UNIVERSITY OF CALIFORNIA
RIVERSIDE

Ceremony of Superheroes

A Dissertation submitted in partial satisfaction
of the requirements for the degree of

Doctor of Philosophy

in

Music

by

Jason Francesco Heath

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Dissertation Committee:
Dr. Tim Labor, Chairperson
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Committee Chairperson

University of California, Riverside

ABSTRACT OF THE DISSERTATION

Ceremony of Superheroes

by

Jason Francesco Heath

Doctor of Philosophy, Graduate Program in Music
University of California, Riverside, June 2014
Dr. Tim Labor, Chairperson

Ceremony of Superheroes is a 35-40 minute musical composition for bass/C flute, bass clarinet, violin, viola, cello, and keyboard, which employs individual and idiosyncratic live electronics intended both to demonstrate digitally facilitated mythological "superpowers" among a representative showcase of soloists and ensembles and convey a philosophical idea of coexistence between the physical and transcendent forces as the instrumentalists integrate their musical powers in a metaphoric battle between creative and destructive forces.

The individuality of the performer is an exciting resource in generating and developing new musical material as well as correlative custom systems for live electronics. In addition, many performers have limited experience rehearsing and

performing with live electronics and few opportunities to become acclimated to the challenges unique to new compositions in this area. Rarely do performers have the opportunity to work with electronics throughout the development of a piece. Typical challenges include miking techniques, understanding and hearing electronic/acoustic interactions, rehearsal logistics involving the integration of the electronics with interpretive choices, and developing clear expectations for how the electronics are involved in the musical material.

Ceremony of Superheroes explores relationships between the archetypal and the experimental, the acoustic and the digital, through a musical and mythological narrative that transforms the acoustic and idiomatic properties of each instrument into supernatural expressive tools. Allowing instrumental and interpersonal idiosyncrasies to guide the development of custom electronics and musical material expands the abilities of each instrumentalist and enhances their investment in collaboratively designed poetics by heightening their identification with their characters' roles in the piece's overall narrative arc as a function of a developmentally iterative process.

This process is documented through the inclusion of a full score; original software and documentation; a reflective analysis of the piece's musical development; draft scores showing primary musical material; and a video of a first performance.

Ceremony of Superheroes

Contents

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A. Full Score

i. Technical Materials and Specifications

Hardware

- 2 Laptops (1 running Max/Msp/Jitter, 1 running Modart's *Pianoteq*)
- 2 Audio Interfaces (1 main interface with 8 inputs and outputs; 1 stereo interface for keyboard)
- 3 Powered PA Speakers (2 Mains and 1 keyboard monitor)
- 5 Small Powered Speakers (1 for each acoustic instrument)
- 5 Directional Microphones (1 for each acoustic instrument)
- 1 MIDI Keyboard

Software

- Cycling 74's *Max/Msp/Jitter* or *Max RunTime*
- Modart's *PianoTeq* (or alternative method of re-tuning the keyboard)
- Included *Ceremony of Superheroes* patches developed using *Max/Msp/Jitter*

Each instrument (except for the keyboard which can feed directly to the engineer's interface) should be closely miked with high-quality small condenser microphones. The mics chosen should allow for maximum transparency of the natural instrument sound, maximum signal-to-noise ratio, and minimum feedback (such as the DPA *d:vote*, or

Countryman *Isomax 2*). Each instrument mic should have a discreet input into the main (sound engineer's) audio interface, which should have at least 8 powered inputs and 8 discreet outputs (I am using a Roland *Octa-Capture*). The interface is to be connected to a laptop running *Max/Msp/Jitter* and the included patches.

Each instrument should have a small speaker placed proximately, with a mix of direct and processed/electronic sound coming from the main computer/interface. Each instrument/electronics mix should also be sent to the two main PA speakers and panned to simulate each performer's location onstage. These small speakers should not be so loud as to cause feedback, and are to be used primarily to localize each output to its source (each performer); as well as, as small monitors for each performer. The natural instrument sounds as well as the electronic sounds should be heard to emanate from each performer's general location. Each small speaker should be placed so as to not obstruct the audience's view of any performers, as well to avoid any feedback. For these, I use 5 M-Audio BX-5's (70-Watt powered speakers with 5 in. woofers). If it is not possible for each performer to have their own speaker, then two mains and one keyboard monitor can suffice (See Staging Diagram III). The main mix should be adjusted so that the keyboard sound is not favored, nor more localized than the other instruments. If necessary, the keyboard monitor may also be faced towards the keyboardist in this scenario.

The two main speakers should be large and powerful enough to sound clear, with an even and full frequency response. I am using two powered Electro-Voice *Live X* ELX 115p's. They each have 15-inch Woofers, 1000 Watts of power, and a frequency range of 44 Hz – 20 kHz. They should be placed in front of the ensemble to the left and right of

the stage.

The MIDI keyboard should be connected to its own laptop and audio interface, running Modart's *Pianoteq,* set to quarter-comma meantone tuning. The keyboard's audio interface should output audio signal to the main interface. The main interface should output the keyboard's audio to the main mix as well to the keyboard monitor (which should be of similar size and quality as the two main speakers).

