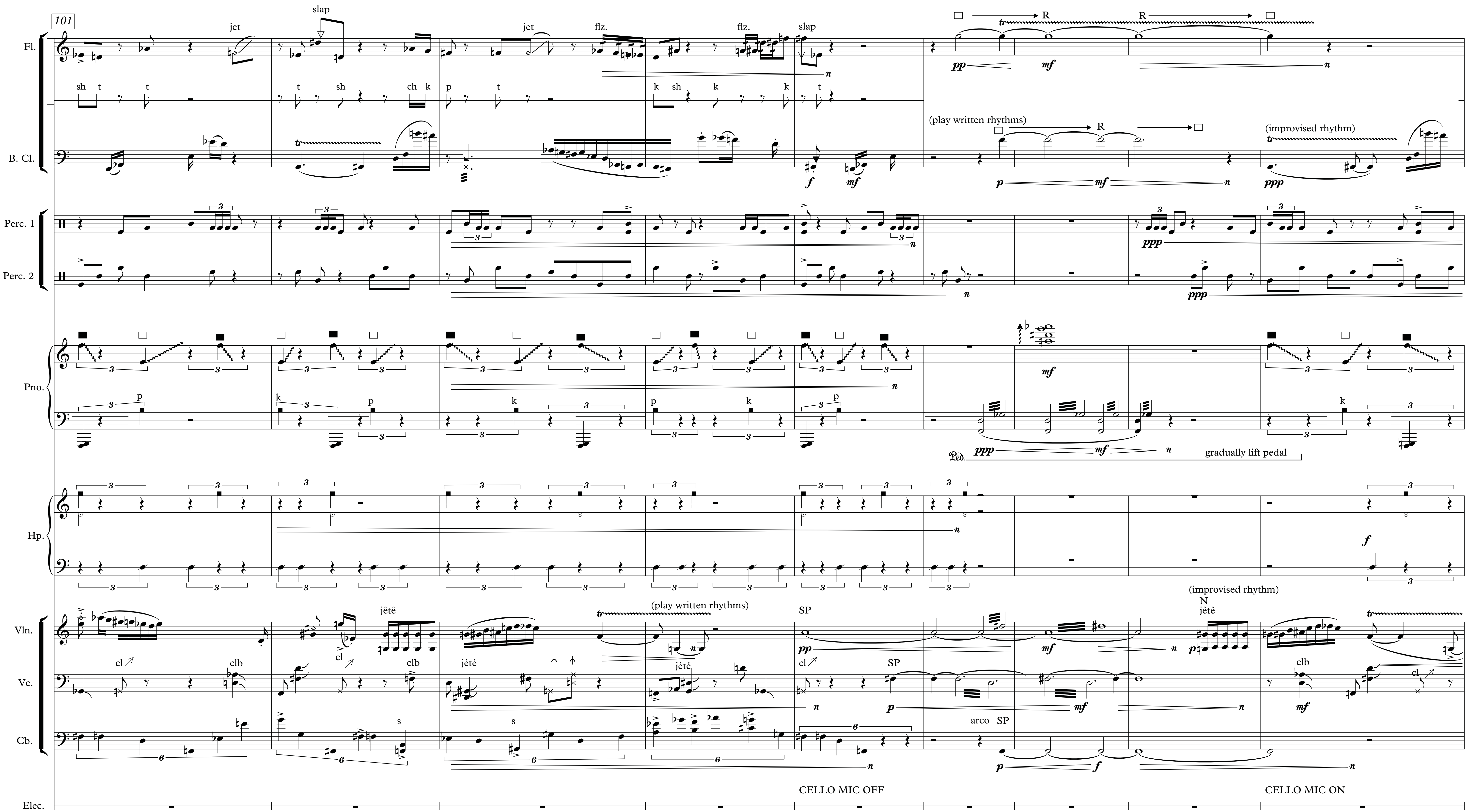
jété

cl

clb

l.v.


94
F
Fl.
B. Cl.
Perc. 1
Perc. 2
Pno.
Hp.
Vln.
Vc.
Cb.
Elec.
jet
flz.
slap
ch k p
sh t
k
tr
mp
pp
p
ff
n
cl
clb
jété
jêtê
l.v.
palm
s
7


101
Fl.
B. Cl.
Perc. 1
Perc. 2
Pno.
Hp.
Vln.
Vc.
Cb.
Elec.
jet
slap
flz.
sh
t
ch
k
p
(play written rhythms)
(improvised rhythm)
R
gradually lift pedal
jêtê
jété
clb
cl
SP
arco
s
N
CELLO MIC OFF
CELLO MIC ON

110

G

♩ = 100

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

Vc.

Cb.

Elec.

jet

flz.

flz.

slap

t k sh t k t

(play written rhythms)

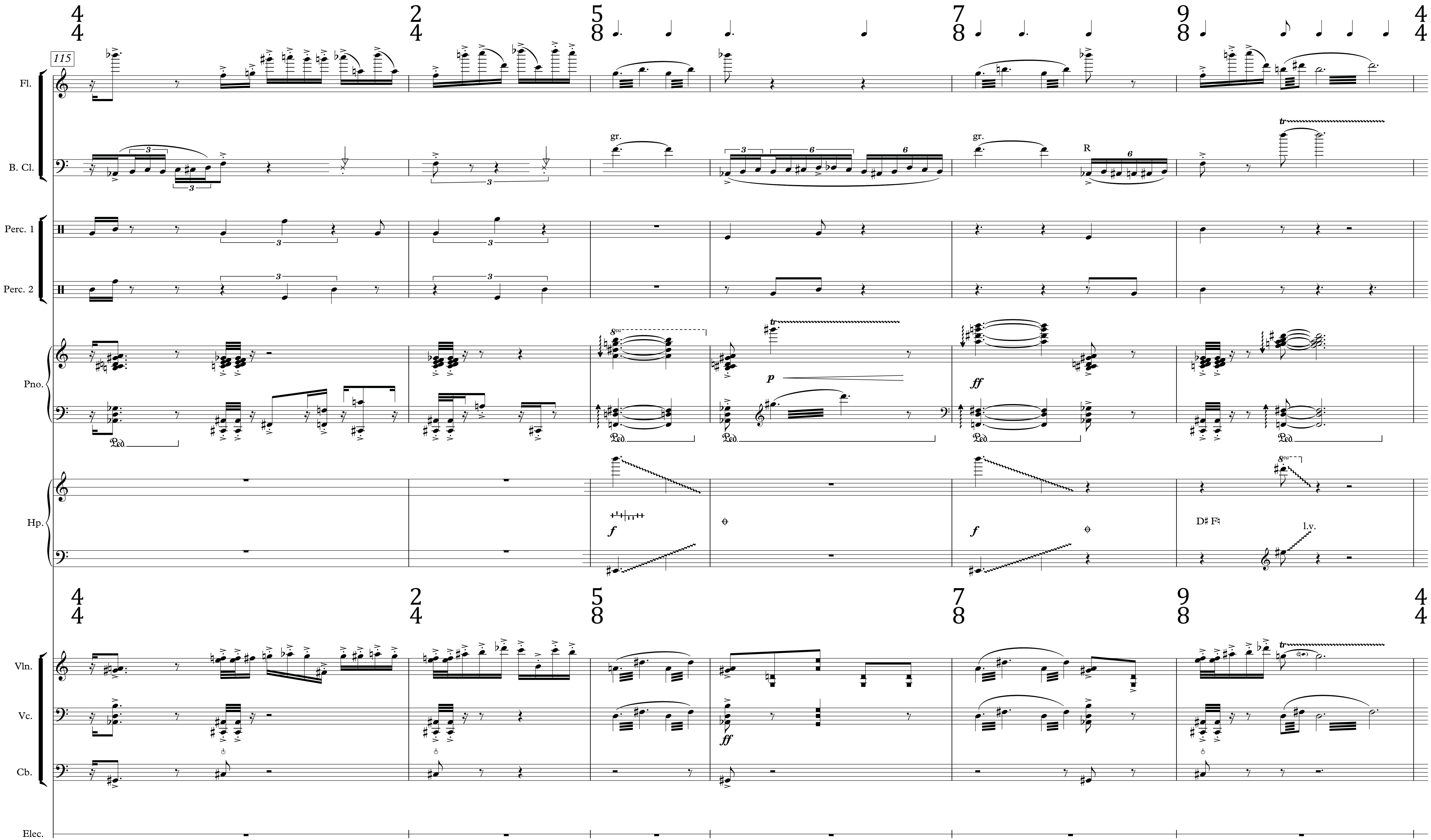
clb jété jété

pizz. s

arco

pizz.

CELLO MIC OFF


115
Fl.
B. Cl.
Perc. 1
Perc. 2
Pno.
Hp.
Vln.
Vc.
Cb.
Elec.
gr.
R
tr
p
ff
f
Ped.
D♯ F♮
l.v.

121

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

Vc.

Cb.

Elec.

flz.

l.v.

arco

H

4
4 ♩ = 144

127

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

Vc.

Cb.

Elec.

slam lid down

(silently open lid)

remove book from piano

gradually lift pedal

l.v.

rub soundboard with wax paper,
move hand in a circular motion
in the rhythm indicated

4
4

flaut.

N → SP

pizz.

(set bow down)

rub body of bass with wax paper,
move hand in a circular motion
in the rhythm indicated

N jeté

CUE 8

CUE 9

139

I

breath only
closed embouchere
I (inhale)

I

Fl.

B. Cl.

short back-and-forth
motions with brush

Perc. 1

crash cymbal

ride cymbal

Perc. 2

Pno.

l.v.

Hp.

jeté
IV (tip)

SP

jeté

N

SP

N jeté

Vln.

pizz.

l.v.

pizz.

l.v.

Vc.

Cb.

CUE 10

Elec.

150

play normally

J

flz.

improvise random notes in lowest register,
fast slurred fluxuating chromatic movement,
ad lib. breaths

continue improvising

gradually
shorten fragments

(sample improvisation)

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

continue to rub with
wax paper, ad lib.

Vln.

Vc.

Cb.

pizz.

N → MSP → N

strike body
with palm

continue to rub with
wax paper, ad lib.

FACE CELLO MIC ON

CUE 11

Elec.

158

Fl.

flz.

p t k p k k t sh k t sh k

flz.

f

p t k p k k t sh k t

flz.

f

p t k p k k t sh k t

flz.

B. Cl.

continue improvising

f 3 ppp

continue improvising

(sample improvisation)

gradually lengthen fragments
(continue improvising)

f 6

half-breath
(sample improvisation)

ppp

Perc. 1

gradually slow down

(rhythmic approximation)

continue to slow down

(rhythmic approximation)

Perc. 2

Pno.

Hp.

3/4

Vln.

N

MSP

N

ric.

f p

III IV

p

f

MSP

N

p

III IV

Vc.

Cb.

Elec.

K

3/4 = 96

very breathy sound, improvise random notes in lower register, fast slurred fluctuating chromatic movement, ad lib. breaths

166

gradually shorten fragments

(very breathy tone) (sample improvisation)

Fl.

pppp

B. Cl.

breath

random key clicks (as fast as possible)

pp

Perc. 1

continue to slow down

slowly come to a stop

Perc. 2

mf

Pno.

p

f

Hp.

(rhythms don't need to be exact)

f

3/4

Vln.

(tr)

ST

arco IV extreme vibrato

ppp

f

Vc.

arco IV extreme vibrato

ppp

f

Cb.

(rhythms don't need to be exact)

f

CELLO MIC OFF

Elec.

175

gradually insert more
rest between fragments

(very breathy tone)
(sample improvisation)

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

III
extreme vibrato

Vln.

extreme vibrato
III

Vc.

Cb.

II
extreme vibrato

extreme vibrato
II

CUE 12

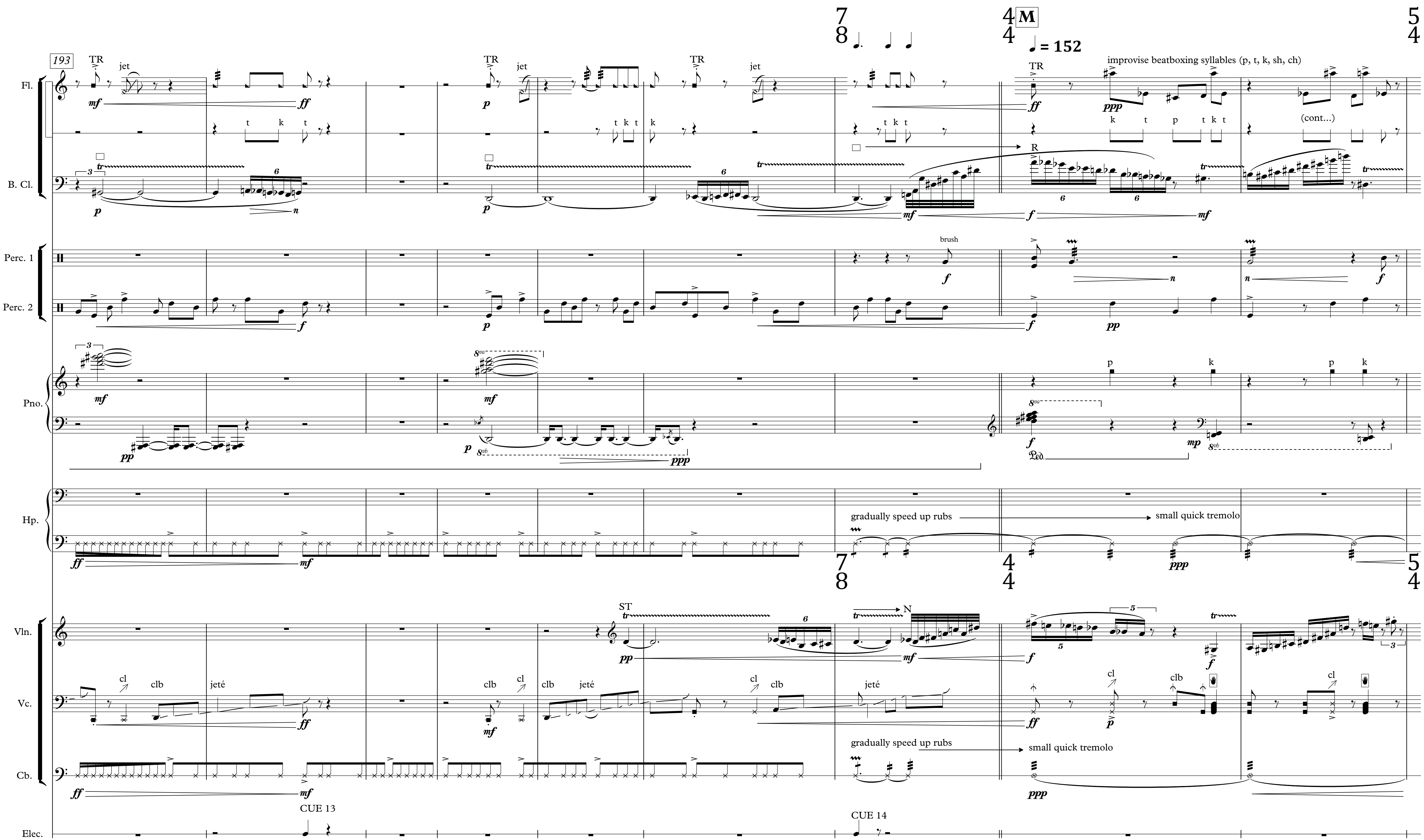
Elec.

