Uncanny Valley

for orchestra

Louis Goldford (2014)

Babel SCORES®

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program note

When I began writing ***Uncanny Valley*** *in January 2014 I was unaware that my own teacher John Gibson had written a work with the same title for piano, electronics, and speaker. I later learned that Nicholas Vines had written an identically titled work for solo piano as well. (Despite these coincidences, both composers gave me their blessings to proceed with writing a new work for orchestra.) It would seem that I've joined the ranks of a privileged and curious few composers who have been charmed by this concept of the uncanny valley, a theory originally proposed in 1970 by the roboticist Masahiro Mori in a paper for the Japanese journal* ***Energy****.*

The theory states that as robots achieve a more humanlike appearance, actual humans find them increasingly familiar, gaining affinity for them until a point is reached when real people are suddenly repelled. The theory is best represented as the graph of a two-dimensional curve with human likeness on an x-axis and affinity (i.e. familiarity and agreeability among real people) on its y-axis, telling the story of this human response to robots or, in a larger sense, to any inanimate object that could appear to "be human."

As the response to this non-human entity becomes more positive, a sudden dip in the curve heralds a state of absolute repulsion–the curve dips down into a valley of minimal-to-no affinity whatsoever, after which it begins to rise again. This valley of the uncanny, of repulsion and eeriness may be due to what Mori identifies as "a form of instinct that protects us from proximal, rather than distal, sources of danger. Proximal sources of danger are corpses […] and other entities we can closely approach. Distal sources of danger include windstorms and floods." The paper gives a number of examples of these entities and locates them at various points along the curve–dolls, masks, healthy and ill people, Bunraku puppets, etc.–while corpses, zombies, prosthetic and myoelectric hands reside at various points in the valley.

I became interested in Mori's theory after viewing David Lynch's documentary on surrealist cinema for the BBC (1987). Among the films screened in this documentary was ***The Girl with the Prefabricated Heart*** *(1947) by Fernand Léger, which features mannequins filmed up-close. "I guess anything that looks human but isn't is frightening," Lynch spoke of the mannequins. "It goes back to this tremendous fear of the unknown." Why is it that mannequins or masks often appear to be scary or unsettling? What are their musical parallels?*

In ***Uncanny Valley*** *(2014) for orchestra, the graphical curve Mori used to illustrate his theory is treated as a control source, governing the piece's formal design and the movement of individual sounds. The large-scale movement of the piece is between the orchestrations of two source sounds–both samples I made of prepared pianos. The curve acts as the non-linear "morph" between these sounds. In this way, Mori's curve has been represented both metaphorically and empirically in the music.*

When the curve is in its valley, the orchestrations most closely resemble a piano sounding its lowest note, the lowest key of A0, its thick string scraped with the fingernail while the damper pedal allows its resonances to decay for as long as the string will vibrate. In the valley of the score the quiet, rolling percussion including low timpani, tubular bells, and gongs (excited by dragging superball friction mallets across them), attempt to recreate the residual noise along with the delicate resonances in the winds and strings, each derived from a time-series analysis of the sound.

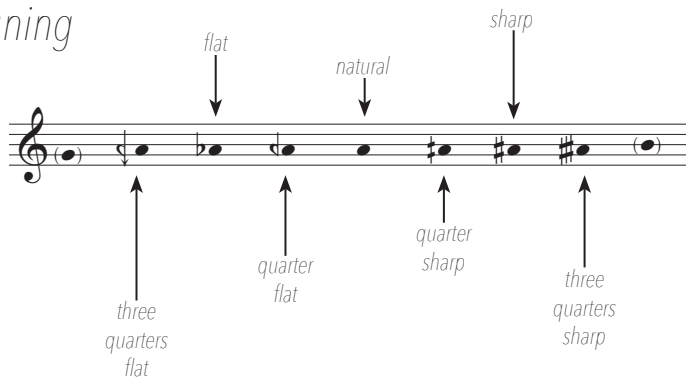
Towards the end of the piece when the curve is at its highest (representing the highest level of affinity for the non-human entity) the orchestrations most closely approximate the sound of another key, a G3 prepared with magnets. Placed directly on the strings, these magnets reveal beautiful inharmonic timbres as the key is pressed. The work progresses along the curve and moves between these sounds as the curve gets closer to one extreme or another.

Both sounds were analyzed for their internal frequency content, which was then orchestrated and used as a compositional basis for the piece. An application was developed to allow the uncanny valley curve to "morph" one sound into another. These tools of computer-assisted composition (CAC) were essential to constructing the raw materials of the piece, opening up the creative space necessary to make a majority of compositional decisions by hand.

Louis Goldford
December 2014
Bloomington, IN

performance notes

Tuning

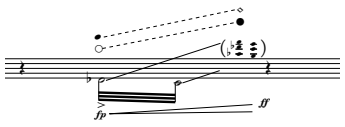


Winds, strings, and brass instruments often employ the use of quartertones.

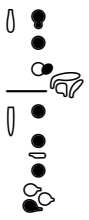
Clefs

Contrabass, contrabassoon, and contrabass clarinet all use the octavo bass clef. Piccolo is notated with the octavo treble clef. Glockenspiel and crotales sound two octaves higher than notated. The score is in C.

Woodwinds



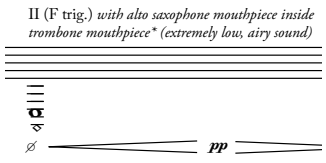
Flute harmonic glissando. Tremolo on indicated fundamentals and glissando towards parenthesized partials. Dotted lines indicate: Gradually move from an air sound to a tone sound, and from a pure tone to a harmonic tone.



The oboe multiphonic in mm. 101 may pose problems on some instruments. Generally, the player should choose a fingering that most closely obtains the indicated partials, with this fingering as a suggestion.

Brass

Trumpets and trombones will be asked for Harmon mutes. Trumpets will also be asked for metal straight mutes.