The sound engineer and main laptop/interface should be positioned so that the engineer may clearly hear what the audience is hearing and make any necessary adjustments during performance. Outputs should be mixed and panned within the included patches or with an external mixer. USB or MIDI control interfaces may be used to make adjustments within these patches. I used two Korg *nanoKontrol'*s.

ii. Staging Diagrams

In all scenarios, the keyboard will require a monitor that should be used on the floor as a wedge. Monitors should be placed on the floor or on small stands and tilted slightly upwards.

Staging Diagram I is preferred, and places the small speakers behind each of the performers. They may be more or less hidden behind each performer. This scenario allows for localization, reinforcement, and monitoring by each performer. In this setup the sound sources are not necessarily seen (or are at least somewhat visually obscured), but they are heard as localized to each performer. This staging is designed to maximize

the psychological impact of acoustic/electronic synergy.

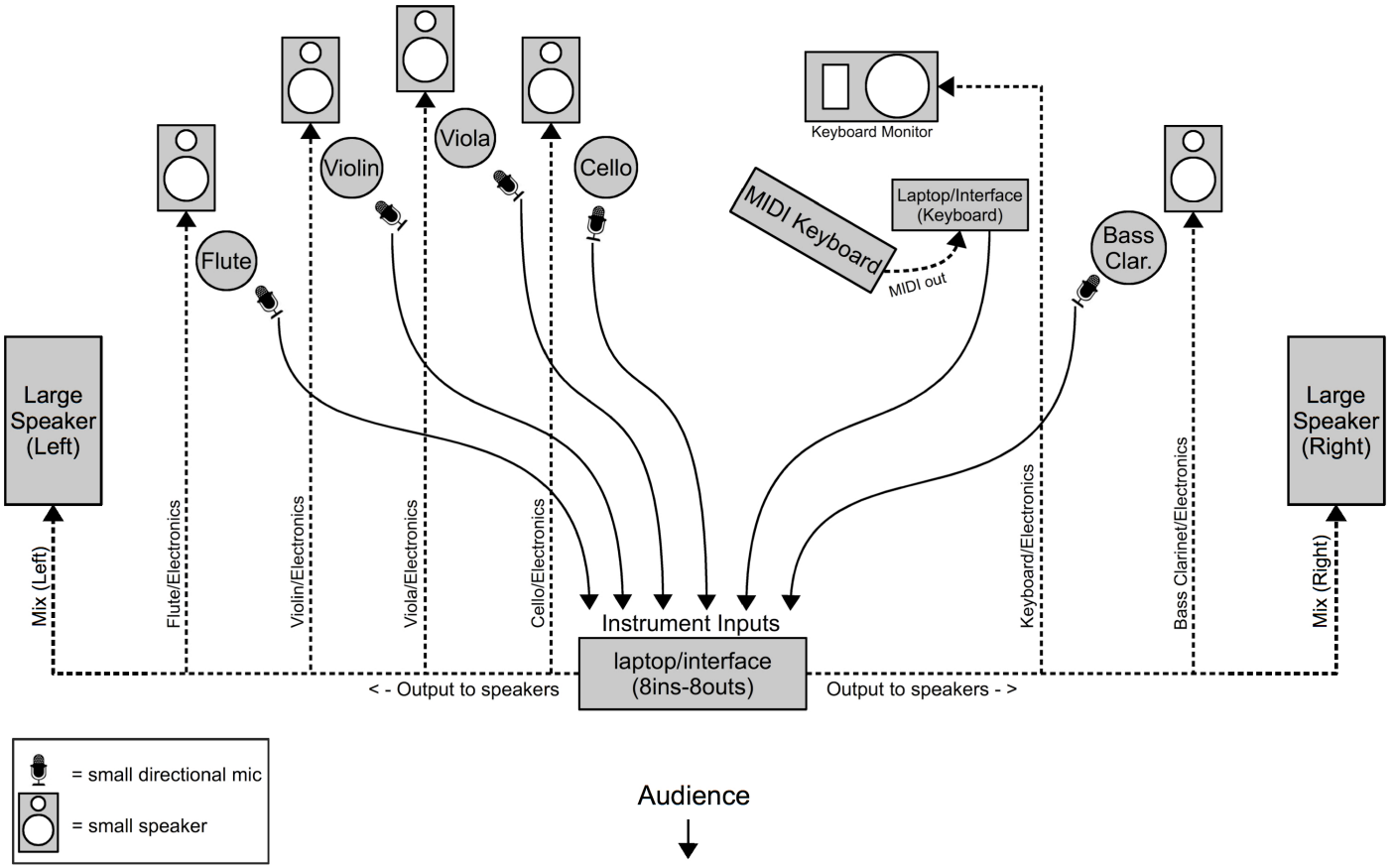
Staging Diagram II places the small speakers in front of each performer. In this case, they should be placed on the floor or on short stands that do not obscure any of the performers. This model should be used if feedback becomes a serious issue when attempting the first scenario. Staging Diagram III uses no small individual speakers.