4 L
4 ♪. = ♩ = 144

185

Fl.
B. Cl.
Perc. 1
Perc. 2
Pno.
Hp.
Vln.
Vc.
Cb.
Elec.

TR
jet
R
clb
cl
jeté
III
CELLO MIC ON



M
♩= 152
193
Fl.
B. Cl.
Perc. 1
Perc. 2
Pno.
Hp.
Vln.
Vc.
Cb.
Elec.
TR
jet
improvise beatboxing syllables (p, t, k, sh, ch)
(cont...)
brush
gradually speed up rubs
small quick tremolo
ST
N
cl
clb
jeté
CUE 13
CUE 14

202

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

Vc.

Cb.

Elec.

4/4 3/4 5/4

207

Fl.

B. Cl.

tr

R

gr.

mp

p

Perc. 1

Perc. 2

f ff f ff

Pno.

p k p k p k p k p

8vb

Hp.

ppp mf n

4/4 3/4 5/4

Vln.

R gliss with extreme vib.

Vc.

clb cl clb cl clb cl clb cl clb cl

Cb.

ppp mf n

Elec.

CUE 15

CELLO MIC OFF

N

5/4 ♩ = 100

213

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

Vc.

Cb.

Elec.

220

Fl.

B. Cl.

R

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

R

Vc.

Cb.

Elec.

O

CUE 16

mute all resonances

♩ = 108

♩ = 120

♩ = 140

♩ = 177

232

6/4 ♩ = 192 | 7/8 | 2/4 | 3/4 **P** ♩ = ca. 124

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

Vc.

Cb.

Elec.

sh

n *mf*

sh

n

brush

mf *n*

wallet

p *f*

plastic

wallet

p

(cue from conductor)

pulse-less circles with wax paper

mf *n*

6/4 | 7/8 | 2/4 | 3/4

(cue from conductor)

bow on the wood

f *n*

(cue from conductor)

bow on the wood

f *n*

solo, with rubato

s s s

mf *ff* *mf*

FADE IN BASS MIC

CUE 17

Q

248

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Harp

Vln.

Vc.

Cb.

Elec.

mf

breath

n

crash cymbal

mp

plastic

f

high tube pitch

s

mp

solo, with rubato

tr

6

mp

p

5

6

mp

3

pp

3

tr

brush

mf

n

wax paper

mf

n

wallet

p

f

plastic

wax paper

f

n

(cue from
conductor)
solo, with rubato

N

tr

SP

N

6

mp

mf

SP

ST

tr

f

p

tr

mp

mp

mf

bow on the wood

f

n

s

s

s

l.v.

BASS MIC OFF

259

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Harp

Vln.

Vc.

Cb.

Elec.

solo, with rubato

brush

wallet

plastic

III

IV

IV

rapid irregular harmonic glissandi in highest register of IV

arco rapid irregular harmonic glissandi in highest register of IV

267

Fl.

flz.

B. Cl.

R

gr.

overblow to multiphonics

Perc. 1

Perc. 2

hands

Pno.

wallet

plastic

improvise rapidly in the lowest register

continue similarly

gradually press pedal

Harp

rub fingers randomly in the lowest register

continue similarly

Vln.

SP

ST

R

all noise no pitch

Vc.

arco improvise sul IV

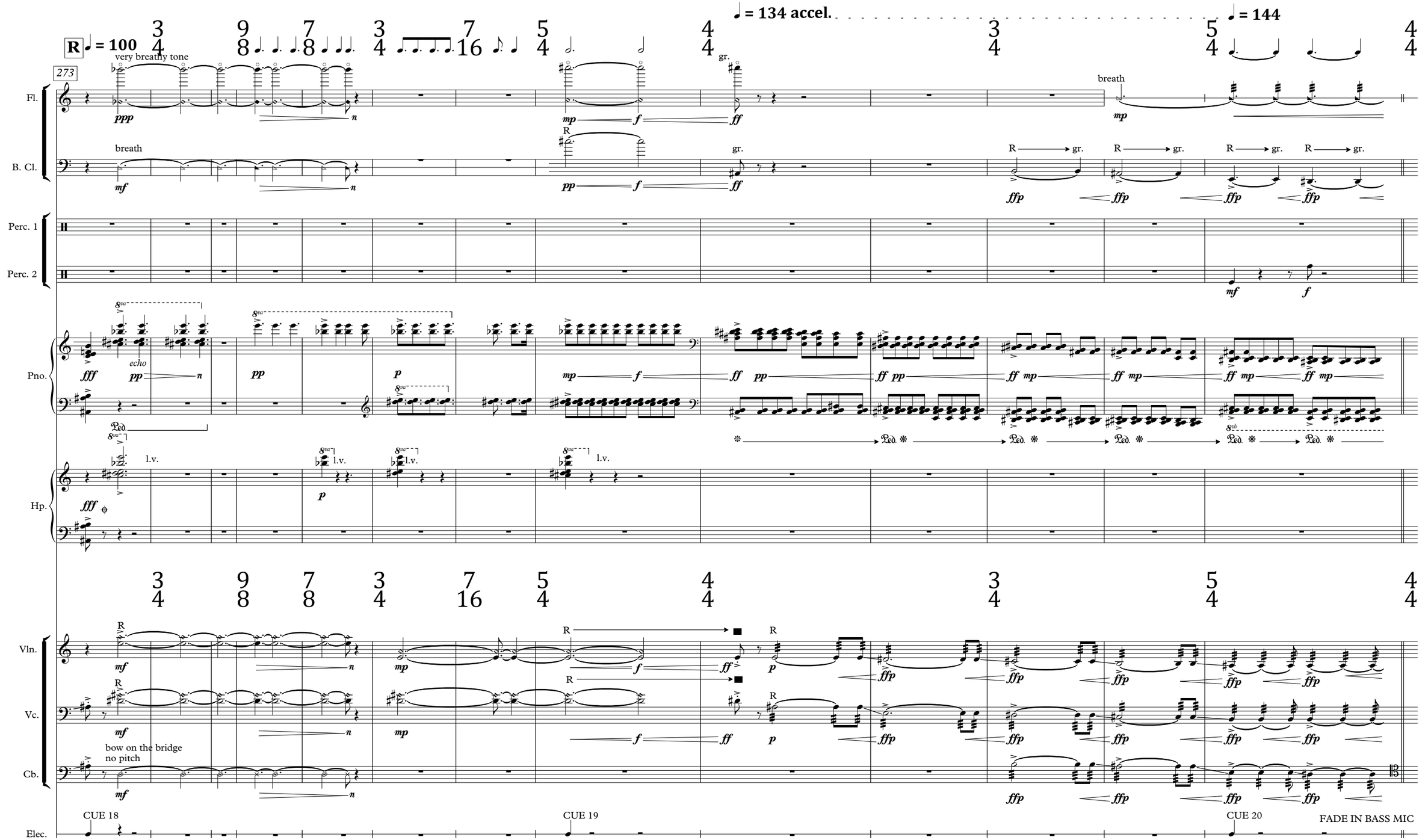
etc.

Cb.

arco improvise sul IV

etc.

Elec.


R
♩ = 100
very breathy tone
273
Fl.
B. Cl.
breath
Perc. 1
Perc. 2
Pno.
echo
l.v.
Hp.
♩ = 134 accel.
♩ = 144
gr.
Vln.
Vc.
Cb.
bow on the bridge
no pitch
Elec.
CUE 18
CUE 19
CUE 20
FADE IN BASS MIC

4
4 ♩ = 150

286 **S**

T

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

Vc.

Cb.

Elec.

fff

ffp

Cue-sized notes may be approximated.
Focus on the general contour of the line.

sticks

fff *mf*

fff *mp*

place book
inside piano, like before

ff

very noisy
always extreme bow pressure

ffff

IV

BASS MIC ON

CUE 21

299

Fl.

B. Cl.

ffp ff ffp ff

gr. gr.

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

Vc.

Cb.

III IV clb

N jeté jeté I II

III IV clb

Elec.

310

U

Fl.

B. Cl.

gr.

tr

pp

t t t t

Perc. 1

Perc. 2

p

Pno.

Hp.

Vln.

Vc.

Cb.

N
jeté

I
II

III
IV

clb

Elec.

322

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

Vc.

Cb.

Elec.

331

Fl.

t k t k | t k sh t k | sh t k t | t k t k | t k sh t k | sh t k t

B. Cl.

breath and key clicks

gr.

Perc. 1

Perc. 2

Pno.

wax paper

Hp.

wax paper

Vln.

pizz.

Vc.

jeté

clb III jeté

N jeté

jeté

I II

arco

Cb.

Elec.

BASS MIC OFF

CUE 22

342 V

♩ = 88

Fl.

B. Cl.

Perc. 1

Perc. 2

wallet

Pno.

(prepared notes)

Hp.

Vln.

arco

Vc.

clb

Cb.

clb jeté clb jeté

clb jeté jeté

IV jeté

Elec.

accel. ♩ = 150

351

♩ = 88 ♩ = 120

2/4 4/4

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

(prepared notes)

8va

Hp.

2/4 4/4

Vln.

Vc.

Cb.

IV jeté IV jeté

clb

ric.

CUE 23

Elec.

W

accel. ♩ = 150

360

Fl.

sh t k t k t

sh t k t k p

sh t k t k t p

pp

sh t k t k p

sh t k t k p

k t k p

B. Cl.

gr.

pp f

freely fluctuate between normal tone and growl tone, ad lib. breath

tr

ppp pp p

Perc. 1

Perc. 2

pp

Pno.

ff

f pp f

p f

Hp.

pp f

Vln.

ric. clb

Vc.

Cb.

clb

f p f

pp f

freely fluctuate between SP and ST
ad lib. bow

p mp mf

Elec.

CUE 24

CUE 25

CUE 26

372

7/8 5/4 | 3/4 X | 4/4 | 3/4 | 4/4 | 3/4

♩ = 126*

Fl.

k t k p

(tr)

B. Cl.

mp f p

Perc. 1

f

Perc. 2

remove cloth

f

Pno.

(non-dampered notes)

wallet

f p ff f p ff f p ff f pp ff

f pp fff

Hp.

let notes resonate

k k k p k

7/8 5/4 ff | 3/4 | 4/4 | 3/4 | 4/4 | 3/4

Vln.

(tr) IV

f fff

Vc.

ric. clb

clb clb

Cb.

f pp fff

pizz. l.v. hit front arco jeté IV scrape hit side side

pizz. l.v. hit body arco jeté IV scrape hit side side

pizz. l.v. hit front arco jeté IV scrape hit side side

pizz. l.v. hit body arco jeté IV scrape hit side side

Elec.

*Musicians should improvise rhythms based on placement of note in each measure. Change rhythm slightly with each repetition.

387

Fl.

B. Cl.

teeth on reed

blow on reed

Perc. 1

Perc. 2

snare sticks

wallet

Pno.

Hp.

Vln.

Vc.

Cb.

pizz.

l.v.

hit body

arco

jeté

IV

scrape side

hit

side

hit front

SP

II

III

IV

jeté

Elec.

401

Y

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

Vc.

Cb.

Elec.

TR

pizz.

flz.
breath

brush

hand

arco

IV
jeté

SP
III

II

clb

ricc.

CUE 27

412

Fl.
flz.
breath
TR
TR
pizz.
flz.
breath
TR
TR
Z
♩ = 76
improvise rhythm and beatboxing syllables
continue playing like this

B. Cl.

Perc. 1
brush
hand
brush
hand

Perc. 2

Pno.
improvise in a similar style using these notes

Hp.
mute all resonances
improvise in this style using these notes

Vln.
pizz.
arco
IV
jeté
SP
III
pizz.
arco
IV
III
IV

Vc.
arco
SP
jeté
IV
ST staccato
continue playing like this

Cb.
clb
jeté
improvise in this style

Elec.

423

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

Vc.

Cb.

Elec.

TR pizz.

flz.
breath

like before

breath

h-p

III
IV.

IV

cl

clb

arco

pizz.

clb
jeté

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Hp.

Vln.

Vc.

Cb.

Elec.

breath

TR
pizz.

flz.
breath

like before

gr.

h-p

III
IV

IV
clb

cl

clb

arco

439

AA

4/4 = 72

4/4 = 80

4/4 = 72

4/4 = 88

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

Perc.

Vln.

Vc.

Cb.

Elec.

pizz.5

sh shu s tu → sh → t

air and key noise

plastic

wax paper

h-p

IV

arco

SP
half-finger pressure

CUE 28

448

2/4 = 72 | 4/4 = 96 | 2/4 = 72 | 4/4 = 104 | 3/4 = 58 | 4/4 = 112 | ♩ = 120

Fl.

pizz. 5

ppp f fp f

sh shu s tu → sh → t

B. Cl.

n f

3

Perc. 1

Perc. 2

Pno.

f

(prepared note)

Hp.

ff n

2/4 | 4/4 | 2/4 | 4/4 | 3/4 | 4/4

Vln.

improvise rhythm

ff

Vc.

improvise rhythm

cl.

pp

arco

Cb.

Elec.