Trombones in mm. 89 - 96 are instructed to use alto saxophone mouthpieces. Insert the alto saxophone mouthpiece into the trombone mouthpiece and play using a saxophone embouchure. In the example to the left, the player is in position for the E, but with the alto saxophone mouthpiece obtains the A below it as a subharmonic. Trombonist David Whitwell has extensively developed this technique and assures us that the correct saxophone embouchure can be taught to the trombonist in roughly 10 minutes.

Percussion

Instruments are listed per part on page vi and on the first page of score. Players may arrange and share instruments as they please.

Strings: Bowing Positions

E.S.P. = *extreme sul ponticello* (half+ on the bridge; fundamental disappears)
S.P. = *sul ponticello* (between S.P. and *verso* S.P., i.e. as close to the bridge as possible, at times on the bridge)
S.T. = *sul tasto* (over the fingerboard; a relatively dull sound)
N. = *normale (ordinato)* (regular, neutral bowing position)

Bow changes should be imperceptible.

Strings: Articulations

c.l. batt. (col legno battuto)

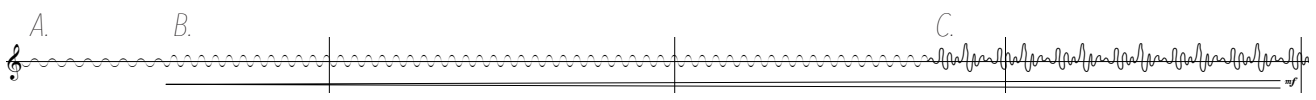
One firm strike of the bow wood against the string at the indicated pitch.

c.l. jetté (col legno jetté)

Repeated jetté of the bow wood against the string at the desired pitch. Often bracketed numbers (i.e.  *) are employed to show approximately how many rearticulations are to be obtained over the indicated duration.*

1st Violins: 3 Kinds of Vibrato at Rehearsal Letter I

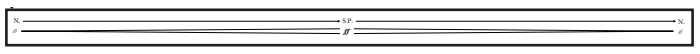
At rehearsal I, mm. 70 - 85, each of the first violins will begin to hold a single harmonic over a given duration and observe the following notations for vibrato:



A. Relatively slow, narrow vibrato spanning +/- a quartertone;
B. Faster, wider vibrato spanning +/- a semitone;
C. Faster and wider still; erratic vibrato spanning an interval wider than a semitone; as comfortably wide as the player sees fit.

Violins, Violas, and Cellos: Dynamics & Bowing at Rehearsal Letters R, W, and Z

A.



B.

In the footer of score pages 19, 21, and 23 are small boxed indications for bowing and dynamic shapes (A). For each of the pulsed phrases, which are projected over a number of beats (B in lower cellos, mm. 120-122), execute the boxed dynamics and bowing over the span of each miniature phrase. These affect all violins, violas and cellos over certain ranges: from letters R-W (mm. 120-134), letters W-Z (mm. 135-144), and letters Z-BB (mm. 145-150).

This system of abbreviating bowing and dynamics has been implemented to save vertical space in the score, but appears normally in all string parts.

Basses: Scordatura at Rehearsal Letter K

In mm. 81, basses 4, 5, and 6 are instructed to detune their low E strings to obtain the A1 below their E2. This tuning remains in effect through the end of the piece. All pitches thereafter represented in parts 4-6 assume that the player adjusts positions to obtain the indicated concert pitches.

technical notes

For those interested, ***Uncanny Valley*** *was composed with the help of the tools of* ***computer-assisted composition (CAC)****. This does not suggest that calculation has taken the place of composition; rather, it does suggest that technology was involved in the preparation of source materials prior to and alongside composition. One might say that technology was employed to do the "heavy lifting" of calculation before composition and orchestration.*

In the context of this piece, CAC tools were used mainly to prepare two source sounds, both prepared piano samples that served as timbral prototypes. The piece is governed by a large-scale movement between these sounds. An application space was developed to help organize this movement by constructing multiple, simultaneous interpolation algorithms that scaled the parameters of each sound. Programs such as OpenMusic were consulted, but ultimately the final result was built using the Bach library for Max/MSP by Andrea Agostini and Daniele Ghisi, along with other tools that interface with the Max environment. Figure 1 illustrates the workflow between these materials.

Masahiro Mori's uncanny valley curve became the control source for the prepared piano sounds. This graphic was imported into Max via the open-source digital art sequencer IanniX. I started by tracing Bézier curves over the uncanny valley curve in Adobe Illustrator and then fed a vector graphic of the result to IanniX. In IanniX, I programmed cursors to travel along the curve over a span of 10 minutes, approximately the length of the piece. I did not need IanniX's real-time capabilities for this project, and I was able to bypass them by sending its output over OSC into Max.

In Max I could easily caputure the IanniX control data in a buffer. I would later use this to evaluate the result of the interpolation at any point along the curve.

Meanwhile, I made partial tracking analyses of the audio for each source sound, visualizing them using Bach in combination with Cage, a library of high-level abstractions based on Bach from the Huate Ecole de Musique de Genève. Cage has superior SDIF support and allowed me to extract the aspects of the audio I needed most.

Cage also offered an interpolation scheme using convex combinations that I originally used to generate the morph, but it did not yield the result I needed. I abandoned this method in favor a slightly more intuitive one, which interpolated the frequencies, along with the durations and onsets, of each partial.