For the Flute, Strings, and Bass Clarinet, an approach favoring little to no vibrato should be employed, unless directly indicated in the score. The Flute and Clarinetist should be positioned slightly in front of the ensemble onstage, and all performers should be able to make eye contact and cue each other as needed throughout the performance. When a solo instrument has an 'ad lib' instruction and their timing may vary, they should cue the other performers as well as the sound engineer.

Lighting may be used to highlight solos, or small groups, such as Strings alone; and to diminish the active presence of inactive performers. Lighting should be slightly dimmed overall, or focussed on an empty part of the stage during playback of acousmatic sounds when all performers are at rest. Performers should remain as still as possible during these moments.

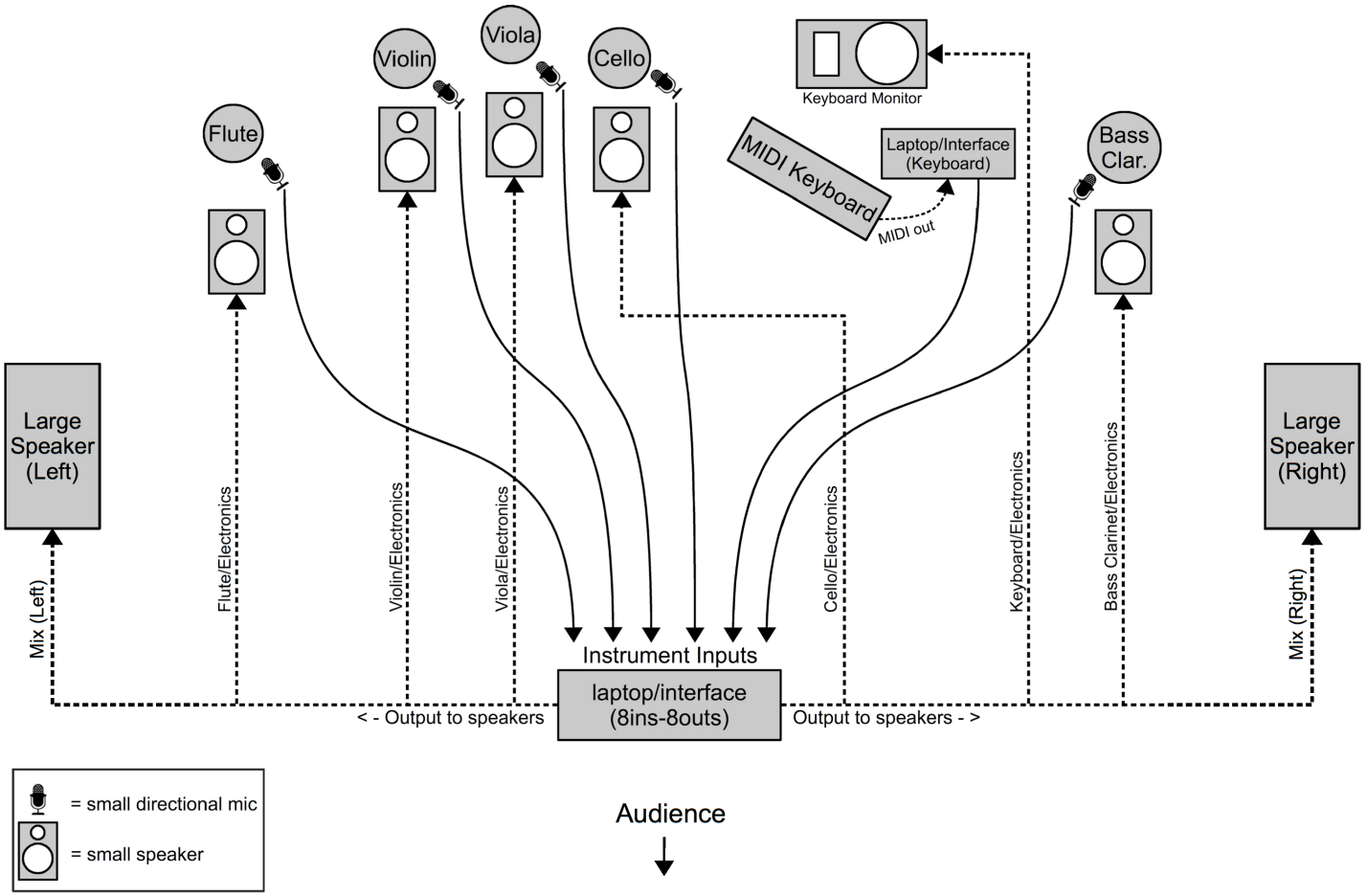
Ceremony of Superheroes

Staging Diagram I



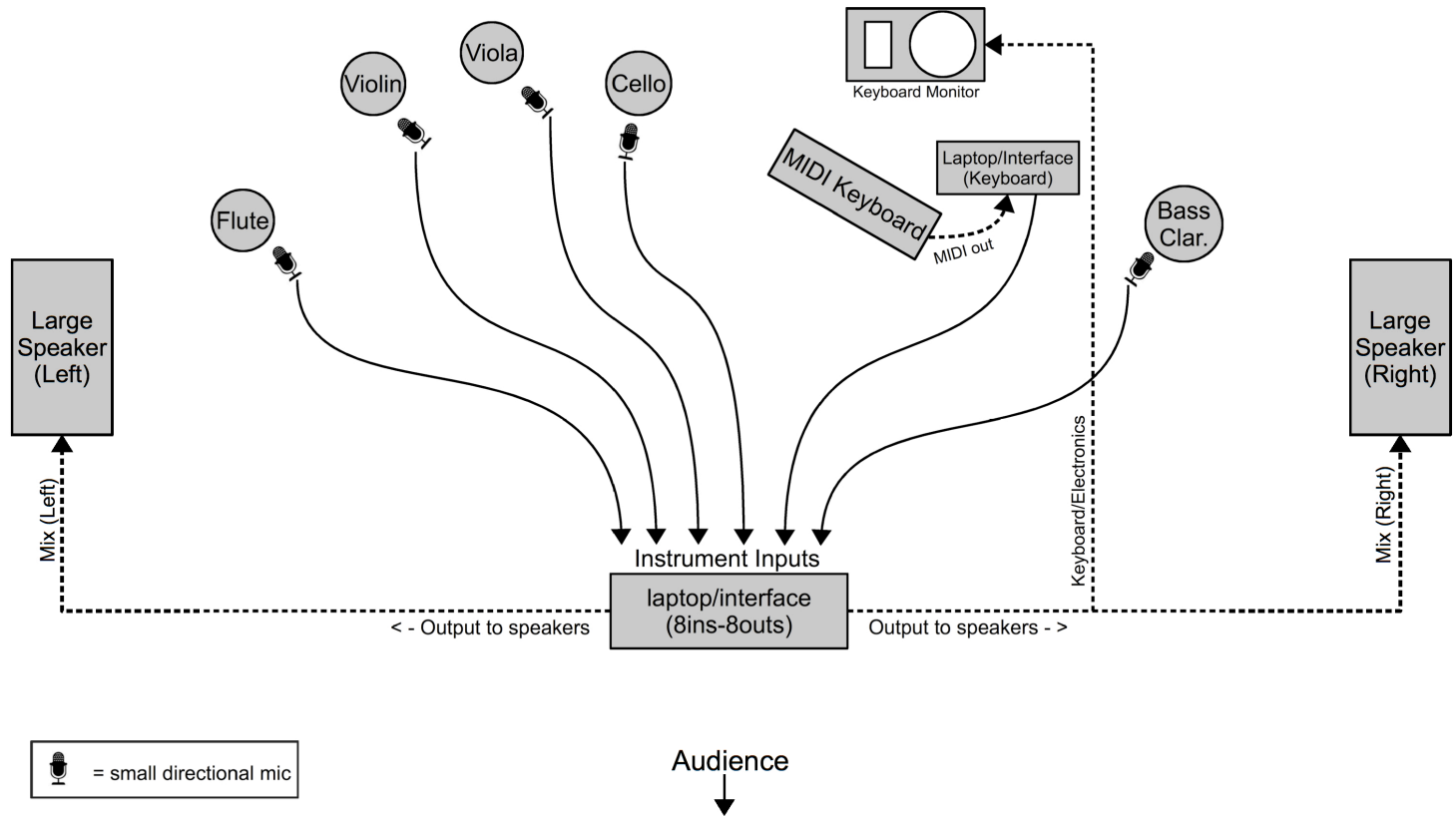
Ceremony of Superheroes

Staging Diagram II



Ceremony of Superheroes

Staging Diagram III



iii. Performance Notes

1. All performers should be on stage at all times. When performers are at rest for longer periods, they should remain comfortably still. When possible, lighting may be used to accentuate this effect of a performer being 'offstage' of the action. Additionally, refer to the staging diagrams.
2. All instruments should be slightly amplified to assist in blending acoustic and electronic sounds. Amplification should also be used to ensure correct dynamic levels in places where the natural acoustic sound would not be powerful enough to achieve the indicated balance, such as during pizzicato sections. When tacet, instrument inputs should be removed from the mix.
3. When performed in its entirety, each movement should be played attaca. Movements may also be played independently.
4. Tempo markings are approximate.
5. Accidentals apply throughout the measure, to notes in all registers.