BB

♩ = 128

455

Fl.

pizz. 5

f fp f

shu s tu → sh → t

pizz. 5

f

shu s

ad lib. breath

p

B. Cl.

3

ad lib. breath

p

Perc. 1

Perc. 2

Pno.

f

fff

improvise rhythm

mf

improvise rhythm

mf

Hp.

ff n

gliss

k h-p

gliss

k h-p

Vln.

cl

bow ad lib.

mp

Vc.

ff

bow ad lib.

mp

Cb.

ff n

ff

pizz. arco improvise rhythm III

f

I II jeté clb

pizz. arco III

I II jeté clb

Elec.

466

CC

Fl.

B. Cl.

Perc. 1

Perc. 2

Pno.

mf

5

Hp.

gliss

mf

k

h-p

Vln.

Vc.

Cb.

pizz.

arco

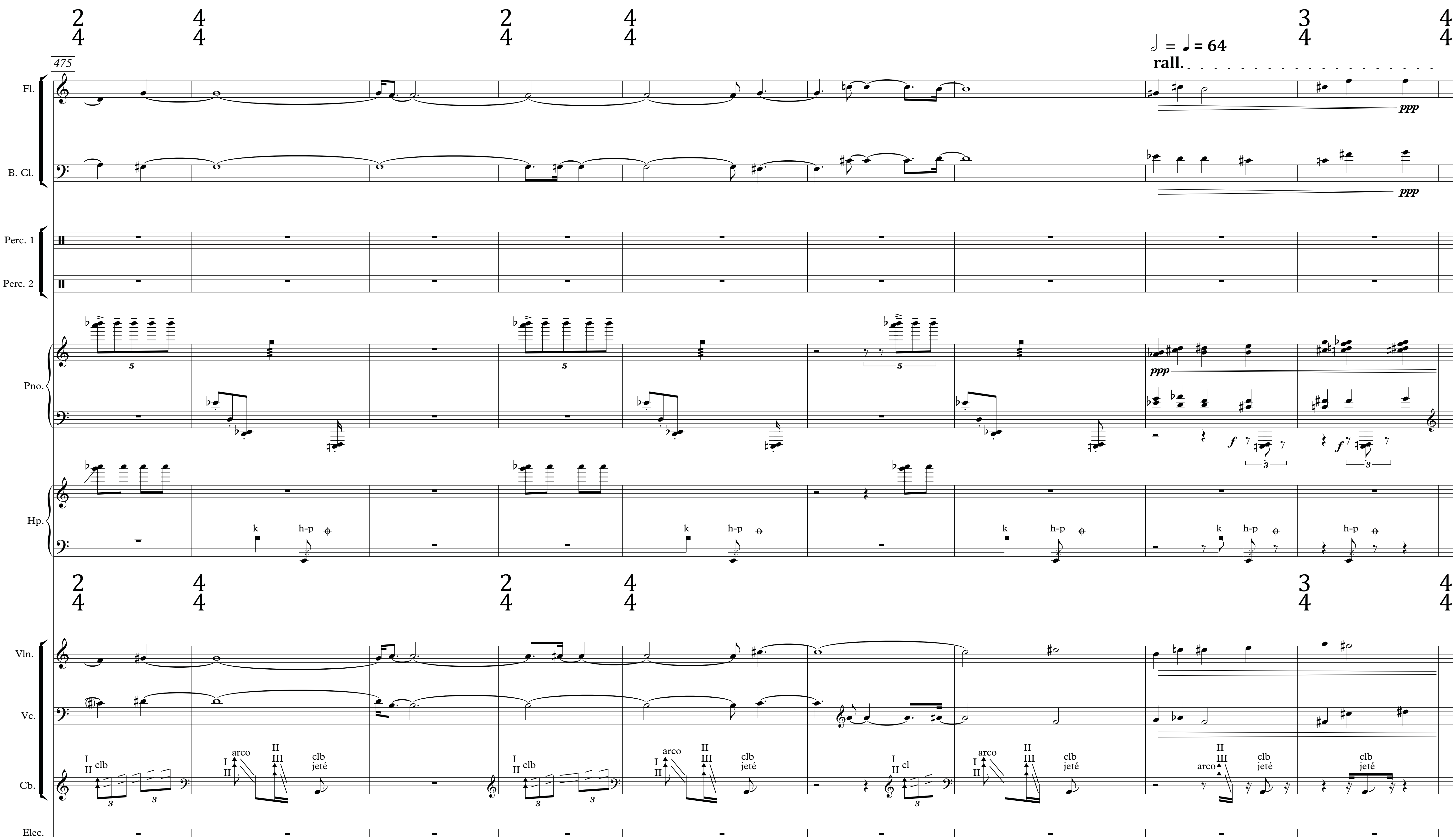
I
II

II
III

clb
jeté

3

Elec.


475
Fl.
B. Cl.
Perc. 1
Perc. 2
Pno.
Hp.
Vln.
Vc.
Cb.
Elec.
= = 64
rall.
ppp
f
k
h-p
arco
clb
jeté
cl
I
II
III

484

DD

♩ = 56

Fl.

sh

mp key clicks

n

sh

mp

n

improvise random notes in lowest register,
fast slurred fluxuating chromatic movement,
ad lib. breaths

B. Cl.

ppp

pp

n

continue improising

pppp

pp

B.D.

brush

ppp

Perc. 1

p

n

ppp

p

syspended cymbal

brush

rotating spring drum

Perc. 2

p

p

mp

n

p

p

mp

n

Pno.

mf

mp

Improvise rhythm

Hp.

ppp

pp

n

ppp

pp

Vln.

pp

n

pp

n

Vc.

pp

n

pp

wax paper

Cb.

mp

n

mp

n

CUE 29

Elec.

489

Fl.

sh

mp n

breath

mp n

pp n

B. Cl.

half breath, half tone
continue improising

n

pppp pp n

breath

p n

pp n

Perc. 1

3

n

ppp p n

ppp p n

Perc. 2

p p mp n

pp p mp n

Pno.

8va

p

pp

15ma

ppp

Hp.

ppp pp n

Vln.

pp n

Vc.

n

pp n

pp n

Cb.

p n

pp n

ppp n

Elec.

Hypnagogia

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Volume 2

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Abstract

Hypnagogia is a composition scored for nine instruments and electronics written for the Contemporary Music Ensemble at McGill University. The piece draws inspiration from the human sleep cycle and explores the concepts of groove, repetition, interaction, controlled improvisation, and varied cyclical forms. This thesis uses theories regarding the groove perception, predictability, and spectromorphology to provide an outline and analysis of *Hypnagogia*.

Résumé

Hypnagogia est une composition pour neuf instruments et dispositif électronique a été écrit pour l'Ensemble de Musique Contemporain de l'Université McGill. La pièce s'inspire des cycles du sommeil humain et explore les concepts de groove, de répétition, d'interaction, d'improvisation contrôlée et de formes cycliques variées. Ce mémoire emprunte les théories de la perception du groove, de la prévisibilité et de la spectromorphologie en guise de cadre d'analyse pour Hypnagogia.

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Table of Contents

Chapter 1: Introduction

1.1 Inspiration from cycles

Hypnagogia is a composition scored for flute, bass clarinet, piano, harp, 2 percussion, violin, cello, contrabass and electronics. The work's primary focus is the interpretation of a fluctuating cyclical form derived from a ubiquitous naturally-occurring event. This idea came from my general observations regarding the divisions and perceptions of cycles and how they are manifested. Cyclical phenomena are numerous, including climate (seasons begin and end at predictable times and always come in the same order, though there exists variations and unpredictable episodes within each cycle) and human life (our bodies go through daily, monthly, and yearly physiological cycles while constantly aging with unpredictable episodes).

These cycles not only provide structure to human existence, they also affect the way in which we experience and perceive time. Progress through certain cycles is inevitably linked to the periodicity of certain thoughts, moods, and actions. In this model, our lives are a product of countless overlapping and interacting cycles, yielding possibilities unique to each person and situation. The length, periodicity, profundity, and unpredictability of each cycle influence our perception of time within the given cycle, both in the perception of the present, and in the evaluation of duration after the cycle has completed. For example, a musician might experience every moment of an important audition as eternity while commuters might experience their habitual daily travel (which may take just as long as an audition) in the blink of an eye. Additionally, the experiential time (Mountain 1989) of a cycle changes depending on one's position in time compared to the cycle. For example, during the course of a daily jog, the jogger

might feel fatigue with every stride, thus stretching the experiential time of the cycle. However, in the moments of accomplishment and relief immediately following the completion of the cycle, the experiential time of the cycle will decrease.

As cycles such as these affect our perception of time in everyday activities, they may also affect our perception of time during a musical performance. By overlapping, superimposing, juxtaposing, and embedding cycles of varying characteristics, composers develop structures that they hope will influence listeners' perception of time in the now-moment and upon reflection. The particular cycle chosen as the model for this work originates from human sleep. *Hypnagogia* refers to the experience of transitional states to and from sleep. During sleep, our brain traverses predictable cycles from consciousness to rapid eye movement (REM) sleep while transitioning through the intermediary stages of non-REM cycles (Silber 2007). Through the course of a night, our brain undergoes this cycle repeatedly while each time slightly altering the periodicity of certain stages. A *hypnogram* graphs the brain's journey through this sleep cycle and its various stages during the course of a period of sleep.

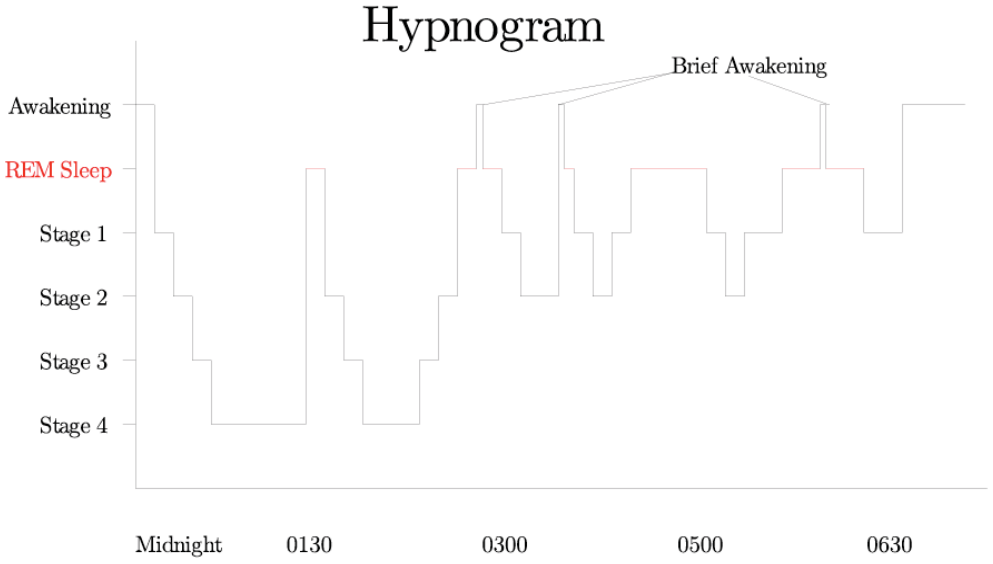

Fig 1. A Hypnogram represents the stages of sleep as a function of time. (Silber 2007)

Hypnagogia uses the sleep cycle as a model by which to organize material and orchestration on a macro and micro level. This model was chosen because it hosts a relatively simple 2-part pattern absent of verbatim repetition. The compositional process, which will be discussed later in detail, involved assigning general musical guidelines to each stage of sleep. These included the instruments featured, the relationships between them, and the hierarchy of each layer of texture.

1.2 Repetition and groove

The cyclical metaphor used to conceive the form for *Hypnagogia* was equally critical in structuring the interactions and relationships between musical materials. When analyzing the hypnogram, one may find patterns when comparing each REM cycle, with the first being the similarities of the first two REM cycles (referencing the diagram and fixed time values in *Fig. 1*, these cycles occur in series from the *initial* awakening to 1:30 AM to the first brief awakening). Both of these cycles pass through each stage on their way to Stage 4, though the second cycle skips Stage 1. When compared to the other stages, Stage 4 is significantly longer. In the second portion of the second cycle, rather than passing through each stage individually, Stage 4 is juxtaposed with REM sleep. Similar types of patterns may be found when comparing the third and fourth cycle.

As portions of the sleep cycle illustrated in the hypnogram exhibit a modified looping pattern, I decided to apply this pattern to the form and musical material in *Hypnagogia*. This structural idea was applied in two ways on both large and small scales. On the large scale, this translated to repetitive macro-structures (large sections of music) that adhered to a predetermined musical trajectory while keeping a unique

identity, meaning that each macro-structure followed similar guidelines while hosting an array of unique anomalies. On the small scale, I interpreted the hypnogram to extend to small repeated musical passages possessing varying metric hierarchies. When this music carries a consistent metric hierarchy, it may yield a repetitive periodic rhythmic structure perceived as having a *groove*.

Groove is experienced differently depending on the nature of the listener; that is to say, musicians and listeners of different genres perceive groove according to their own musical preferences, thus creating difficulties in establishing a universal definition. To capture groove's multifaceted nature to form relationships between the written music (if it exists), the musicians, the listeners, and the genre of the music, there is a need for a multifaceted definition.

We may acknowledge groove's contribution to the identity of the music, as it "marks an understanding of rhythmic patterning that underlies its role in producing the characteristic rhythmic 'feel' of the piece" (Middleton 1999). However, this description does not make any note regarding the cyclical nature or pulsation of a groove.

Groove may be described as "an intuitive sense of style as process, a perception of a cycle in motion, a form or organizing pattern being revealed, a recurrent clustering of elements through time" (Keil 2005). Since, our ability to encode the complex elaboration of rhythmic patterns is "fairly acute and highly structured", this definition reveals groove's potential to act as a *form-bearing element* in music (McAdams 1989a). Furthermore, "when [a] groove is established among players, the musical whole becomes greater than the sum of its parts, enabling a person […] to experience something beyond himself which he [/she] cannot create alone" (Aigen 2002). While

noting the relationship of a groove to its individual components, this statement also highlights the collective psychology experienced by the musicians performing the groove.