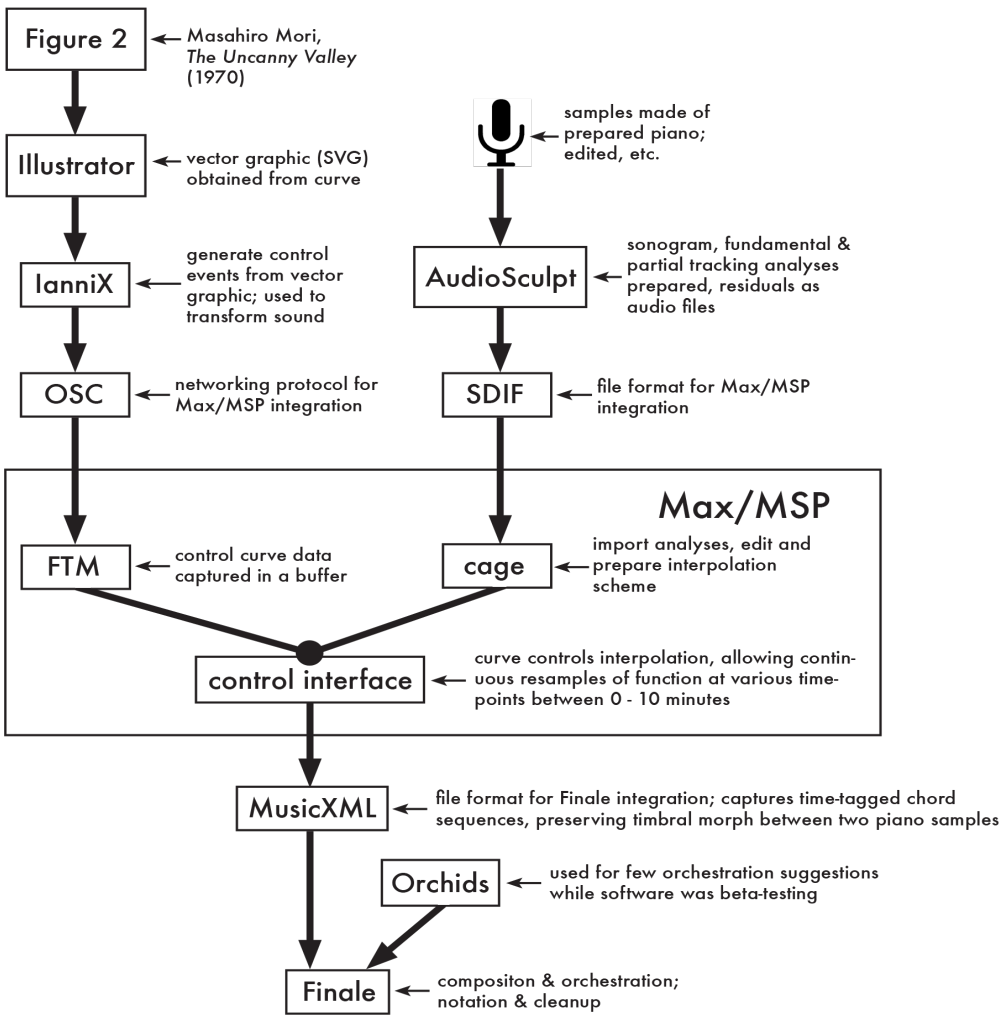


Figure 1: *Workflow between CAC materials in* ***Uncanny Valley*** *(2014).*

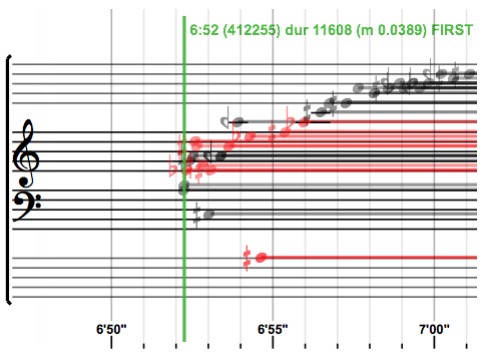


Figure 2: *Evaluation of the curve at 6:52, with an interpolation coefficient of 0.0389. Red partials indicate those that have changed between evaluation frames.*

I was able to track the frequency changes of each partial by programming them to highlight in red when the result differed between successive evaluation frames. This provided an intuitive way for me to visualize and capture the timepoints that would serve me best in composition. Each timepoint was captured in a sequence similar to the one in Figure 2. The final result was exported for composition and orchestration.

While participating in the beta-testing for IRCAM's latest release Orchids, a sophisticated orchestration software, I analyzed my source sounds for suggestions on their orchestration. I used only a few of the Orchids solutions in lieu of finer control, and instead prefered to do most of the orchestration by hand. Further refined CAC routines were implemeneted while composing. These included algorithms to map the Orchids sequence to the nearest partials at a given timepoint, effectively using the Orchids solution as a "spectral envelope" to filter a new set of partials from the control curve data. One can think of this as a symbolic representation of the source/filter model.

I have been writing about partial tracking analysis and its manipulation, but I have not yet mentioned the use of the noise components in the sound. After considering many of my own orchestrations of the prepared piano sounds, I worked directly with the sonogram of the residual (that is, the partials captured in analysis subtracted from the original source sound) and used it to orchestrate the piano's delicate noise components, mostly in the percussion.