6. Phrase markings are provided as suggestions. Performers may choose personalized bowings and breaths to achieve results. In instances where two or more performers play together, their approach to these indications should be coordinated.
7. The keyboard is tuned to a quarter-comma meantone tuning (refer to “Materials and Technical Specifications”). Quarter-comma meantone tuning uses a slightly flattened perfect fifth to create justly intoned major thirds.

8. The ensemble need not attempt to adjust their tuning to match the keyboard's; rather the keyboard should be allowed to come in and out of tune with the ensemble.
9. Entries in the staff labeled “Electronics” indicate which electronics should be active for each instrument. Start and stop times are approximate except for the keyboard's “water sounds”, which instruct the electronics engineer to add and remove the “water sounds” from the mix. For more details, refer to the software documentation.
10. When shifting bow positions, the transitional timbral shift should be emphasized by constant and steady motion between positions.
11. The articulation, *fcl.* (forced col legno) refers to the technique of striking the string with the wood of the bow with more force than a standard *col legno battuto*, so that the string slaps back against the fingerboard, sonically resulting in a Bartok *pizz.* combined with *col battuto*.

iv. Program Note

Ceremony of Superheroes is a 35-40 minute musical composition for bass flute, C flute, bass clarinet, violin, viola, cello, and keyboard. It employs individual and idiosyncratic live electronics intended to demonstrate digitally facilitated mythological "superpowers" among a representative showcase of soloists and ensembles. The work is also intended to convey a philosophical idea of coexistence between the physical and the transcendent as the instrumentalists integrate their musical powers in a metaphoric battle between heroic and shadow forces.