Jeff Pressing's 2002 article claimed that a "groove or feel" is "a cognitive temporal phenomenon emerging from one or more carefully aligned concurrent rhythmic patterns, characterized by...perception of recurring pulses, and subdivision of structure in such pulses, ...perception of a cycle of time, of length 2 or more pulses, enabling identification of cycle locations, and...effectiveness of engaging synchronizing body responses (e.g. dance, foot-tapping)" (Pressing 2002). Pressing's definition takes a more empirical approach, first describing a groove's construction in a musical sense before moving on to its physiological relationship to the person experiencing the groove. By addressing both the constructive and cognitive characteristics of groove, this definition hints at establishing the relationships groove forms between the music and the cognition of the musician, as well as the listener.

When Pressing's definition is extended from the musical domain into the neuro-cognitive domain, groove is understood as an example of sensory-motor coupling between neural systems. When music with a groove is heard, listeners may translate the auditory stimulus into a physiological action, such as head nodding or foot tapping (Janata 2011). This is caused by the listener's tendency to entrain certain kinds of exogenous rhythms such as those Pressing describes. As Rosemary Mountain writes, "if the musical pulse is very close to our own pulse or breathing rate, we have a tendency to synchronize with it. Then, we are sensitive to the slightest speeding up or slowing down of that beat" (Mountain 1989). Here, Mountain draws connections between the

sensitivity of perception and its ability to result in entrainment. If entrainment to these 'human-scale' pulses is established, composers may use the perception of groove to build, satisfy, and thwart musical expectations. On a small scale, this may include slight alterations of the pulse. For example, if listeners hear 3 pulses of regular periodicity, they may expect the 4th pulse to come after the period established by the previous pulses. If this pulse is slightly early or late, we notice the anomaly in the anticipated pattern. This effect may be described as beat dilation and contraction, where the beat is heard slightly before or after it is expected. When done repeatedly, this creates the perception of swing pattern found in Jazz and Latin music. Since this specific groove manipulation mainly exists outside the realm of written notation and is dictated by intuition and 'feel' (jazz, hip hop), its precise notation presents unnecessary rhythmic complexity, rendering it difficult to communicate to classically trained musicians.

Fig. 2. Example of beat expansion/compression: the second and fourth beats occur slightly after (first measure) and slightly before (second measure) their expected arrival

Another method of expectancy violation using groove makes use of missing (or added) beats. If we hear a 4-bar groove in common time, we expect the repetition to have the same pattern. This expectation may be thwarted by briefly abandoning the 4/4 meter in lieu of a substitution (such as 3/4 or 7/8). Groove gives the listener a framework by which she or he may easily place and compare musical material. When a listener experiences groove and sensory-motor coupling, they are able to identify slight alterations to the pattern, syncopation, accents, and repetition. This relationship made groove an important consideration when composing *Hypnagogia*. In order to give each

sleep stage a unique identity, it was important that the listener entrain each stage differently. Entrainment would suggest certain musical expectations that could be met or left unsatisfied depending on the demands of the local global form.

Repetition is a form-bearing element where sounds or sequences are restated. Middleton differentiates between levels of repetition as a function of the musical unit undergoing the process. *Discursive repetition* occurs "at the level of the phrase or section, which generally functions as part of a larger-scale 'argument'." (Middleton 1999). *Musematic repetition* is "at the level of the short figure, often used to generate an entire structural framework." Comparing the two, he states, “musematic repetition includes circularity, synchronic relations, and openness. Discursive repetition includes linearity, rational control, and self-sufficiency. Discursive repetition is most often nested (hierarchically) in larger repetitions and may be thought of as sectional, while musematic repetition may be thought of as additive.” (1999). These definitions are useful in that they illustrate the ways in which repetition is used to create small- and large-scale musical structures.

Hypnagogia uses these two concepts in a variety of ways and manipulations to create musical discourse. To explain how alterations are made, it is necessary to reference information theory and its relationship to aesthetics originally brought forth by Abraham Moles (1966) and commented on by Gérard Grisey (1987).

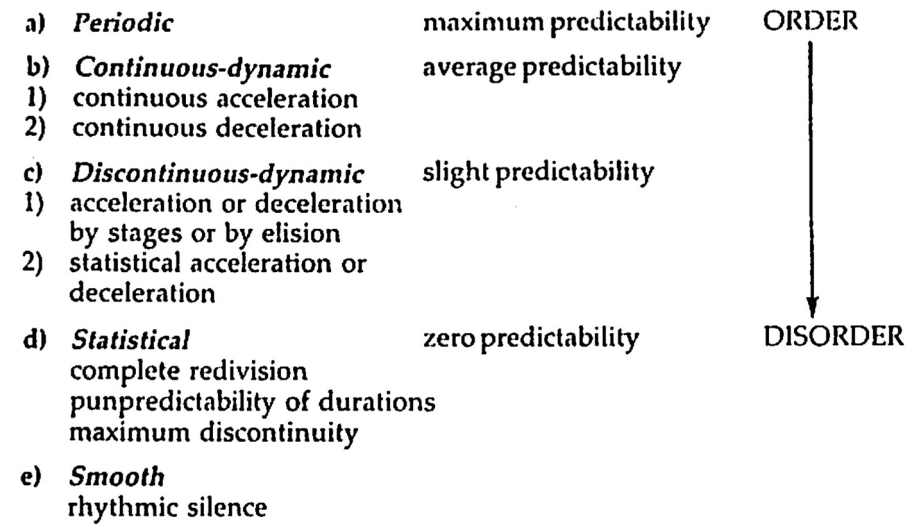

Fig. 3. Perceived order as a function of information saturation (Grisey 1987)

In this table above, a continuum is constructed illustrating the perception of order or disorder as a function of the amount of saturation of information in music as recognized by the listener. If musical material is constantly followed by the most probable phenomenon, it will have maximum predictability and strict order in the perception of the listener. At the other end of the scale, a musical passage featuring statistical distributions of a vast scale may leave the listener with no predictability or musical expectations. *Hypnagogia* applies this continuum to repetition and groove by means of carefully constructing alterations that aim to affect their perceived momentum trajectories.

While the concepts of groove, repetition, and predictability are helpful in describing the perception and structure of music, they do little to shed light on the nature of the material itself. To address this issue, it is necessary to reference spectromorphology as proposed by Denis Smalley (1997). Smalley's system of characterizing sounds by their spectromorphological content is useful in the analysis of *Hypnagogia* because his proposed vocabulary has the capacity to precisely describe the spectromorphological expectation and the function of each structural component of the

sound. Furthermore, this method of analysis can extend to describing a sound's motion and growth processes, texture, behavior, spectra, and several other aural and structural dimensions (1997). These descriptors are able to address musical dimensions that exist beyond the realm of traditional music notation (which mostly describe instructions for instrumental playing technique, but not the resulting sound quality itself).

Central to Smalley's theories is the notion of behavior. This concept may be defined as a metaphor "used to elaborate relationships among the varied spectromophologies acting within a musical context" (Smalley 1997). According to Smalley, listeners evaluate behaviors and the relationships between them intuitively, and this evaluation may influence their perceptions and reflections of the music. Smalley classified behavior based on an array of variables.

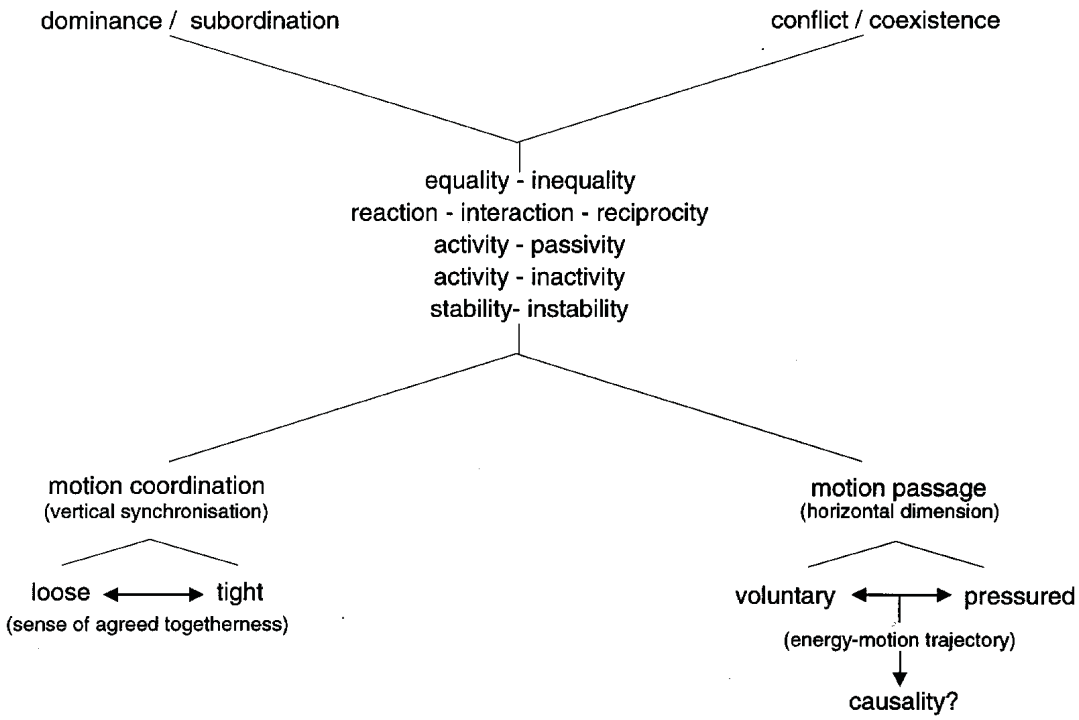

Fig. 4. Diagram presenting parameters that categorize behavior (Smalley 1997)

These variables may be applied to any level of the composition: discrete events, texture

motions, layers, and the relationships between them. The bottom section of the diagram illustrates the continuum of behavioral relationships in the temporal synchronization of the music (motion coordination) and the passage of the music itself (motion passage). The upper portion of the diagram describes the relationships between behaviors as dependent on two oppositional pairs, which in turn contextualize the pairs of *relationship modes* in the center of the diagram.

Relating groove and modes of repetition to Smalley's model of behavior, we may claim that groove and repetition affect the motion passage of music. Groove sets up a small-scale notion of causality in the energy-motion of trajectory. Meanwhile, repetition facilitates causality on a larger-scale, creating the expectation of causality within the trajectory of the repeated passage of music.

To illustrate how these concepts may be applied in contemporary classical music, I will briefly analyze excerpts of four contemporary pieces that use notable methods of repetition before drawing upon these same concepts in an analysis of *Hypnagogia*. By drawing comparisons between these pieces and the previously mentioned concepts, this survey serves to provide a framework in which to contextualize *Hypnagogia* in the musical discourse.

Chapter 2: Functions of repetition and groove in the music of Romitelli, Hurel, Cendo, and Filidei

Contemporary composers have used repetition and groove in notable and innovative ways to give saliency and accessible structure to complex musical material. In the following section, I will outline how four composers have used these devices

differently to accomplish varied musical goals.

In Fausto Romitelli's *Professor Bad Trip, Lesson I* for 8 musicians and electronics (1998), the composer uses the repetition of musical signals to entrain the listener to identify slight alterations in complex musical material. After a brief introduction, Romitelli introduces a passage of about 16 seconds in length. This music, while not having a strong sense of vertical synchronization, has distinct signals that help segment it into parts that may be committed to working memory. These signals include powerful air gestures from the bass flute, slap-tongues from the bass clarinet, distorted pitch bends from the electric guitar, intervallic movement in the low register, and repeated harmonics from the electric guitar and the kazoo. Using timbres that cut through the background texture, Romitelli orchestrates these signals carefully to give them prominence and identity within the texture. Their precise placement within the passage and individual rhythmic profiles allow them to serve as markers to divide up the passage into sections. Therefore, as listeners hear these signals repeatedly, they can identify slight shifts in: the pacing between signals, pitch, contour, density, rhythm, and timbre. Through this method of repetition, Romitelli is able to develop each signal in a way that the listener may recognize and follow all of them simultaneously through ten iterations. It also allows him to sculpt a large trajectory to shape the passage's development. Since Romitelli begins and ends the loop in a similar fashion, an expectation of causality is developed. If these signals were absent from the music (leaving behind background textures marked at *pianissimo*), the saliency of the loop might decrease, rendering Romitelli's structure less perceptibly accessible. In the case of this structure, Romitelli gradually compresses the loop's length and increases the

tempo repeatedly until the texture is completely saturated. Thus, the composer creates a large-scale multi-dimensional *discontinuous-dynamic acceleration*. Additionally, through establishing this process, Romitelli blurs the boundaries of what he classifies as material and form. By using this repetition/compression process as repetitive material in itself, he draws relationships between different parts of the work through the development of this salient large-scale structure.