Louis Goldford
December 2014
Bloomington, IN

source sounds used in analysis

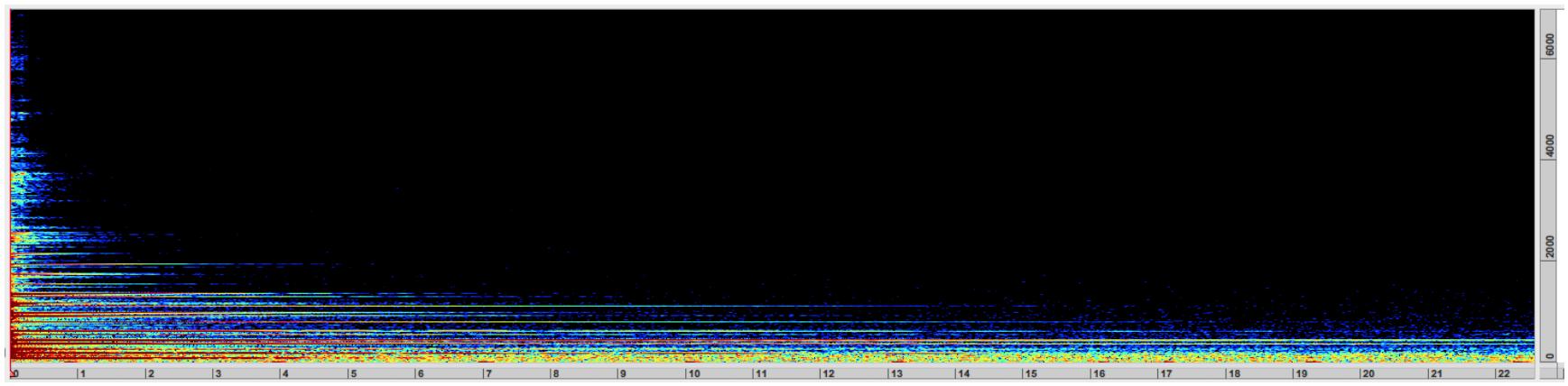


Figure 3: *A grand piano G♭3 prepared with a magnet approximately 6 inches away from the hammers. The strings decay over a period of 23 seconds. The magnet covers all 3 strings. Resultant pitches include beautiful combination tones whose upper partials die away one after another. This is the timbre associated with the end of the piece, when the interpolation coefficient = 1.00. The piece begins with a coefficient of 0.28 and then peaks at 0.75 before plummeting into the "vallley" (a coefficient of 0.00).*

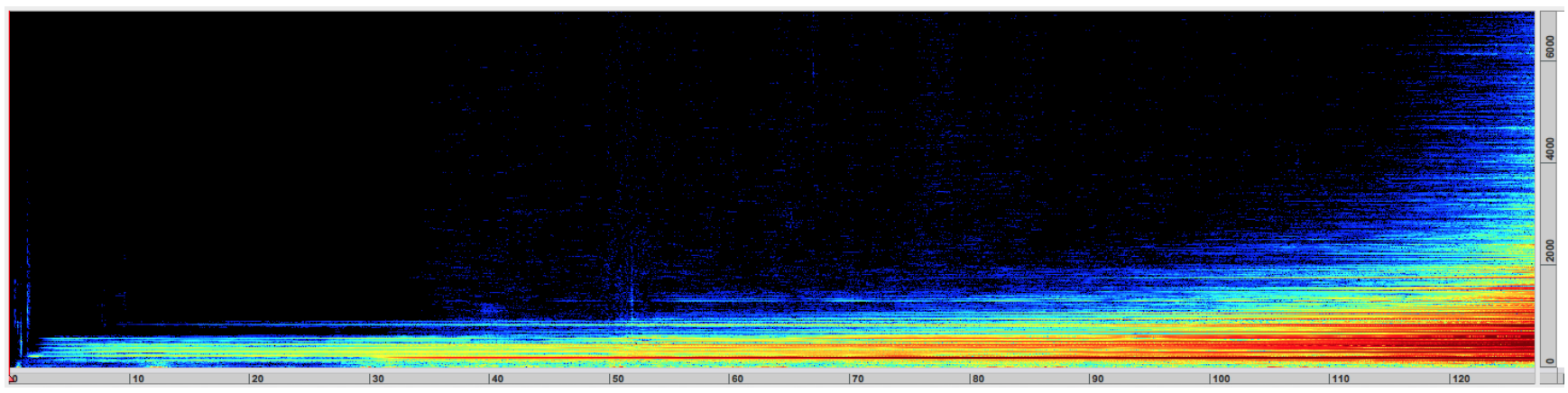


Figure 4: *The low A0 of a grand piano scraped with a fingernail. This sample has been reversed and timestretched over a duration of 2:11. The low A0 is associated with the valley, and the first section of the piece can be characterized as a large scale movement towards the valley. The latter sections of the piece might be called a large scale movement out of the valley.*

instrumentation

2 piccolos
flute (doubling piccolo)
2 oboes
english horn
clarinet in E♭
clarinet in B♭
bass clarinet (doubling contrabass clarinet)
2 bassoons
contrabassoon

4 horns
3 trumpets in C (1st player doubling piccolo trumpet in A)
2 trombones
bass trombone
tuba

timpani (with suspended cymbal)

percussion 1
    tubular bells
    bass drum
    large tam tam

percussion 2
    bass drum
    vibraphone
    glockenspiel
    tubular bells

percussion 3
    crotales
    vibraphone
    32" gong
    large tam tam
    3 Chinese cymbals (recommended: 27" 16" and 11")

harp (with brass mallets)
piano

strings (14 12 10 8 6)

DURATION ca. 11'

Score in C
[duration ca. 11:00]

Uncanny Valley

for orchestra

Louis GOLDFORD (2014)

Without restraint [♩ = 60]

Piccolo 1
Piccolo 2
Flute
Oboe 1
Oboe 2
English Horn
Clarinet in E♭
Clarinet in B♭ 1
Clarinet in B♭ 2
Bassoon 1
Bassoon 2
Contrabassoon
Horn in F 1
Horn in F 3
Horn in F 2
Horn in F 4
Trumpet in C 1
Trumpet in C 2
Trumpet in C 3
Trombone 1
Trombone 2
Bass Trombone
Tuba
Timpani
Percussion 1
tubular bells
bass drum
large tam tam
Percussion 2
bass drum
vibraphone
glockenspiel
tubular bells
Percussion 3
crotales
vibraphone
32" gong
large tam tam
3 Chinese cymbals
Harp
Piano

Without restraint [♩ = 60]

Violin I
div. en 4
Violin II
div. en 4
Viola
div. en 4
Cello
div. en 3
Contrabass

1 2 3 4 5 6 7

A

Picc. 1
Picc. 2
Fl.
Ob. 1
E. Hn.
E♭ Cl.
B♭ Cl. 1
Bsn. 1
Bsn. 2
C. Bn.
Hn. 3
C Tpt. 1
C Tpt. 2
Tbn. 1
Tbn. 2
B. Tbn.
Pno.
Vln. I
div. en 4
Vln. II
div. en 4
Vla.
div. en 4
Cello
div. en 3
C.B.