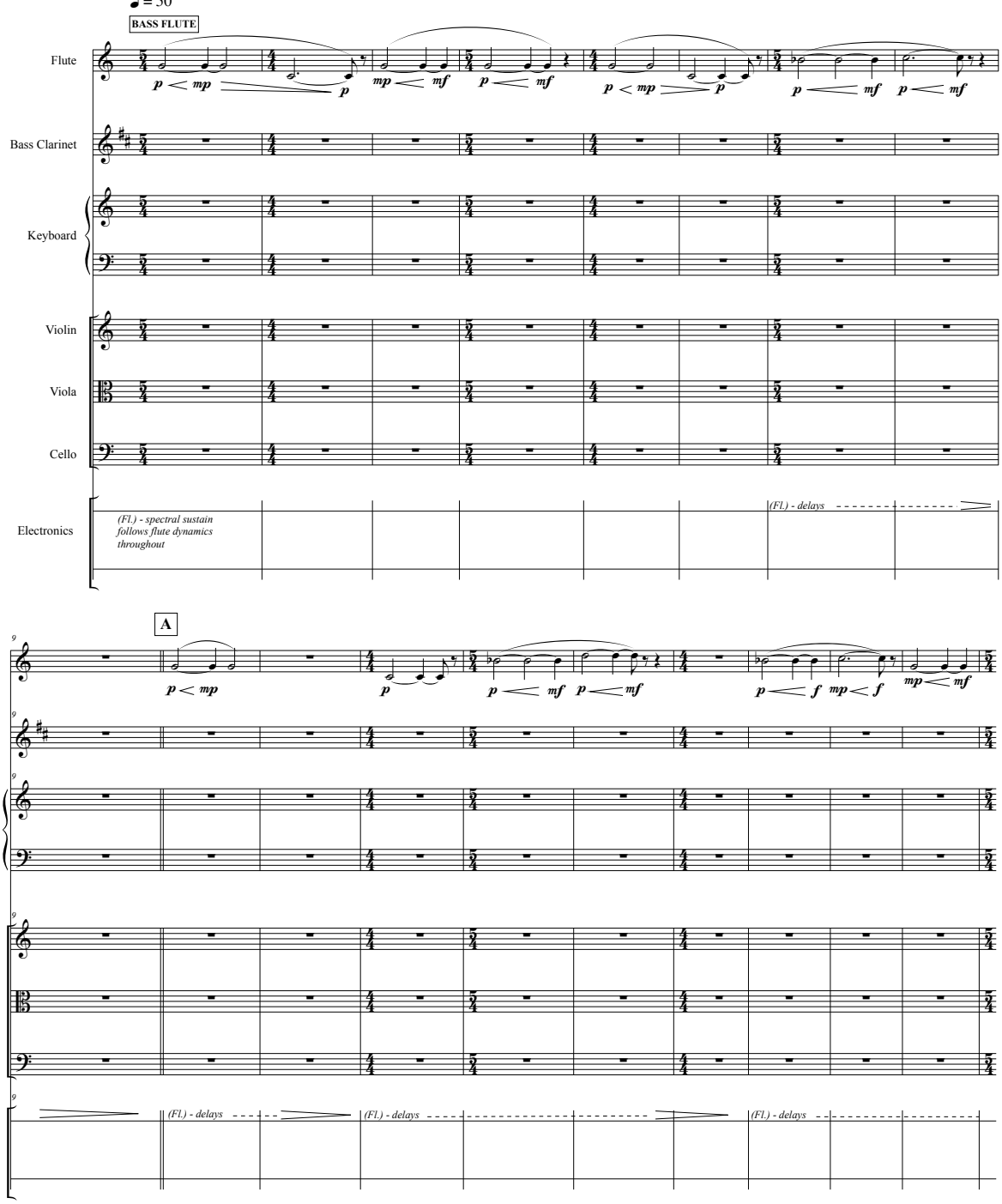
The overall narrative metaphor of *Ceremony of Superheroes* deals with the coexistence and harmony between seemingly opposing cosmic forces. The ceremony/'ceremony' takes place in a sound world where opposing forces vie for the power of musical dominance by asserting themselves through incantations made up of their unique musical languages. The characters' powers are derived from reciting unique incantations, or musical codes used to persuade and develop affinities and allies, and to pacify and neutralize their enemies. The metaphoric theme of integration and harmony between opposing cosmic forces is also reflected in the relationships between instrumentalists and their respective electronic processes. Similarly the opposing characters are ultimately revealed as, or transformed into co-existing and complimentary forces.