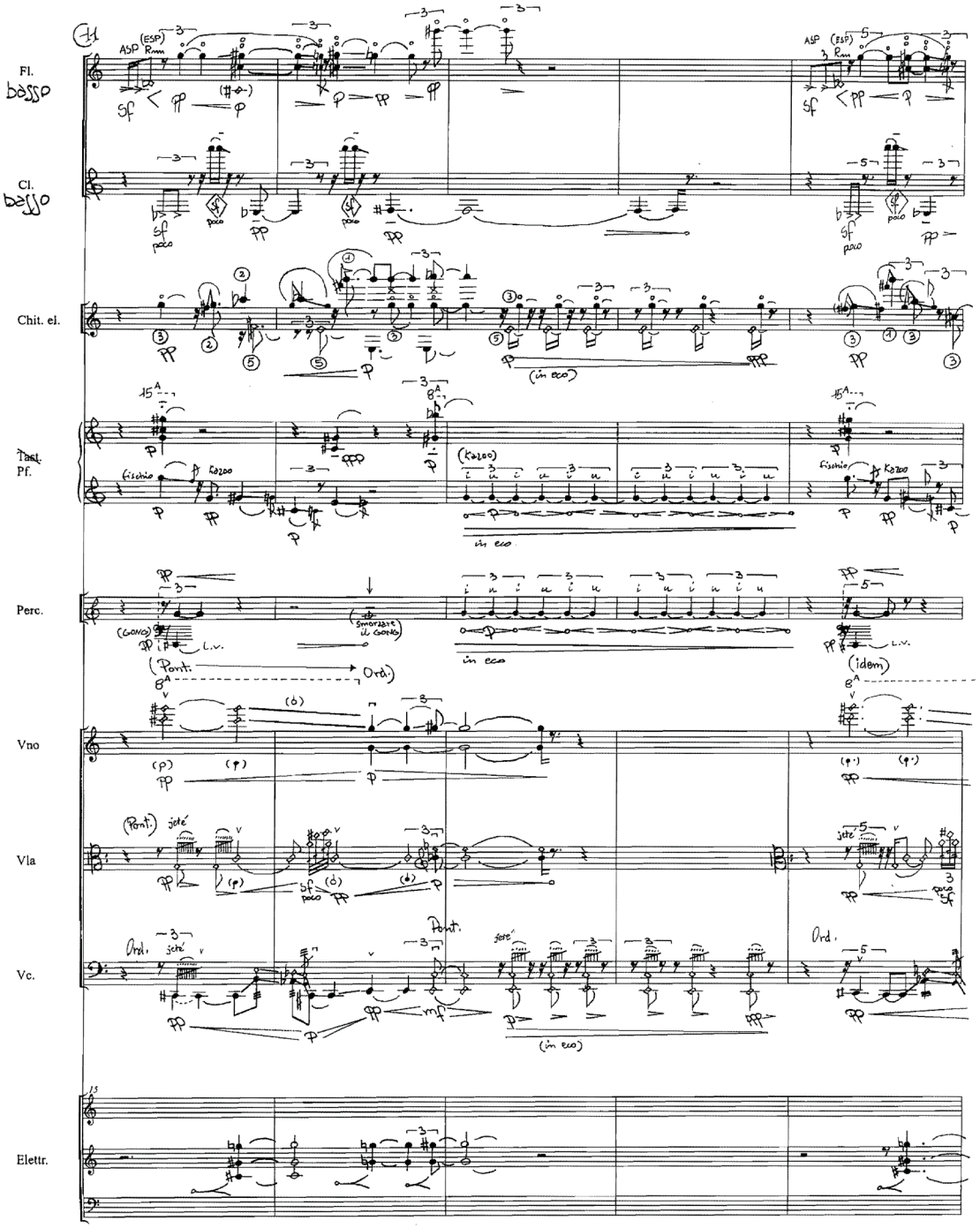

Fig. 5. Measures 11-15 of Romitelli's *Professor Bad Trip, Lesson I* (1998)

A similar technique may be found in Philippe Hurel's *...a mesure* for mixed sextet (1997). The opening of this piece features a passage one minute in length. Like Romitelli, Hurel has broken the passage into distinct parts connected by gradually

compressing the rhythm of each instrumental line until one note remains, thus enabling the listener to recognize and follow the trajectory of the loop's development through four iterations. Like Romitelli, Hurel creates a sense of causality as each loop starts and ends in a similar fashion without resorting to strict vertical synchronization. The length of the loop decreases with each iteration (the first three being 60 seconds, 44 seconds, and 32 seconds long, respectively), creating a fractal design (a compression process inside another compression process) within a *discontinuous-dynamic acceleration*. However, Hurel breaks the pattern at the (false) ending of 3rd iteration, where he writes a brief episodic *continuous-dynamic deceleration* and *acceleration*, only to interrupt it with material belonging to the ending of the 3rd loop. Neither *Professor Bad Trip* nor *…a mesure* keeps a strong pulse, but they possess salient signals that break up larger blocks of material into smaller recognizable portions that undergo development. Both works use musematic repetition of small fragments within a large passage to create a large-scale structure. These structures are repeated discursively to create the form extending through the entire piece.

The opening of *scratch data* for percussion and electronics (2002), by Raphael Cendo, features a six-second phrase with a strong pulse that undergoes varied musematic repetition. This loop features a wide array of pitched and non-pitched instruments struck with mallets. Though the phrase is composed of numerous juxtaposed fragments, the phrase does not possess a large-scale metrical hierarchy. Each fragment of Cendo's introduction carries its own timbral and rhythmic identity while hosting similar morphological properties (a resonant surface struck with a mallet). An overriding pulse is heard, but the independence of each pulse within the meter limits the

possibility of a salient groove being recognized. To develop the loop, Cendo inserts short repetitive episodes based on a single fragment, yielding a 'broken record' effect. By doing this, Cendo mixes a large-scale *periodic* musical environment interspersed with short *statistical* episodes.

The first movement of Francesco Filidei's *Partita, Movement I*, for 8 musicians (2003/2007), exhibits repetition of a phrase with a consistent strong pulse and a metric hierarchy. Throughout this movement, Filidei uses noise-based extended techniques with a regular metric identity and hierarchy to create the perception of a consistent groove. By keeping a predictable and stable metric hierarchy in strict synchronization, Filidei affords the listener to easily track the development of the material. The repetition in *Partita* is both musematic and discursive because Filidei orders his grooves in a fashion that yields a strong formal arc. Since the material in *Movement I* is heavily section-based, it is difficult to perceive small-scale accelerations or decelerations, therefore resisting classification on Grisey's continuum.

When composers work with these particular styles of repetition, they develop creative ways of incorporating loops into a larger formal design with varied amounts of causality. Establishing a loop of complex musical material is useful in that it can provide a stable foundation through which the listener may experience development. If a listener can learn a model, they may be able to form expectations and identify alterations to the model. Through manipulating orchestration, rhythm, pitch, and other musical parameters, a composer can control the saliency and magnitude of these alterations in noticeable ways that yield varied amounts of musical momentum. If the loop is changing quickly, we might sense that the musical trajectory is moving quickly

towards a goal. On the other hand, a loop repeated without alteration might suggest musical stasis. By dividing the loop into discrete recognizable parts, these parts can be individually altered to give the repetition its own musical behavior, while maintaining focus on the global structure.

Hypnagogia uses the aforementioned methods of repetition in various ways to build structure and musical syntax. The methods by which these behaviors are enacted will be explained in detail in the following analysis.

Chapter 3: Compositional process

3.1 Selection of the ensemble

The acoustic part of *Hypnagogia* was composed for nine instruments that were treated as three mixed trios. The electronic part (discussed in section 3.4) consists of fixed soundfiles that are triggered during the live performance by the conductor using a foot pedal. Two trios (flute, cello, metal percussion; violin, bass clarinet, wooden percussion) were constructed by using a high voice from one instrument family, a low voice from another instrument family, and a group of familial non-pitched percussive sounds. It was important that the percussion setups could yield a large variety of sounds in a small and easily navigable space mimicking the functionality of a drum set. The third trio (contrabass, piano, harp) was chosen to provide contrast to the other trios by using instruments of a single type (strings) that nonetheless host vastly independent timbral characteristics. For simplification purposes, the flute-cello-metal percussion trio will be referred to as the flute trio, the violin-bass clarinet-wood percussion trio will be referred to as the violin trio, and the contrabass-piano-harp trio will be referred to as the

contrabass trio, though it must be noted that these names do not reflect any inherent dominance or hierarchy within the trios.

The stage setup spatializes each trio (a diagram may be found in the 'stage setup' section in *Hypnagogia*). The bass trio is center-stage while the flute and violin trios are positioned stage-left and stage-right, respectively. This setup aimed to reinforce the distinct identity of each trio (discussed in section 3.2) by giving them give dedicated physical spaces on the stage. Also, this separation sought to aid the listener in grasping the form of the piece by coupling the music of each trio to the space physical space it originates from, localizing each trio and their interactions independently within the stereo field.

3.2 General guidelines for musical characteristics

To develop a musical identity for each sleep stage, each trio was assigned a set of musical behaviors, which evolved during the trajectory of the piece. When determining the behavior of each trio, I considered the dependent and independent relationships between each instrument in the trio, the rhythmic and timbral character of each instrument, and the small-scale forms that material would create.

The contrabass trio begins by featuring the bass as the dominating voice, though this hierarchy is not permanent. After the tutti introduction (m. 18), the bass leads the trio while the piano and harp provide subordinate percussive sounds to reinforce downbeats within a mixed-meter environment with tight synchronization. Playing a texture of fast pizzicati and glissandi, the bass keeps a relatively consistent musical profile while the piano and harp serve as passive rhythmic supporting roles.

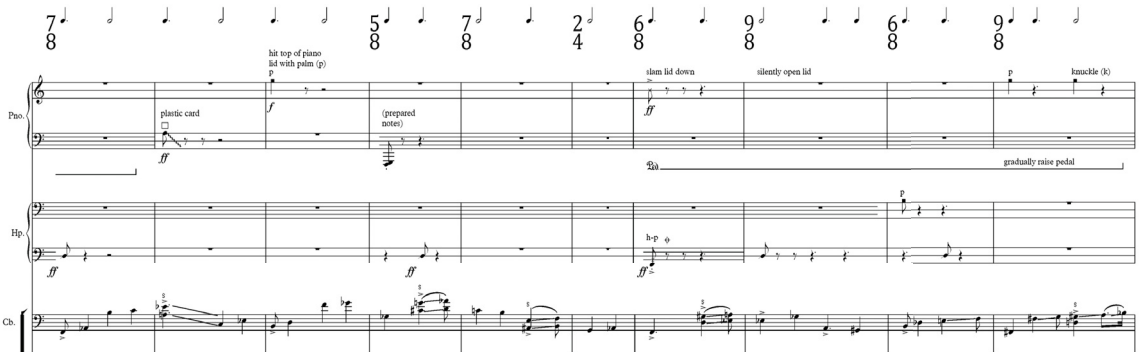

Fig. 6. Interactions within bass trio in *Hypnagogia* (mm. 22-31)

The violin trio, introduced at m. 37, uses an expanded cajon setup (mounted cajon, wood blocks, and a guiro) to provide a stable pulsating rhythmic structure while the violin and bass clarinet are given fast and unstable fluctuating lines that are played outside of the stable rhythmic matrix. While the behavior of the violin and clarinet are similar, the synchronization between the parts is nonexistent (except for brief episodes in bars 40 and 43). Both instruments are instructed to improvise the placement of the gestures in the music based on the position of the material within the measure. This approach can be seen in Luciano Berio's *Sequenza I* for flute (1958). Though Berio's work does not have bar lines and no meter is suggested, the composer included small evenly placed tics in the staff to frame the proportionally placed notes and denote tempo. In *Hypnagogia*, this approach was taken in order to give the music a freer feel without burdening the performers with complex rhythms.

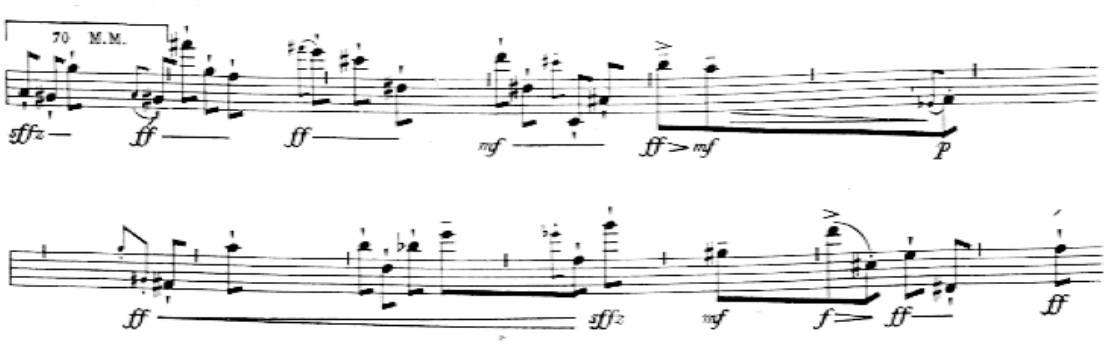

Fig. 7. Semi-improvisational rhythmic notation in Berio's *Sequenza I* (1958)

The music for this section consists of a loop comprised of two 4-beat measures and one 5-beat measure. The measures change their order with each iteration of the loop, and the beat patterns in the cajon are kept constant in each measure, thus yielding an altered form of musematic repetition. This structure was used to give each repetition a familiar groove while avoiding verbatim repetition and high predictability.

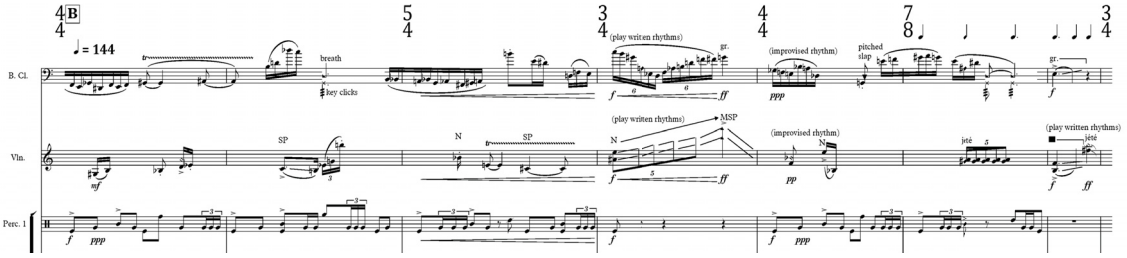

Fig. 8. Interactions within violin trio in *Hypnagogia* (mm. 37-43)

The flute trio starting at m. 41 culminates with a loop of breathy percussive sounds from the flute, noisy col lengo battuto and jeté techniques from the cello, and muted metal percussion. Though the instruments avoid rhythmic unison at the start of the passage, the entire trio eventually succumbs to a steady pulse in strict synchronization. The loop, though not immediately audible, was first composed of two alternating sections whose length was altered in each musematic repetition. After the entire section was composed, fragments of each part were deleted to momentarily draw attention to the remaining instrument(s) while also obscuring the perceptibility of the

loop. Since the music of the violin trio was based in fluctuating pitch contours, I wanted noise- and percussion-based sounds for the flute trio. By combining noise-based sounds from the flute and cello with the muted metallic sounds from the percussion, a drum set-like texture is created with timbres from both acoustic and electronic realms.