Flz.

metal straight mute

to Harmon mute...

fully stopped

8 9 10 11 12 13

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
E. Hn.
E♭ Cl.
B♭ Cl. 1
B. Cl.
Bsn. 1
Hn. 1
Hn. 3
Hn. 2
Hn. 4
C Tpt. 1
C Tpt. 2
C Tpt. 3
Tbn. 1
Tbn. 2
B. Tbn.
Tuba
Timp.
Perc. 1 [tub. bells]
Perc. 2 [bass dr.]
Vln. I div. en 4
Vln. II div. en 4
Vla. div. en 4
Cello
C.B. div. en 2

B

bass clarinet
Flz.
fully stopped
open
metal straight mute
Harmon mute (stem in)
to vibraphone...
div. en 3 (next page)

14 15 16 17 18

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
E. Hn.
E♭ Cl.
B♭ Cl. 1
B. Cl.
Bsn. 1
Bsn. 2
C. Bn.
Hn. 1
Hn. 3
Hn. 2
C Tpt. 1
C Tpt. 2
C Tpt. 3
Tuba
Timp.
Perc. 2 [vib.]
Vln. I div. en 4
Vln. II div. en 4
Vla. div. en 4
Cello div. en 4
C.B. div. en 3

(open)
to piccolo trumpet in A (with Harmon mute if poss.)...
to Harmon mute...
to Harmon mute...
vibraphone [soft yarn mallets]
sempre secco throughout

19 20 21 22

C

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
E. Hn.
E♭ Cl.
B♭ Cl. 1
B. Cl.
C. Bn.
Hn. 1
Hn. 3
Hn. 2
Picc.Tpt.
C Tpt. 2
Tbn. 1
Tbn. 2
Tuba
Timp.
Perc. 2 [vib.]
1
Vln. I div. en 4
2
Vln. II div. en 4
Vla. 6 (solo)
Cello 1 en 4
C.B. (tutti)

to piccolo...
Piccolo Trumpet in A
Harmon mute (stem in) (to stand if no picc. trp. mute)
Harmon mute (stem in)
(Harmon mute, cont.)
(Harmon mute, cont.)
to bass drum...
hold Ped. until decay ...
senza vib.
molto vib.

23 24 25 26

D

B. Cl.

Hn. 1

Hn. 3

Hn. 2

Hn. 4

Picc.Tpt.

C Tpt. 2

C Tpt. 3

Harmon mute (stem in)

Tbn. 1

Tbn. 2

B. Tbn.

(Harmon mute, cont.)

Tuba

Timp.

boss drum

Perc. 2
[bass dr.]

D

Vln. I
div. en 3

Vln. II
div. en 4

Vla.

Cello
div. en 4

C.B.