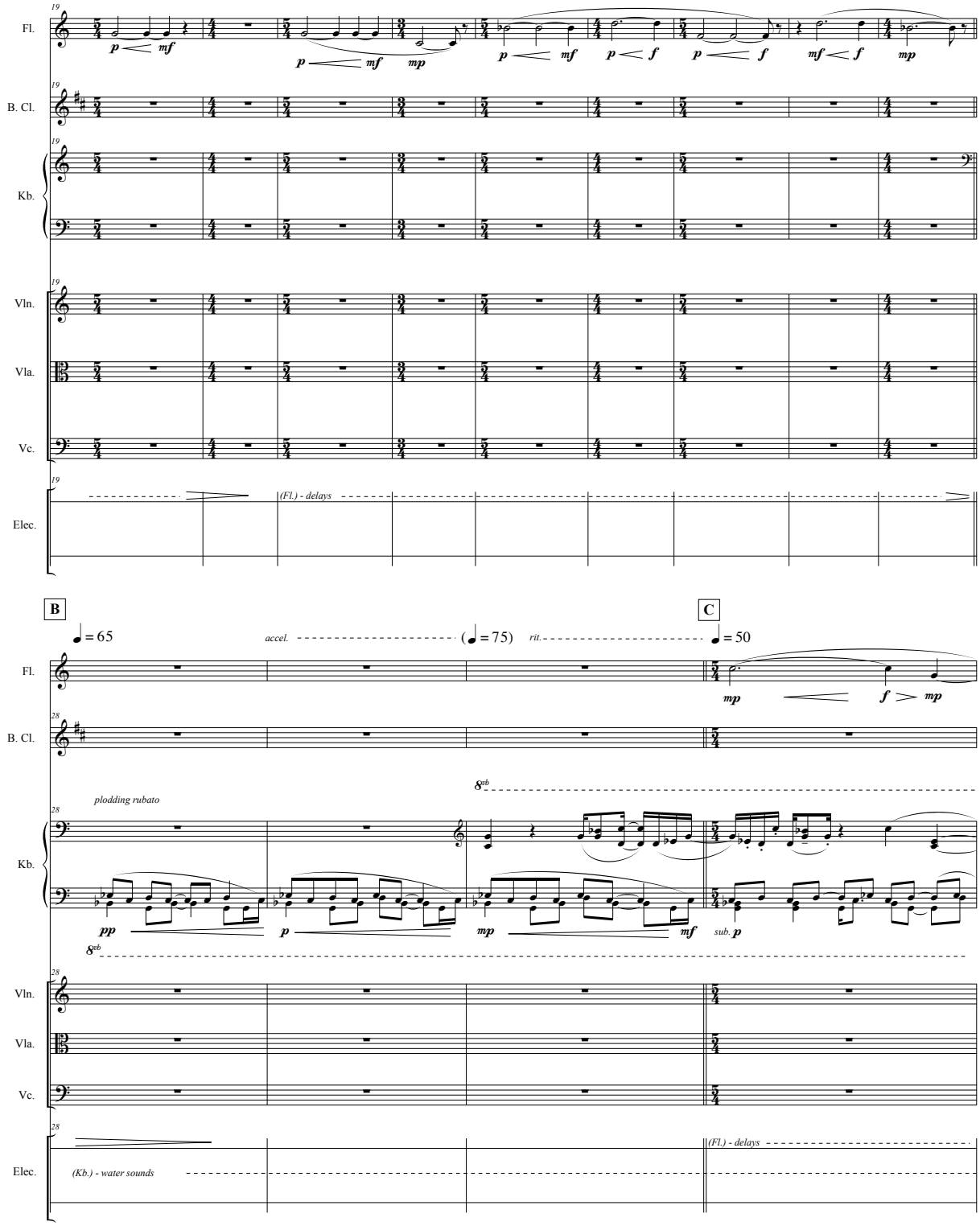
Ceremony of Superheroes