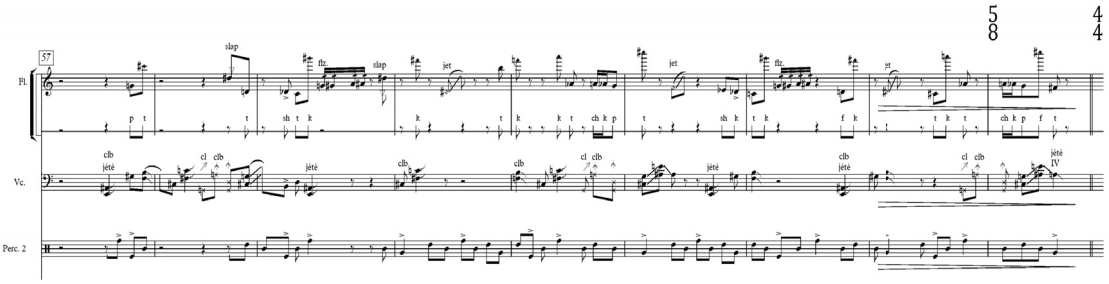

Fig.9. Interactions within flute trio in *Hypnagogia* (mm. 57-65)

These distinct identities not only facilitate the recognition of each trio's place in the form, but also aid in identifying modes of interaction between the trios.

3.3 Instrumental interactions as a function of form

The form of *Hypnagogia* was built through small- and large-scale interactions between the three trios, as well as the development of behavior within these interactions. The form on a whole mirrors the REM cycles seen in the hypnogram, and therefore, REM cycle numbers will be used to denote large sections of the work. The first REM cycle, which ends at rehearsal H, shows the prototype of each stage and its interactions both within the trio and the ensemble as a whole. The form of the first section starts tutti, moves through each trio, accumulates, and finally approaches a local climax at rehearsal G.

The idea for this orchestrational choice was derived from an analysis of the hypnogram. In order to highlight the musical environment of each sleep stage in the hypnogram, as well as the transitions between them, I assigned the occurrence of each

stage to a particular trio, in that each stage features a particular trio in the foreground layer through use of dynamic markings. Stage 1 was assigned to the contrabass trio, Stage 2 was assigned to the flute trio, and Stage 3 was assigned to the violin trio. Stage 4 would feature a method of gradual ensemble superimposition, and REM/Awakening sections were always tutti. Though these compositional restrictions are generally adhered to during the first half of the composition, they are only loosely followed in the second half.

Rehearsal letter	Beginning	A	B	C	D	G
Sleep stage	Awake	Stage 1	Stage 2	Stage 3	Stage 4	REM
Orchestration	Tutti	Cb, pno, hp	Vn, bcl, wood perc	Vcl, fl, metal perc	Gradual superimposition	Tutti

Fig. 10. Orchestration of first REM cycle of *Hypnagogia* from beginning to rehearsal G as a function of sleep stage

The Awake section was composed using a loop consisting of three juxtaposed chords.

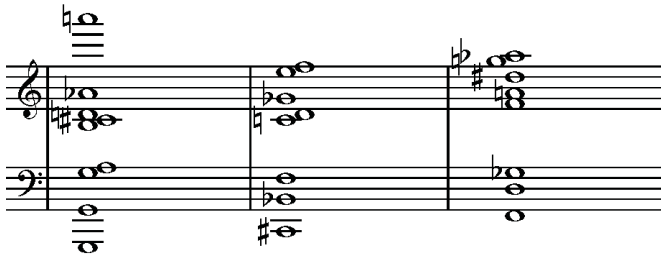

Fig. 11. 3 chords that are looped in the introduction of *Hypnagogia*

The ensemble plays through these chords in harmonic unison, and each is given a different character. The first chords exhibits running lines in the winds and glissandi in the strings, the second is a dramatic timbre shift, and the third features loud strikes in the lower register from the piano, harp, and bass. After the first chord cycle is heard (m. 2 to the end of m. 5), the length and rhythmic profile of each chord is altered with each repetition. Though Awake sections were assigned to be tutti, this music is not meant to

be a conceptualization of ‘awakeness’. Rather, this is intuitively composed music meant to serve as a rich reservoir of material for future development. Conceptually, the methods used in composing the introduction mirror those used in the rest of the piece. Though the order of the three chords is kept constant through the introduction, the repetition is expanded and contracted in various ways to thwart rhythmic expectation and manipulate the music’s momentum.

The first chord is based on a G Lydian pentachord combined with an A-flat for Phrygian color. The second combines a B-flat Lydian mode with a flattened 6^{th} over a C-sharp in the bass, yielding a chord with both major and minor flavors in the first inversion. This voicing was constructed to be perceived as a contraction of register from the first chord. The final chord in the loop combines octatonic flavors of different sets (D/D-sharp and G-sharp/A belong to the octatonic (0,2) set while F-sharp/G belongs to the octatonic (0,1) set). These pitches are voiced with three major-3^{rd} dyads occupying the middle/upper register (D/G-flat, F/A, D-sharp/G). The F is placed in the bass to serve as a lowered leading tone back to the first chord.

In Stage 4, the three trios are introduced in reverse order. Instead of being cross-faded as they were in the prior sleep stages, each trio is introduced with repeated loud punctuated gestures. The temporal space in between these entrances decrease until the texture of the trio is completely superimposed upon that of the previous trio.

The REM sections were composed in a method related to the opening Awake section. Though traditional loops are absent from this passage, it uses repeated and juxtaposed sonorities from the Awake section coupled with fixed characteristics that are then modified rhythmically. In this way, these juxtaposed sonorities repeat themselves

without a fixed order, resulting in a loop that appears to be constantly gaining and losing material. The subtle shortening and lengthening of these sonorities serve to produce tension and momentum leading into the second REM cycle, whose form is presented below.

Rehearsal letter	H	I	J	K	L	M	N	O
Sleep stage	Transition	Stage 2	Stage 3	Stage 4	Stage 3	Stage 2	REM	Awake
Foreground of orchestration	Vn, bcl	Vn, bcl, wood perc	Vcl, ft, metal perc	No clear foreground	Vcl, fl, metal perc	Vn, bcl, wood perc	Tutti	Tutti

Fig. 12. Orchestration of second REM cycle of *Hypnagogia* from rehearsal H to O as a function of sleep stage

The second cycle uses guidelines established in the first, though with a number of important differences. Instead of the trios performing as solo units, they are accompanied by a subordinate background layer. This background layer contains noise-based sounds from the bass and harp rubbing their instruments with wax paper, breathy sounds from the flute, and soft and rapid improvised lines in the lowest register of the wind instruments. A portion of this background material at rehearsal I is then patterned into smaller units, which are later compressed and used as loops by the flute trio at rehearsal J.

Another important difference between the second and first cycles is the transition from Stage 4 to REM. In the first REM cycle, this consisted of a gradual superimposition of each trio forming a multi-dimensional texture. In the second section, the trios are presented again in reverse order, but they are accompanied by the preexisting music of the previous passage. The results are seen at rehearsal M. Here, the violin trio holds the foreground with soloistic material, the flute trio is playing a looping

pulsating figure, and the bass and harp are providing a noise-based background texture.

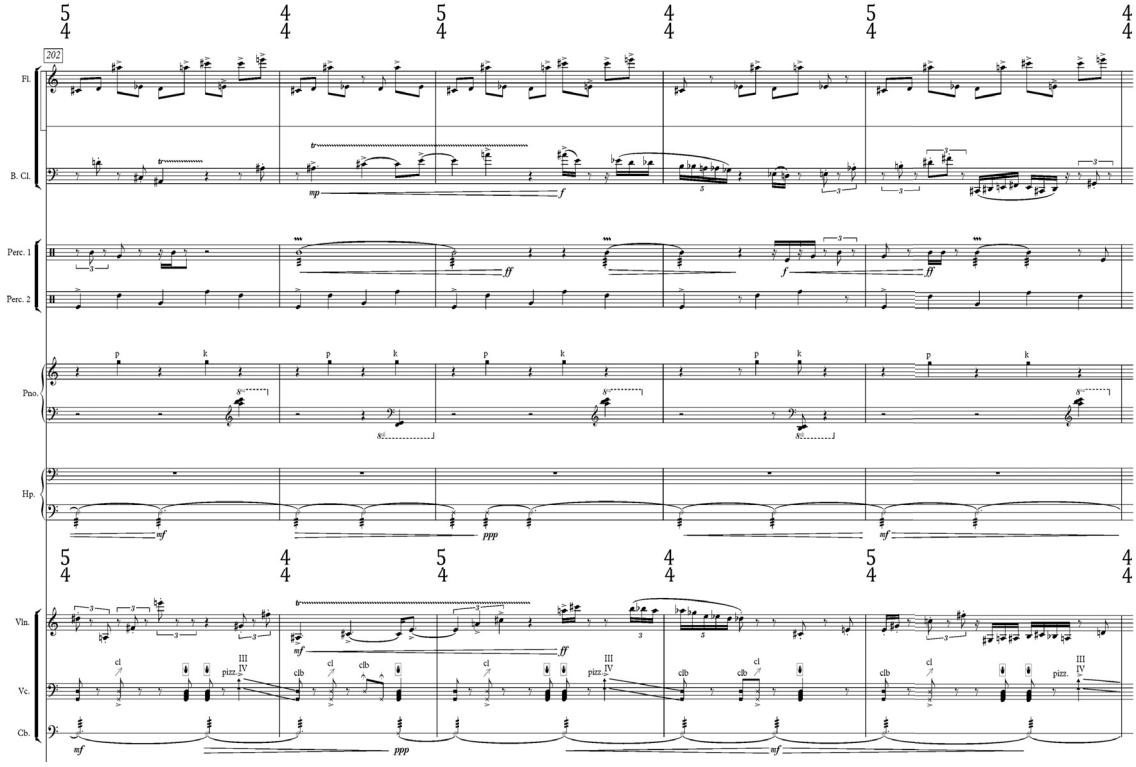

Fig. 13. Superimposition of trios with background layer in the bass and harp in *Hypnagogia* (mm. 202-206)

After this build up, the REM passage reoccurs at rehearsal M, though this time, it is interrupted by the awakening motif. This motif, consisting of a long sustained chord, is meant to briefly pause and reset the momentum of the music. The passage, which is modeled after the piano part from measure 2, returns in various forms several times over the course of the work, often transitioning into a new section.

The subsequent two REM cycles (R to S, S to V) each begin with a bass solo similar to the one heard at rehearsal A. The first is played pizzicato in a rubato fashion and accompanied by an instrumental noise-based background gesture cued by the conductor. The violin and bass clarinet enter afterwards with material similar to that heard at rehearsal B. Entrances from the rest of the ensemble follow, quickly building

momentum into the second iteration of the Awake motif at rehearsal R.

The second bass solo is played as loudly as possible with extremely heavy bow pressure, resulting in a mixture of pitch and noise accompanied by both percussionists locked in a repeating 11-beat groove pattern. Here, the bass plays outside the tight synchronization of the percussion. When the bass clarinet enters, it is without the accompaniment of the violin. Instead, the trio pattern breaks and a loop forms encompassing the bass and clarinet. It is at this moment that the guidelines established during the first two REM cycles begin to dissolve, and the focus of the music shifts from large-scale trio interaction structured in large discursive repetitions to small-scale trio interaction structured into smaller loops. This transition of focus lasts until rehearsal V. During this passage, the bass/clarinet/percussion loop is expanded and compressed while other instruments add and subtract from the preexisting pattern.

The two transition sections (rehearsal O and rehearsal R) are similar in that they both begin with the Awake motif followed by an extended continuant before beginning an accelerando process into the following section. The accumulation of momentum is handled differently in each transition. At rehearsal O, the accelerando is achieved through a combination of mixed meter and abrupt tempo increases, thus avoiding high predictability by achieving a *discontinuous-dynamic* environment using *acceleration by stages*. On the other hand, rehearsal R accomplishes the same task with one large tempo change (M.M. 100 to M.M. 134 in measure 281) followed by a gradual compression of meter (5/4 to 4/4 to 3/4 to 5/8 (represented as 5/4), resulting in a similar *discontinuous-dynamic* environment, though by way of *acceleration by elision*.

On the whole, the first four REM cycles were composed to be perceived as two

sections each having two related subsections (see *Fig. 14*). Each of the two subsections within the larger section share a general orchestration and material trajectory. The first two REM cycles end with loud tutti sections, while the second two REM cycles begin with a bass solo. By linking these distinct events together, the listener should form a 'chain of events' based on the large-scale order of material. For example the loud tutti sections that conclude the first two REM cycles serve as climatic points of arrival for the preceding material. Metaphorically speaking, the music provides two related paths that share the same goal. Oppositely, the bass solos that begin the third and fourth cycle serve as points of departure, though the individual character of each solo yields a different consequence. Together, the first two cycles are longer than the second two, thus yielding a sense of gradual large-scale *discontinuous acceleration by stages* using large-scale discursive repetition.

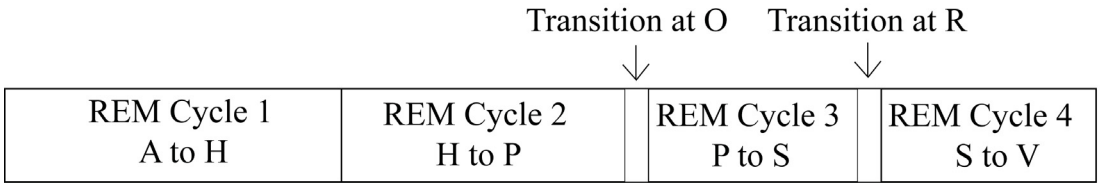

Fig. 14. Diagram of the first four REM cycles in *Hypnagogia*

At rehearsal V, the entire ensemble engages in a 4-measure metric groove comprised of small-scale trio interactions (see *Fig. 15*). Using noise-based techniques, each trio plays a small portion of the groove in tandem. As this music develops, the trios begin to mix with each other, transforming the groove through dramatic tempo and orchestrational shifts. Since the rhythmic profile of the music is relatively simple, the tempo shifts serve to disrupt perception of high predictability. Rehearsal W begins a beat stretching/compression process where specific pulses of the groove are subtly expanded and compressed by use of mixed meter. This causes momentum of the groove

to jerk back and forth as tension builds through semi-improvised ascending trilling glissandos in the bass clarinet and violin.