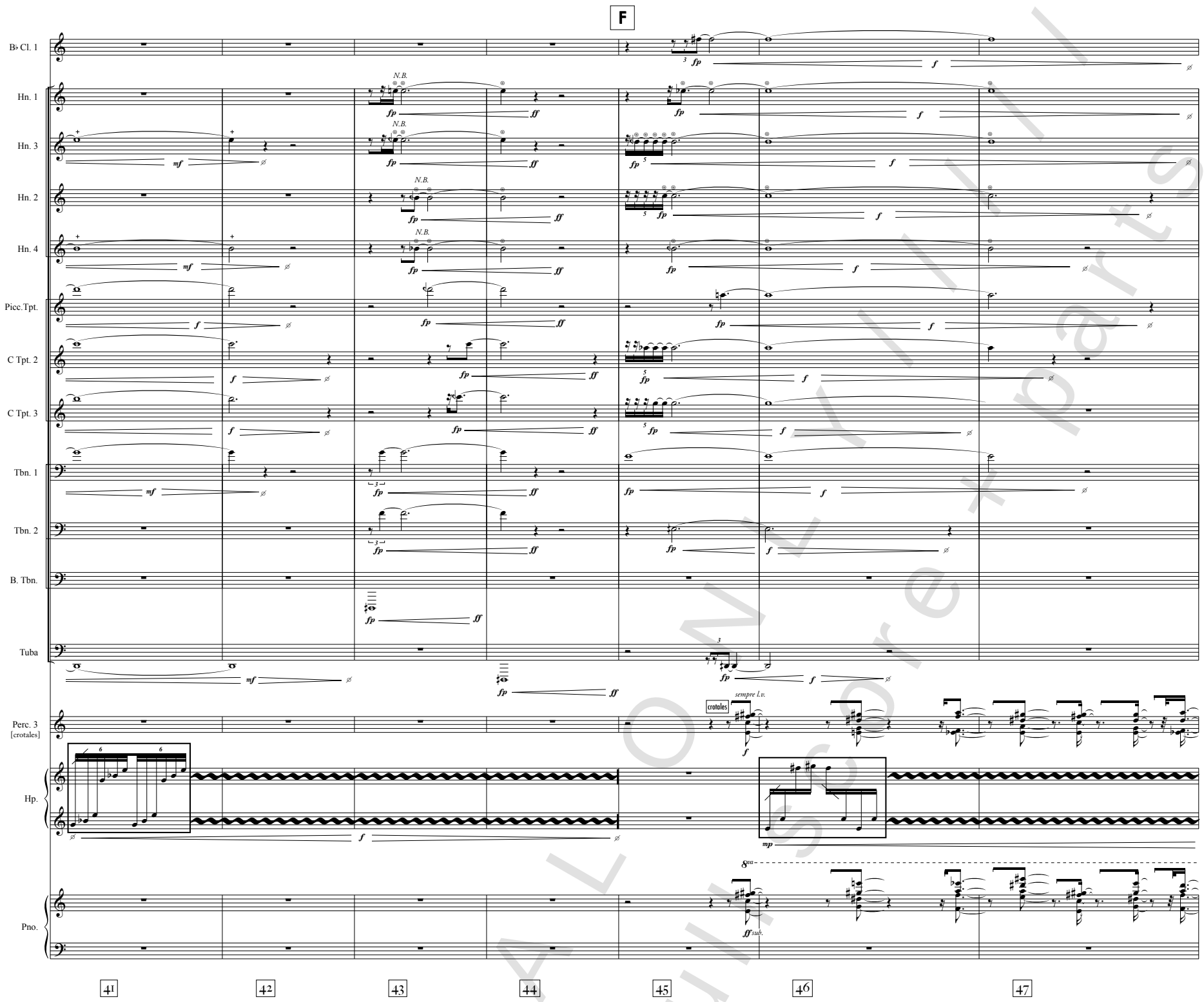
E

Hn. 1
Hn. 3
Hn. 2
Hn. 4
Picc.Tpt.
C Tpt. 2
C Tpt. 3
Tbn. 1
Tbn. 2
B. Tbn.
Tuba
Timp.
Perc. 2 [bass dr.]

E

Vln. I div. en 3
Vln. II div. en 4
1
2
3
Vla.
4
5
6
Cello div. en 4
C.B.

35 36 37 38 39 40



N.B. This symbol is used to denote the half-stop.

Picc. 1
Picc. 2
Picc. 3
Ob. 1
Ob. 2
E♭ Cl.
B♭ Cl. 1
B. Cl.
Bsn. 1
C. Bn.
Hn. 1
Hn. 3
Hn. 2
Hn. 4
Picc.Tpt.
C Tpt. 2
C Tpt. 3
Tbn. 1
Tuba
Timp.
Perc. 1 [tub. bells]
Perc. 2 [bass dr.]
Perc. 3 [crotales]
Hp.
Pno.
Vln. I
C.B. (tutti)

G

piccolo

remove mute...

open

to trumpet in C...

(sempre l.v.)

to glockenspiel...

strike palms against lowest strings

gliss.

48 49 50 51 52 53

Picc. 1
Picc. 2
Picc. 3
Ob. 1
Ob. 2
C. Bn.
Perc. 2 [glock.]
Perc. 3 [crotales]
Vln. I
Vln. II
Vla.
C.B. (tutti)

glockenspiel *sempre l.v.*

f *mf poco a poco dim.*

f sub. *p sub.*

II gliss. III gliss.

54 55 56 57 58 59

Picc. 1
Picc. 2
Picc. 3
Ob. 1
Ob. 2
E. Hn.
B. Cl.
Bsn. 1
Bsn. 2
C. Bn.
Perc. 2 [glock.]
Perc. 3 [vib.]
Hp.
Vn. I
Vn. II
Vla.
C.B.

H

vibraphone
motor on
sempre l.v.
to vibraphone...
fsub.
8va
II *gliss.*
p sub.
III *gliss.*

60 61 62 63 64 65

I

Picc. 1
Picc. 2
Picc. 3
Ob. 1
Ob. 2
E. Hn.
B. Cl.
Bsn. 1
Bsn. 2
C. Bn.
B. Tbn.
Tuba
Perc. 2 [glock.]
Perc. 3 [vib.]
Hp.

I

Vln. I
Vln. II
Vla.
Cello
C.B.