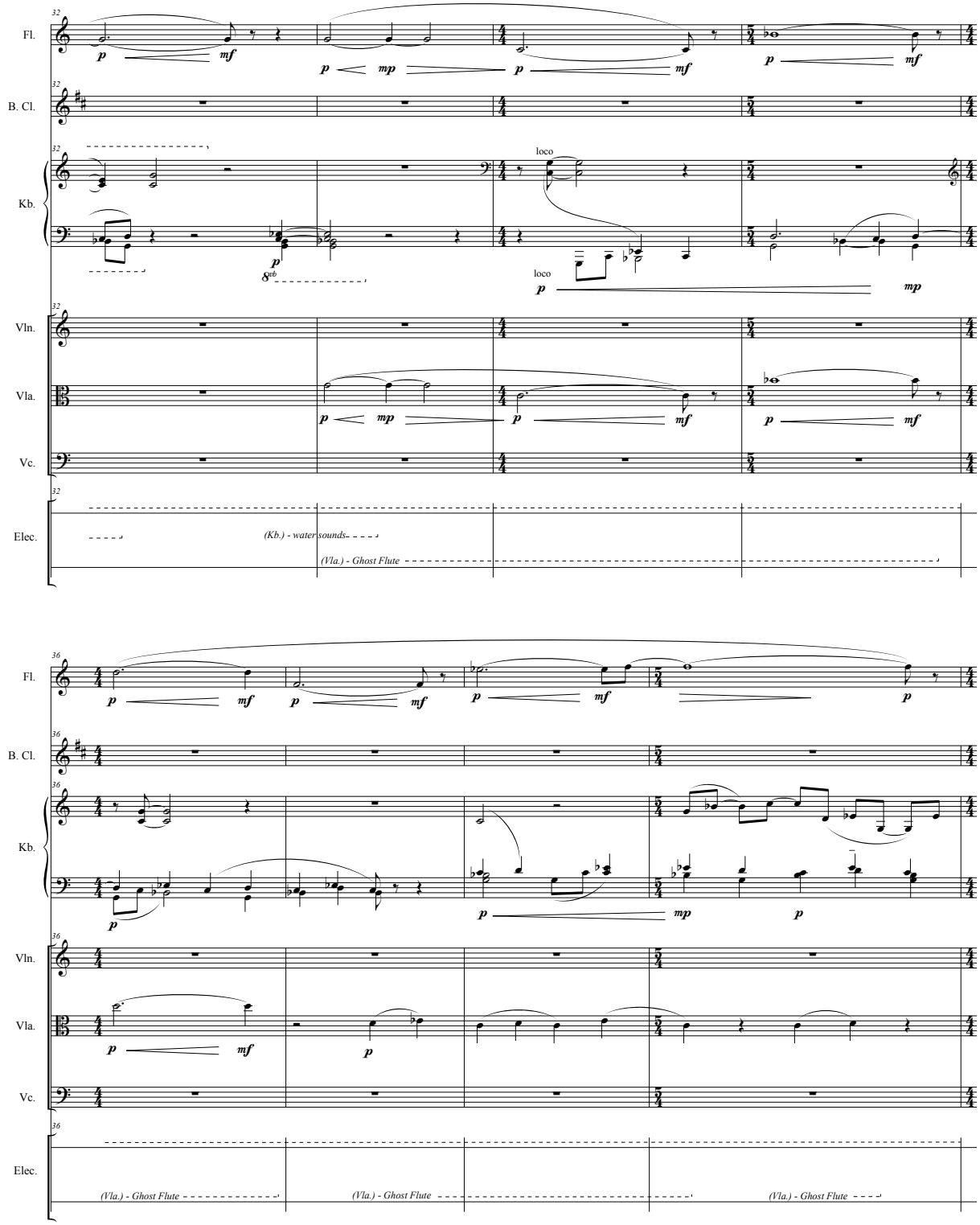
Transposed Score

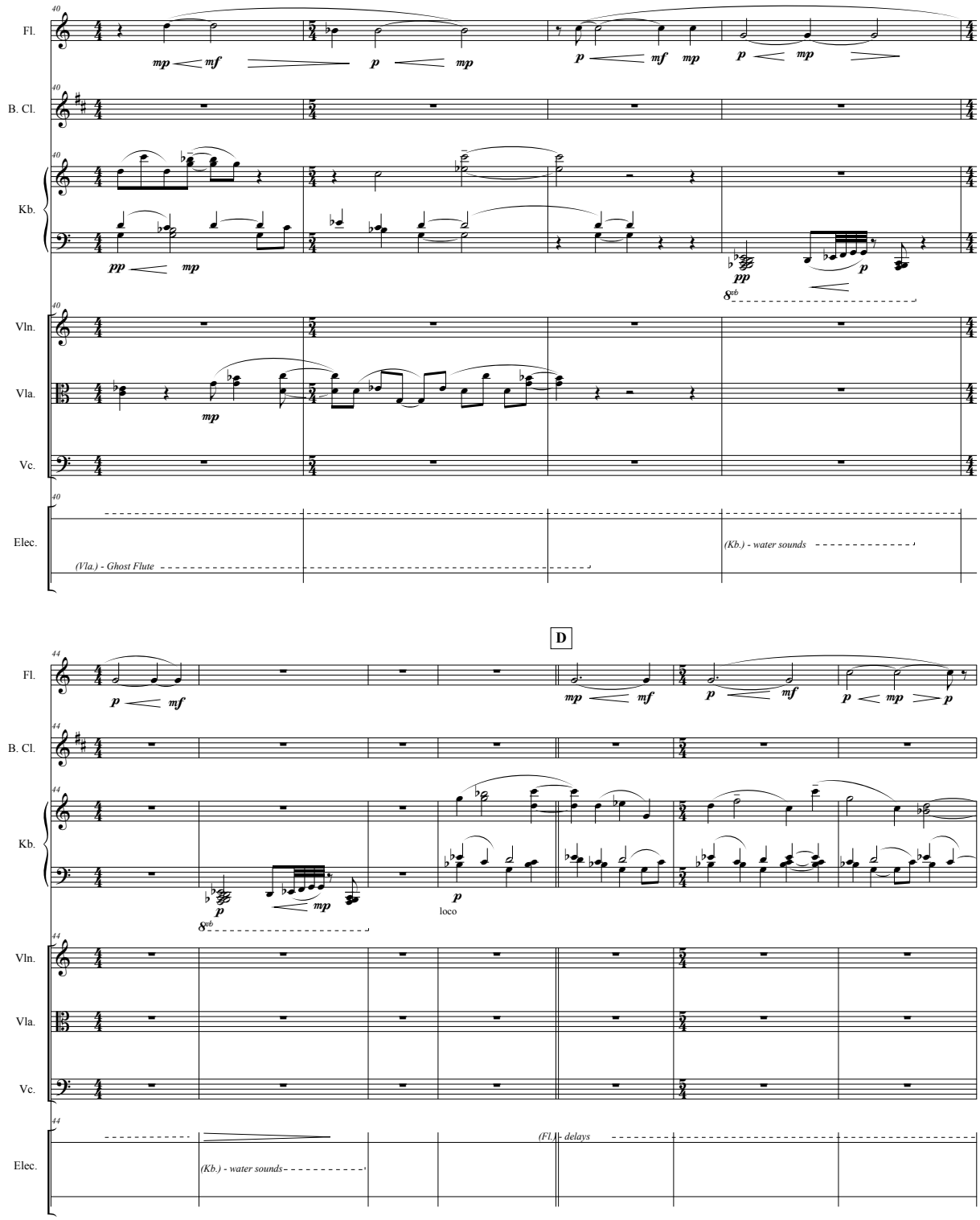