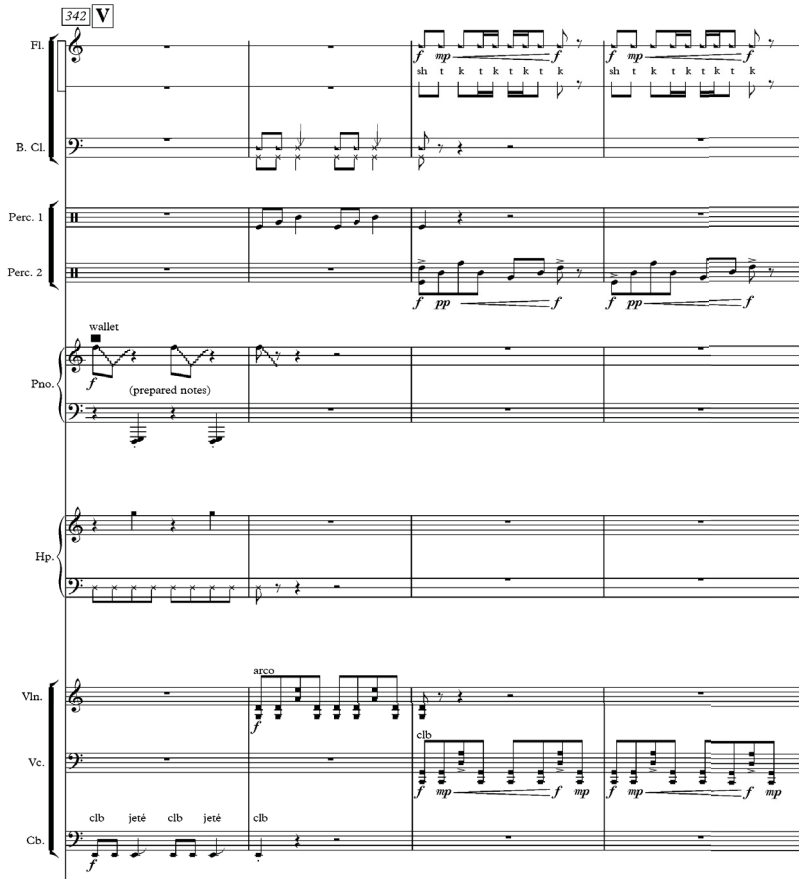

Fig. 15. 4-measure groove featuring small-scale trio interaction in *Hypnagogia* (mm. 342-345)

Beat dilation and compression is also apparent at rehearsal X. From here until rehearsal Z, a 4-second loop is repeated and undergoes a gradual shift in instrumentation through the crossfading of trios. A 4-second loop was chosen because it is thought to be the limit of aural echoic memory (Mountain 1989). Though beat dilation/compression at rehearsal V was used within a constant pulse (albeit with many tempo shifts), the loop at rehearsal X is absent of pulse. Therefore, its effect is not perceived as tension in the groove, but rather as tension and in the perceived length of the repeated phrase. This manipulation serves to avoid maximum predictability by avoiding a strict periodic

structure.

The musicians in this passage are instructed to improvise the placement of each gesture based on its position within the measure. Additionally, they are asked to change the rhythm slightly with each repetition. This was done to eliminate the need for complex rhythmic notation, and also to let the musicians engage more with their respective trios.

The loop begins in the bass trio, where it is presented six times. During each repetition, one of three measures is slightly compressed, resulting in subtle rhythmic alterations. Starting in measure 388, the violin trio begins to fade in, following the same process. At rehearsal V, the flute trio gradually adds to the existing loop, which repeats until rehearsal Z. The musical behavior here takes a different approach, first presenting fragments of a phrase iterated in its completion starting at m. 437. To begin, three synchronized active fragments in the foreground are played in an ordered series, each by a different trio. These fragments are separated in musical time and interspersed by an unsynchronized subordinate background texture. In each repetition, less and less time is inserted in between the separated fragments. After three iterations of the loop, the background disappears and the fragments are heard in immediate juxtaposition. The relationship between the fragments, though at first unclear and faint, finally becomes recognized as the complete phrase is revealed. Unfortunately, measures 375-440 were not played at the premiere. I plan on revising these sections at a later date.

This process is interrupted at rehearsal AA by the third and final statement of the awakening motif, thus ushering in new material. The loop in this passage is much shorter than those used previously in the piece. Here, the winds play quick airy gestures

separated by brief moments of stasis. Each time this alternation is repeated, the tempo and instrumentation of the quick gestures increases while the tempo of the stagnant moment is gradually decreased. These tempo alterations gradually exaggerate the difference in perceived time between the gesture and the moments of stasis. Eventually, the moments of stasis vanish and the pattern is interrupted by a grand pause one measure before rehearsal BB.

The process at BB is similar to the one at AA, but with a few distinct changes. The bass trio performs a short intense phrase that repeats with breaks and alterations. This is superimposed over a slow chord progression played by the flute, clarinet, violin, and cello. The progression here is a hyper-expansion of the final piano sequence, which consists of 8 chords repeated and transposed up a perfect 4th at each repetition. These chords feature chromatic voice leading built around small fluctuating clusters of pitch. The clusters are meant to obscure individual pitch identity, resulting in sonorities that seem to ascend in pitch space without the perception of a chromatic scale. The ascending perfect 4th transposition serves to link the last chord with the first in that the middle voices at the end of the progression meld into the lowest voices in the following sequence.

The chord sequence is played faster and faster until the orchestration shift at measure 482. At this point, the piano takes over for the mixed quartet, and the loop played by the bass trio is truncated down to a single note.

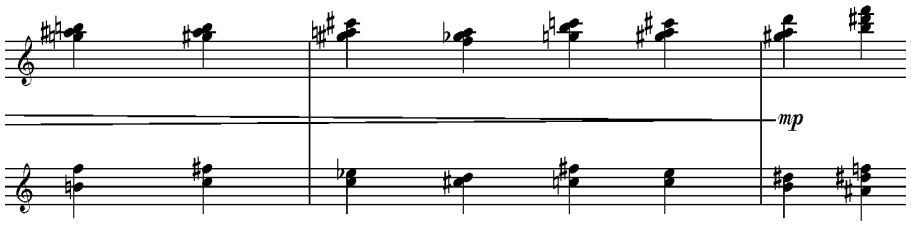

Fig. 16. 8 chords used in piano part in the coda of *Hypnagogia* (mm. 485.3-487.2)

The conclusion of *Hypnagogia* begins at rehearsal DD. The piano, accompanied by the harp, plays a continuation of the chord progression introduced in the previous section, while the rest of the ensemble plays a repeating instrumental noise-based background. This chorale is sequenced until it ascends the highest register of the instrument, and the music fades out. Rather than using material similar to the other brief awakenings, as the hypnogram suggests, this passage needed a conclusive character, instead of a transitory one. Also, I wanted the concluding material to be unfamiliar to the listener, mirroring the metaphorical shift from unconsciousness to consciousness. However, while one might assume that the floating atmospheric character of rehearsal DD would be associated with drifting into unconsciousness, for me it addresses the distinction between the alert conscious mind, which we use in public, and the uninhibited unconscious mind, which we reserve for our own private cerebral excursions.

On the whole, as illustrated by the hypnogram, the form of *Hypnagogia* suggests a 3-sectioned piece. The first section (beginning to O) may be grouped as two relating cycles. The second section (O to V) is also two relating cycles (though shorter in length). The final section (V to end) is a chain of smaller sections of related repetitive behaviors.

3.4 Formulation and role of electronics

The electronics in *Hypnagogia* are comprised of 29 fixed stereo soundfiles that are triggered during the performance by the conductor according to cues written in the score. Soundfiles are triggered using Max/MSP and diffused through two speakers

positioned on each side of the ensemble facing the audience. Since many of the soundfiles are rhythmically related to the acoustic part, numerous cues are coupled with a click track that is fed from the computer to headphones worn by the conductor. The raw materials used to compose the sound files originate from instrumental sounds acquired in the Digital Composition Studios at McGill University. Additionally, some sounds were created with samples from percussion instruments and electrical metal tubing recorded by the composer.

The goal of the electronics was to extend the spectral palette of the ensemble through the use of cross-synthesized timbres and morphologies outside the physical acoustic realm. When placed in the foreground, the electronics cut through the orchestration in order to punctuate the form of the piece. In the middle ground, they sometimes mimic the pitch or rhythmic identity of the accompanying acoustic material. Additionally, the electronics often serve as a granulated background texture upon which the ensemble is superimposed.

The electronics play instrumental sounds that are otherwise impossible for humans to create. These include cross-synthesized percussive timbres, non-pitched percussive sounds that are tuned through pitch-shifting, and other common processes such as envelope editing, cross-synthesis, granulation, time-stretching/compressing, and reversing of sound files.

In the first two REM cycles, the electronics serve to punctuate each sleep stage. The sound files triggered at measures 16, 26, 35, 50, 65, 82, and 97 (cues 1, 2, 3, 4, 5, 6, and 7, respectively) all function to reinforce the downbeat into the proceeding section (if speaking of the form, this corresponds to a new sleep stage, and therefore new

instrumentation). These cues use similar *attack-decay* archetypes with extended *graduated continuants* and preceded by an anacrustic *onset* (Smalley 1997). The *attack* is typically comprised of multiple pitch-shifted bells in the high spectral range with cross-synthesized percussive timbres (one example being a bass drum cross-synthesized with a spring drum) in the low spectral range.

The *onsets* aim to inject energy into the *attack* by using several variations of non-linear swells. Often enough, the *onsets* themselves feature many *attacks* before introducing the main *attack*, similar to the sparking heard when igniting a gas stove. Visual metaphors useful in describing this increase in spectral energy may be the wind-up before a pitch in baseball or pulling the arrow back in archery.

The *continuant* of each attack becomes the background layer upon which the instrumental music is heard. Usually, these comprise of long granulated sounds. While the *onset* and *attack* dominate the foreground as *gesture-carried* devices, the *continuants* are more *texture-carried*, in that they simply prolong the presence of the electronics without redirecting focus from the instrumental layer.

At rehearsal J, the electronics (cue 11) present a different approach. In addition to providing a background layer, a foreground loop was composed to accompany the flute trio. As the trio performs a short loop of noise-based sounds interspersed with brief episodes, the electronics expand the spectral pallet of the live trio with repeated sequences of quick juxtaposed noise-based sounds. Each sample of the loop is given its own spatial identity in the stereo mix.

The electronics at rehearsal L (cue 12) supplement the pulse played by the bass, harp, and metal percussion through use of granulation. In this cue, the sound of an

industrial fan was filtered and processed through granulation to create a synthetic-sounding pulse that is superimposed upon the acoustic material.

Though electronics are absent in the REM sections, they are always used in the Awake motifs (rehearsal letters O, R, and AA; cues 16, 18, and 28, respectively). As the Awake motif typically follows the REM passages, I wanted to give this motif a contrasting and salient sonic identity through use of gestures only possible in the electroacoustic domain. In cues 18 and 28, the electronics punctuate the rhythm of the live material, expanding the *continuant* of the acoustic sound with pitch-shifted bells and cymbals tuned to match the harmony of the ensemble.

Cues 17, 20, and 21 are similar in that they all function to introduce a solo instrument. Similar to the first group of sound files, they demarcate the arrival of a new sleep stage, but they are slightly different in their spectromorphological design. Here, the *attack* and *continuant* of the sound do not necessarily match with the *onset*. When speaking about the motion of sounds, Smalley proposes comparisons that suggest physical motion such as launching, flying, floating, drifting, and dragging (1997). Many of these behaviors may potentially have a counterpart in the real world (to float is to sink as to drag is to push). While one could describe the *continuants* of these cues as *floating*, each *onset* and *attack* hosts a different motion, cue 17 may be classified as rising, and 20 and 21 may be described as sinking or being dragged downwards, though each cue approaches the word differently. These comparisons serve to draw structural relationships between the functionality of each cue within the larger form.

The electronics in cue 22 (rehearsal V) take a similar approach to those in cue 11. Here, as the entire ensemble is tasked with producing a timbrally-fragmented groove

(see *Fig. 15*), and the electronics mirror and reinforce the phrase structure of the acoustic material. The instrumental part is a 4-measure groove that is segmented by orchestration into a 1+1+2 bar structure. This segmentation is mimicked in the electronics to expand the spectral palette of the ensemble through use of strong attacks on downbeats preluded by fast onsets and the spatial separation of each measure. Similar to the music at cue 11 (rehearsal J), this creates a beat that blends and extends the morphologies of the live ensemble with those of the electronics.

Cue 26 (measure 366) exhibits shifts between three functions. First, cue begins softly in the background, begins in the background layer. Steadily, the sound gains energy through the addition of electrical static and sustained granulated textures. In measure 373, the sound shifts to the foreground and mimics the rhythm of the harp using sounds similar to that in cue 22. After this moment (rehearsal X), the sound is launched into high ascending spectral space, similar to cues 20 and 21.

The approach to the final tape cue (rehearsal DD) was unique when compared to the approaches previously mentioned. In this cue, a piano sampling of the coda was processed using repeated auto-convolution. When combined with envelope editing and equalization, the resulting sound is absent of traditional piano transients and decay. Just as the harp part is meant to subtly obscure the rhythmic regularity of the piano, the electronic part is meant to subtly obscure the timbre.

Chapter 4: Issues in notation

4.1 Problems in approaches to rhythmic complexity

In *Hypnagogia*, I was interested in creating structures of rhythmic complexity that would be playable by the musicians without the stress of interpreting nestled tuplets.

These structures included small, quick, repetitive units that could be changed subtly without using a steady pulse, fast soloistic lines played outside of a pulse, and interpolations between two musical cells of varying rhythmic identity. Traditionally, these kinds of effects could be accomplished using traditional rhythmic notation featuring carefully calculated nestled tuplets. While the original musical idea was incredibly intuitive, I imagined that the transcription of this idea using traditional music notation would initiate problems during the rehearsal, as these sorts of practices demand many hours of rehearsal time and focused dedication. Practically speaking, these demands were not practical for this project, so an alternative approach was needed.

To remedy this issue, I made use of several improvisational techniques. This decision was made to decrease the perception of musical complexity by the musicians, with the intent that they would perceive the music with the same intuitive and flexible thought with which it was composed. These techniques include using semi-improvised rhythmic notation, boxed notation, and improvised interpolations, which will all be defined and discussed in the following sections.