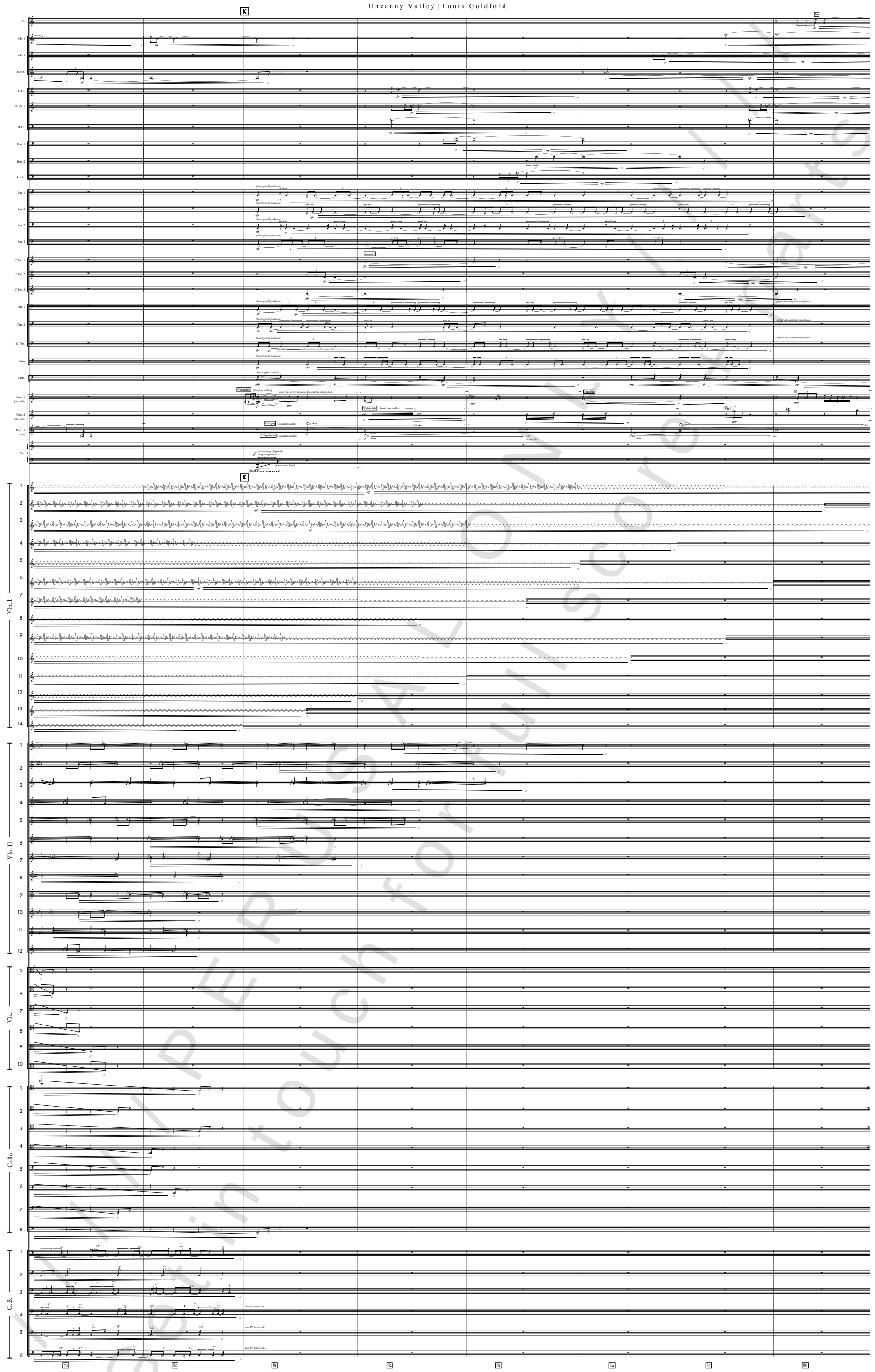
J

Ob. 1
Ob. 2
E. Hn.
Perc. 3 [vib.]

J

Vln. I
Vln. II
Vla.
Cello
C.B.

72 73 74 75 76 77 78



L

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
E. Hn.
E♭ Cl.
B♭ Cl. 1
B. Cl.
Bsn. 1
Bsn. 2
C. Bn.
C Tpt. 1
Tbn. 1
Tbn. 2
B. Tbn.
Tuba
Timp.
Perc. 1 [tub. bells]
Perc. 2 [vib.]
Perc. 3 [gong] [tam tam]
Vln. I 1
Vln. II 12
Vla.
Cello
C.B. 1 - 3

II (F trig.) *with alto saxophone mouthpiece inside trombone mouthpiece* (extremely low, airy sound)*

to oboe...

to contrabass clarinet...

(Freely permutate pitches. As comfortably fast as possible.)

S.T. *senza vib.*

87 88 89 90 91 92 93 94

*Use of the alto saxophone mouthpiece with a trombone is described in the score preface.

N.B. This oboe multiphonic is discussed in the score preface.

Piec. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
Es Cl.
Bs Cl. 1
C.B. Cl.
Bsn. 1
Bsn. 2
C. Bn.
Hn. 1
Hn. 3
Hn. 2
C Tpt. 1
C Tpt. 2
C Tpt. 3
Tbn. 1
Tbn. 2
B. Tbn.
Tuba
Timp.
Perc. 1 [tam tam]
Perc. 2 [bass dr.]
Perc. 3 [Ch. cym.]
Pno.
Vln. I
Vln. II
Vla.
Cello
C.B.

O

P

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
Ob. 3
E♭ Cl.
B♭ Cl. 1
B♭ Cl. 2
C. Bn.
Hn. 1
Hn. 3
Hn. 2
Hn. 4
C Tpt. 1
C Tpt. 2
C Tpt. 3
Tbn. 1
B. Tbn.
Tuba
Timp.
Perc. 1 [vib. bells]
Perc. 2 [bass dr.]
Hp.
Vln. I
Vln. II
Vla.
Cello
C.B.

B♭ clarinet

[brass mallets on low strings]

sempre l.v.

sim.

S.P.

S.T.

(S.P.)

(N.)