4.2 Semi-improvised rhythmic notation

The first solution to this problem was writing passages using complex but vague rhythmic notation that would be improvised. The first example of this may be found in the violin and bass clarinet parts at rehearsal B (see *114*). These parts feature fast gestures absent of rests, and the musicians are instructed to improvise the placement of a group of notes or gestures based on its position within the bar. Therefore, while the gesture itself and its general location in the music are both predetermined, the musician

determines the precise placement of the gesture in the passage.

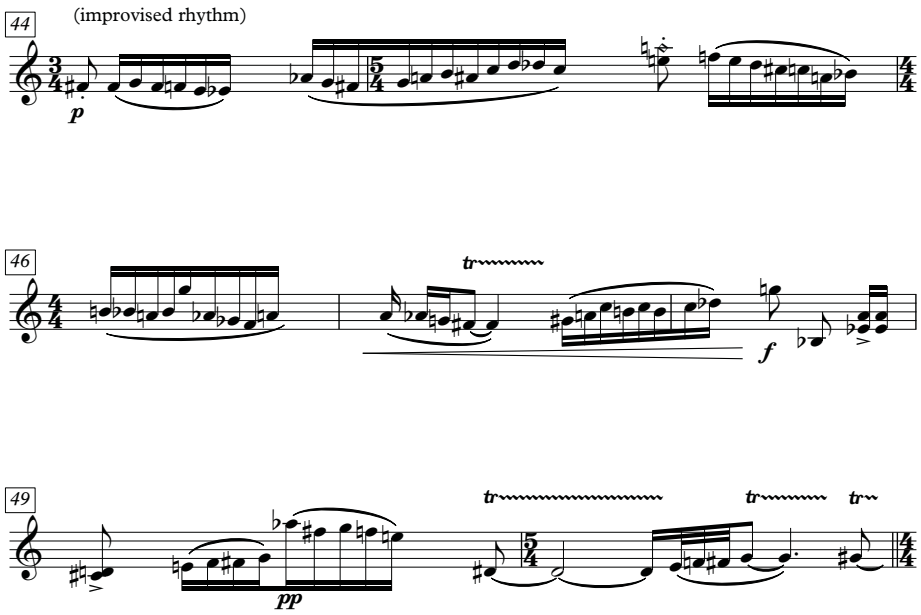

Fig. 17. Semi-aleatoric rhythmic notation in violin part in *Hypnagogia* (mm. 44-50)

This style of notation is interpolated with traditionally notated music, creating brief moments of strict synchronicity inside a freer rhythmic environment, thus giving the musician more autonomy during performance. Instead of performing the passage while tediously counting out subdivisions of tuplets, the performers may concentrate on the feeling and musicality of each gesture.

At rehearsal X, a similar technique is used on a larger scale. Similar to the previous method of notation, the musicians are instructed to improvise rhythms based on the placement of notes in each measure. In addition, they are asked to slightly alter the rhythm with each repetition of the phrase. This process is coupled with slight meter changes that subtly stretch and compress the length of each bar. In the larger passage, this msic is gradually crossfaded from the bass trio to the violin trio, thus creating a music object that is repeated with subtle rhythmic variations and larger-scale

orchestrational shifts.

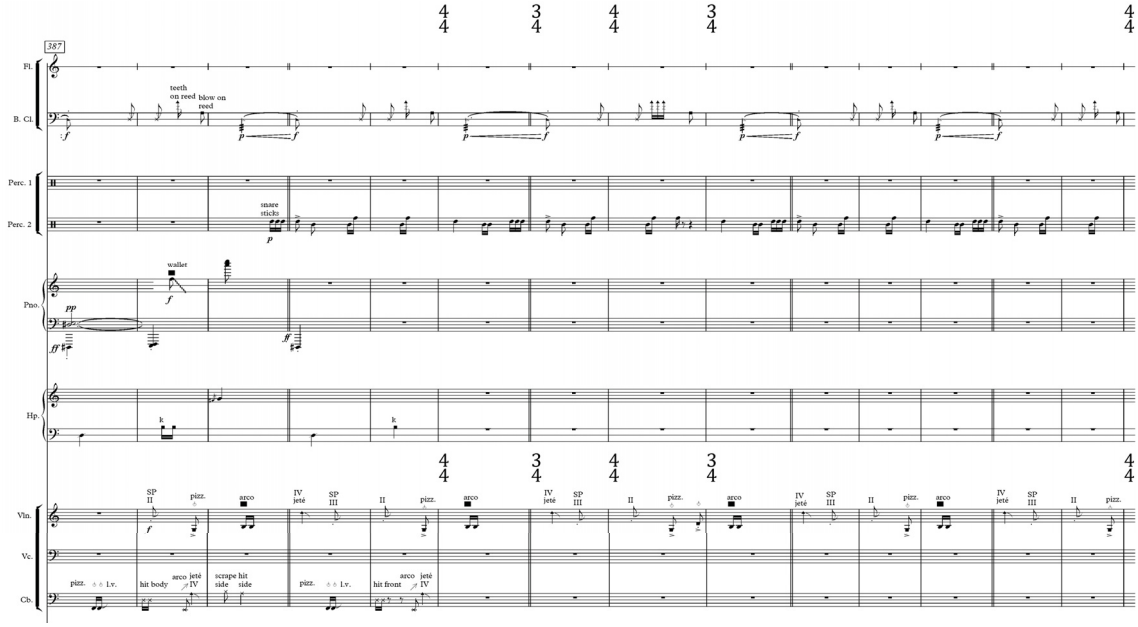

Fig. 18. Semi-improvised rhythmic notation with orchestration crossfade in *Hypnagogia* (mm. 387-400)

As previously mentioned, the music at rehearsal Z is divided into two layers. The *gesture-carried* foreground consists of short and separated fragments that are gradually brought into closer proximity to form a large gesture. The *texture-carried* background is composed of five instruments playing boxed material that is repeated indeterminately. This creates a layer with a fluctuating pointilistic rhythmic identity, thus providing support to the foreground layer while not redirecting focus away from it.

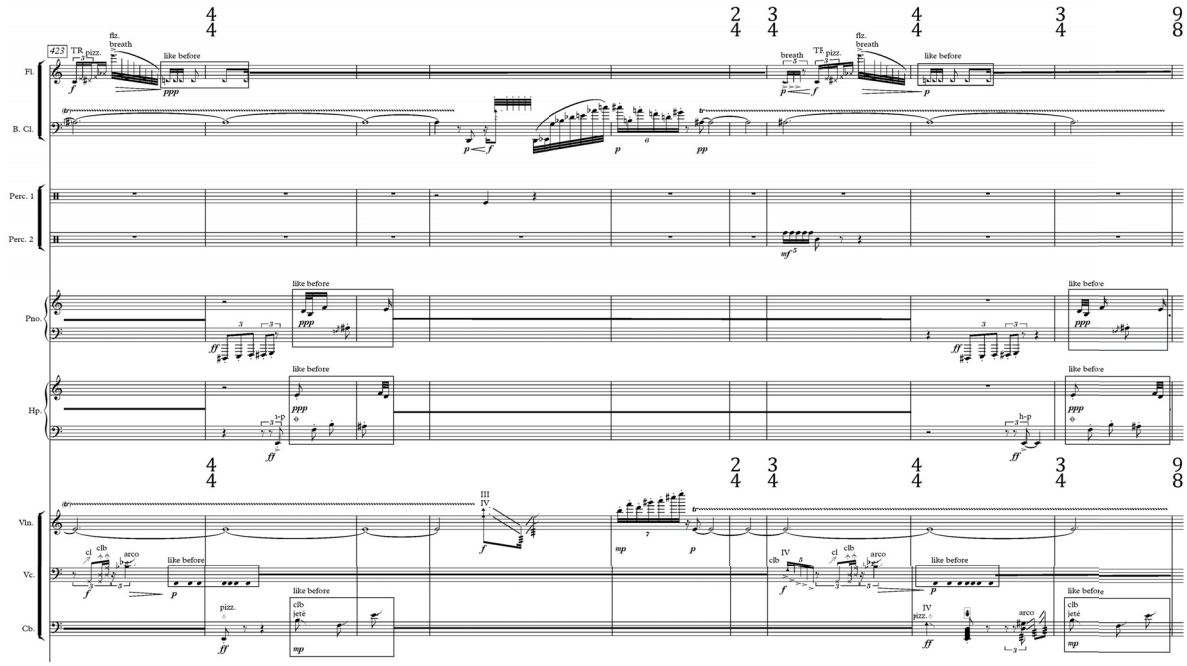

Fig. 19. Boxed notation in *Hypnagogia* (mm. 423-431)

Unfortunately, due to difficulties during the rehearsal process, mm. 375-440 were omitted at the premiere. I plan on revising this section at a later date.

4.3 Improvised interpolations

In order to achieve a certain texture, it was occasionally necessary to combine improvised boxed material with written instructions to slightly alter the character of a musical texture. Since this texture was usually in the background layer, it was not necessary or practical to specify every minute detail of the interpolation. Instead, these details were left to the discretion of the performer. Thus, sections of the score feature a box of short musical model coupled with written instructions. During the improvisation, the musician is instructed to change the material in a specific way, usually demonstrated with boxed samples of suggested music that serve as improvisation checkpoints. This method releases the musician from the burden of learning a precise fixed interpolation, and instead lets them focus on the character of the sound, therefore yielding intuitively-

sounding music without the stress of learning complex material absent of traditional or predictable rhythm and pitch patterns.

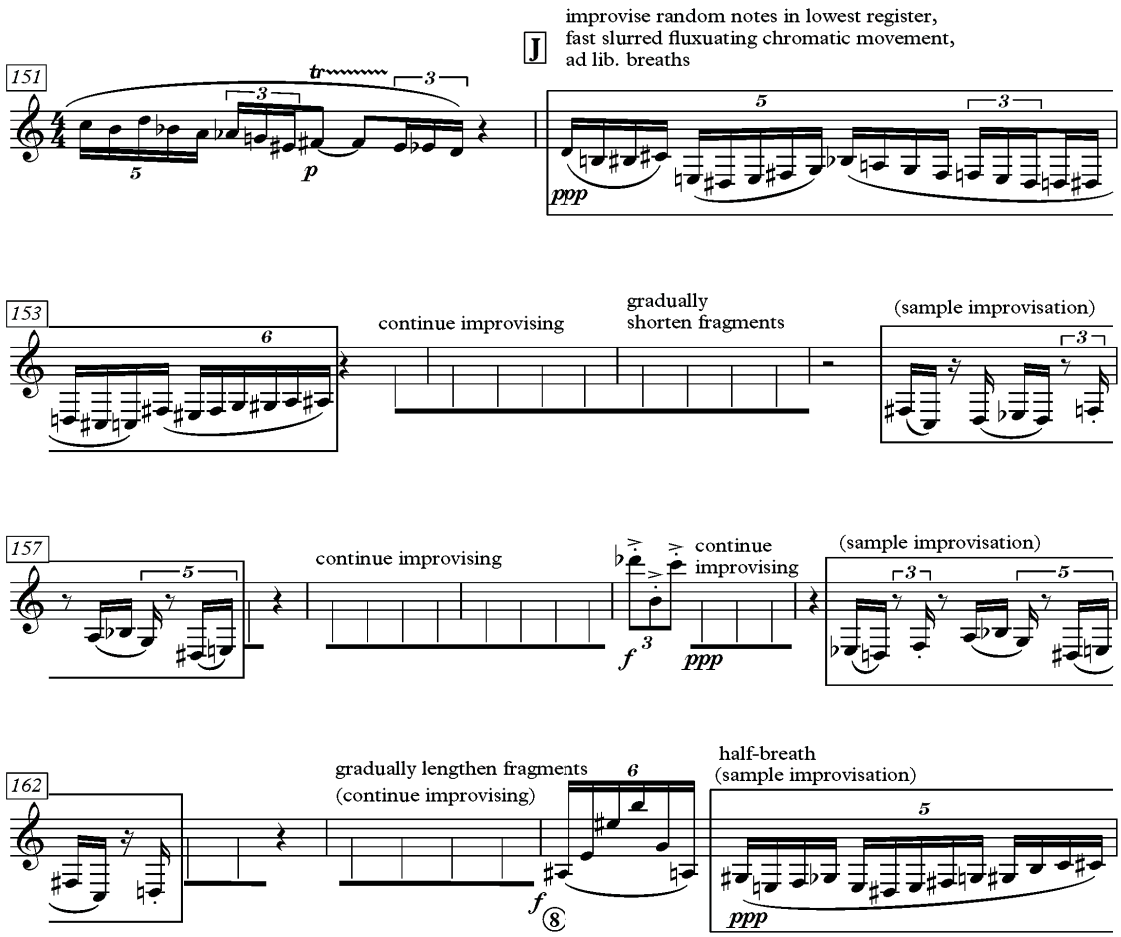

Fig. 20. Improvised interpolation in the bass clarinet (transposed) part at rehearsal J in *Hypnagogia*

Chapter 5: Conclusions and further considerations

Hypnagogia is a musical composition concerned with the roles and functions of cycles, repetition, and groove in the realm of form and material in contemporary music. This analysis aims to illustrate how a complex cycle may be evaluated and adapted into a musical environment. The altered periodicity exhibited in the sleep cycle is mimicked in the macro- and micro-structures of the piece. Compositional techniques that may affect the perceived predictability of chronologically local and distant material have

been explored and enacted. The electronics in *Hypnagogia* have been investigated with regard to their ability to strengthen certain aspects of the form through concerns of spectromorphology. Additionally, issues of notation, their origins, and possible remedies have been addressed.

One area of additional personal research would be the investigation of intended predictability of musical patterns by the composer versus perceived predictability of these patterns by the listener, and whether the perception predictability changes from the now-moment to when the moment is reflected upon in retrospect. Also, information on the notion of how specific structural manipulations affect the amount of predictability would be useful in formulating inferences regarding expectation and fulfillment/violation in music.

My future work will expand on the notion of improvised interpolation within a modified cyclical environment. In *Hypnagogia*, the technique is used in very select background passages. I would like to employ this concept to a greater domain in the context of a small chamber ensemble. When applied to different types of material (short pulseless fragments, periodic rhythmic patterns, long virtuosic lines), it is possible to achieve material that may guide my musical thinking in new directions. Improvised interpolation has the potential to shift intuitive compositional thought from the composer to the performer without the use of complex notation.

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