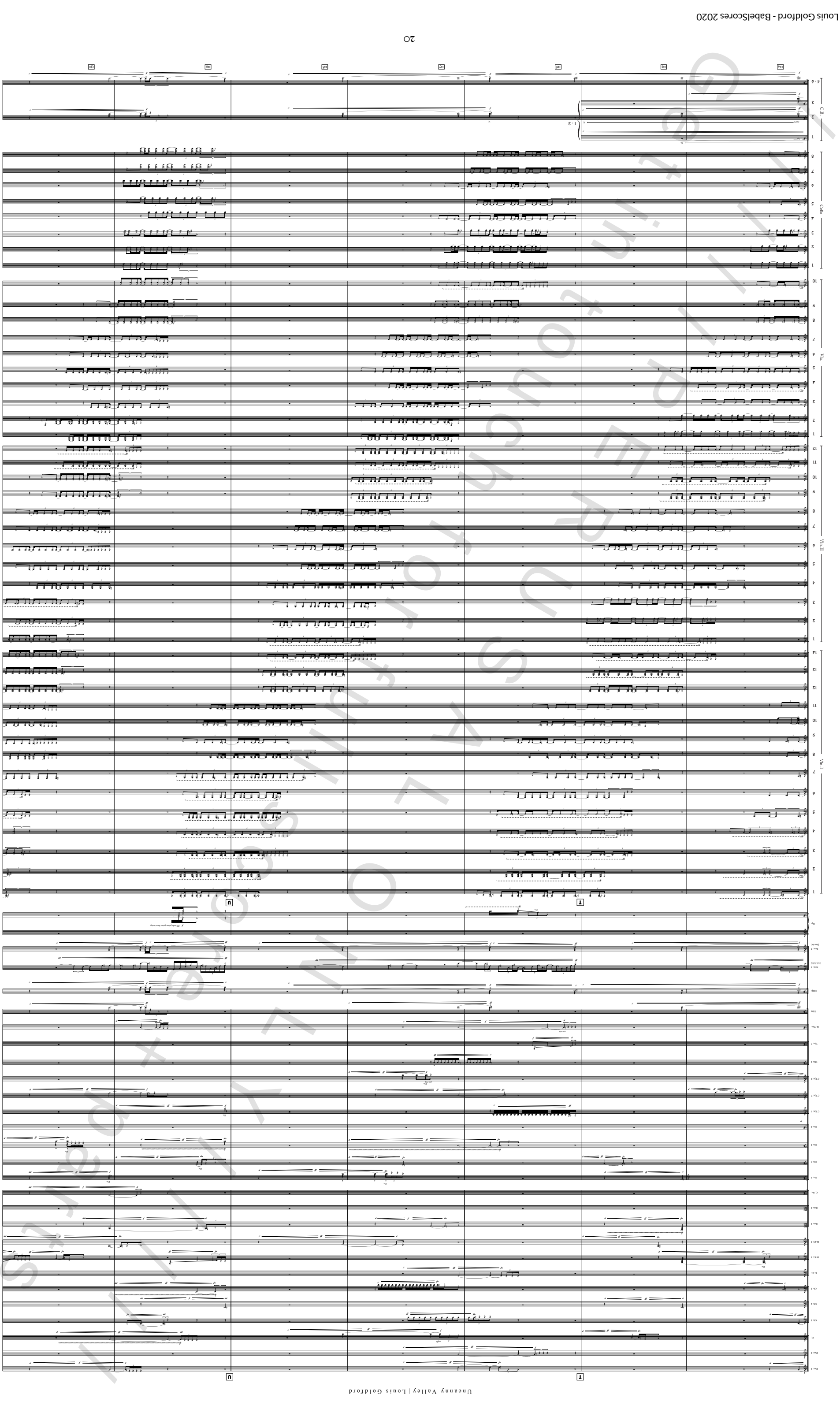
109 110 111 112 113 114 115 116

Q R S

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
Ob. 3
Eb Cl.
Bb-Cl. 1
Bb-Cl. 2
Bsn. 1
Bsn. 2
C. Bn.
Hn. 1
Hn. 3
Hn. 2
Hn. 4
C Tpt. 1
C Tpt. 2
C Tpt. 3
Tbn. 1
Tbn. 2
B. Tbn.
Tuba
Timp.
Perc. 1 [sus. bells]
Perc. 2 [bass dr.]
Hp.
Vln. I
Vln. II
Vla.
Cello
C.B.

19

(tutti violins, violas, & cellos: see score preface)



V

W

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
Ob. 3
E♭ Cl.
B♭ Cl. 1
B♭ Cl. 2
Bsn. 1
C. Bn.
Hn. 1
Hn. 3
Hn. 2
Hn. 4
C Tpt. 1
C Tpt. 2
C Tpt. 3
Tbn. 1
Tbn. 2
B. Tbn.
Tuba
Timp.
Perc. 1 [vib. bells]
Perc. 2 [bass dr.]
Hp.

Vln. I
Vln. II
Vla.
Cello
C.B.

(tutti violins, violas, & cellos: see score preface)

X

Y

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
Ob. 3
Eb Cl.
Bb Cl. 1
Bb Cl. 2
Bsn. 1
Bsn. 2
C. Bn.
Hn. 1
Hn. 3
Hn. 2
Hn. 4
C Tpt. 1
C Tpt. 2
C Tpt. 3
Tbn. 1
Tbn. 2
B. Tbn.
Tuba
Timp.
Perc. 1 [tub. bells]
Perc. 2 [bass dr.]
Hp.

X

Y

Vln. I
1 2 3 4 5 6 7 8 9 10 11 12 13 14

Vln. II
1 2 3 4 5 6 7 8 9 10 11 12

Vla.
1 2 3 4 5 6 7 8 9 10

Cello
1 2 3 4 5 6 7 8

C.B.
div. no 2

139 140 141 142 143 144

Z

AA

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
Ob. 3
Eb Cl.
Bb Cl. 1
Bb Cl. 2
Bsn. 1
Bsn. 2
C. Bn.
Hn. 1
Hn. 3
Hn. 2
Hn. 4
C Tpt. 1
C Tpt. 2
C Tpt. 3
Tbn. 1
Tbn. 2
B. Tbn.
Tuba
Timp.
Perc. 1 [sub. bells]
Perc. 2 [bass dr.]
Hp.

Z

AA

Vln. I
Vln. II
Vla.
Cello
C.B.

div. en 6
(next page)

145 146 147 148 149 150

S.T. — E.S.P.

(tutti violins, violas, & cellos: see score preface)

BB

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
Ob. 3
E♭ Cl.
B♭ Cl. 1
B♭ Cl. 2
Bsn. 1
Bsn. 2
C. Bn.
Hn. 1
Hn. 3
Hn. 2
Hn. 4
C Tpt. 1
C Tpt. 2
C Tpt. 3
Tbn. 1
Tbn. 2
B. Tbn.
Tuba
Timp.
[fiberglass]
Perc. 1 [rub. bells]
Perc. 2 [bass dr.]
[triangle beaters]
Perc. 3 [tam tam]
large tam tam
Hp.

BB

Vln. I
Vln. II div. en 6
Vla.
Cello
C.B.

N. Gradually slow tremolo down...
...to a steady pulse.
(N.)
(N.) Gradually speed bowing back up (while moving bow towards F.S.P.)...

151 152 153 154 155 156 157

Picc. 1
Picc. 2
Fl.
Ob. 1
Ob. 2
Ob.
E♭ Cl.
B♭ Cl. 1
B♭ Cl. 2
Bsn. 1
Bsn. 2
C. Bn.
Hn. 1
Hn. 3
Hn. 2
Hn. 4
C Tpt. 1
C Tpt. 2
C Tpt. 3
Tbn. 1
Tbn. 2
B. Tbn.
Tuba
Timp.
Perc. 1
Perc. 2
Perc. 3
Hp.
Vla.
4
5
6 - 10
...to an infinitely faster, disappearing tremolo.
E.S.P.
Cello
2
3
4
5 - 8
...to an infinitely faster, disappearing tremolo.
E.S.P.
C.B.
1
2
3
4 - 6
(N.) Gradually speed bowing back up (while moving bow towards E.S.P.)...
...to an infinitely faster, disappearing tremolo.
E.S.P.
158
159
160
161
162
163

December 2014 Bloomington, IN

[duration ca. 11:00]

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