I. Call of the Messenger

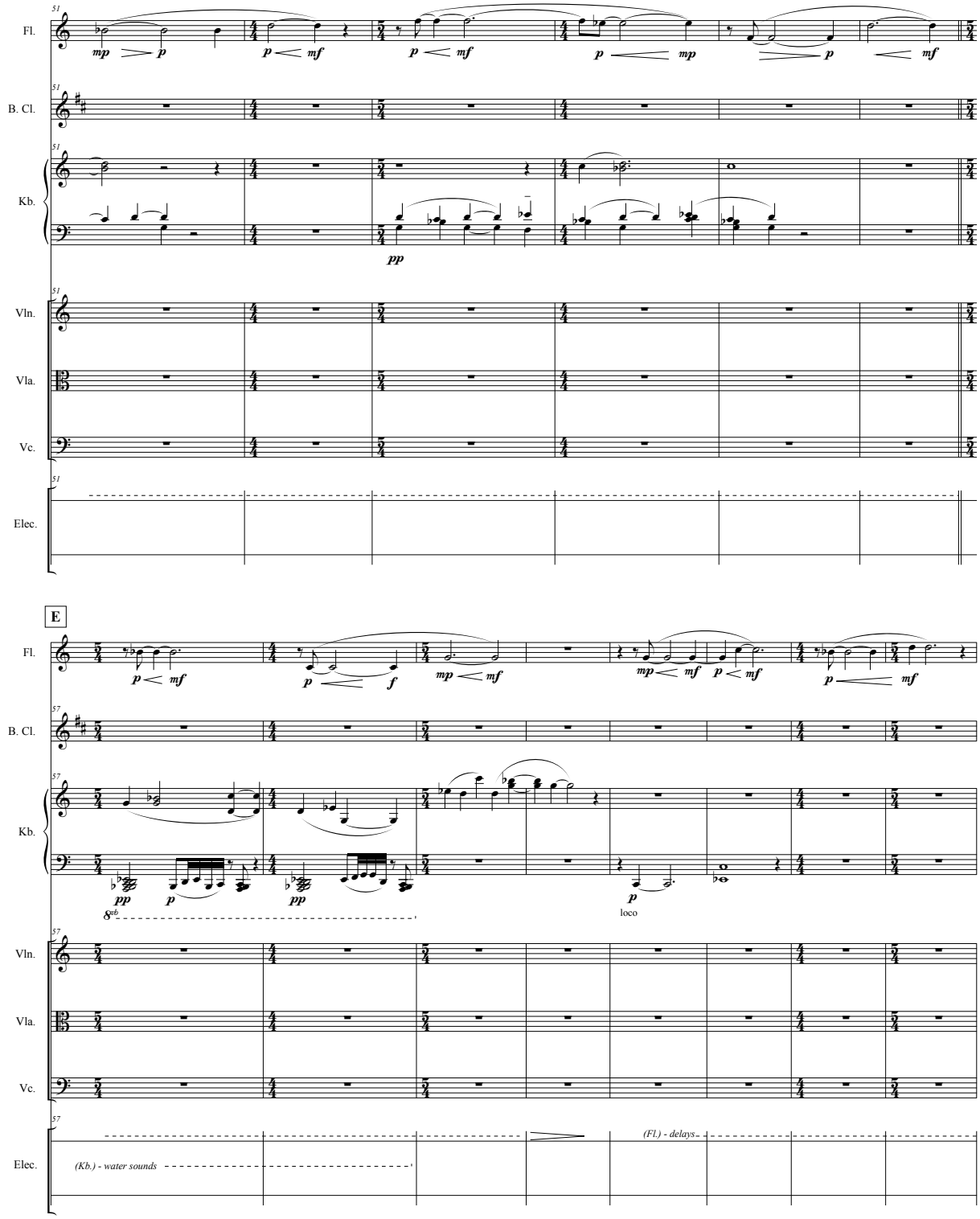
Jason Francesco Heath

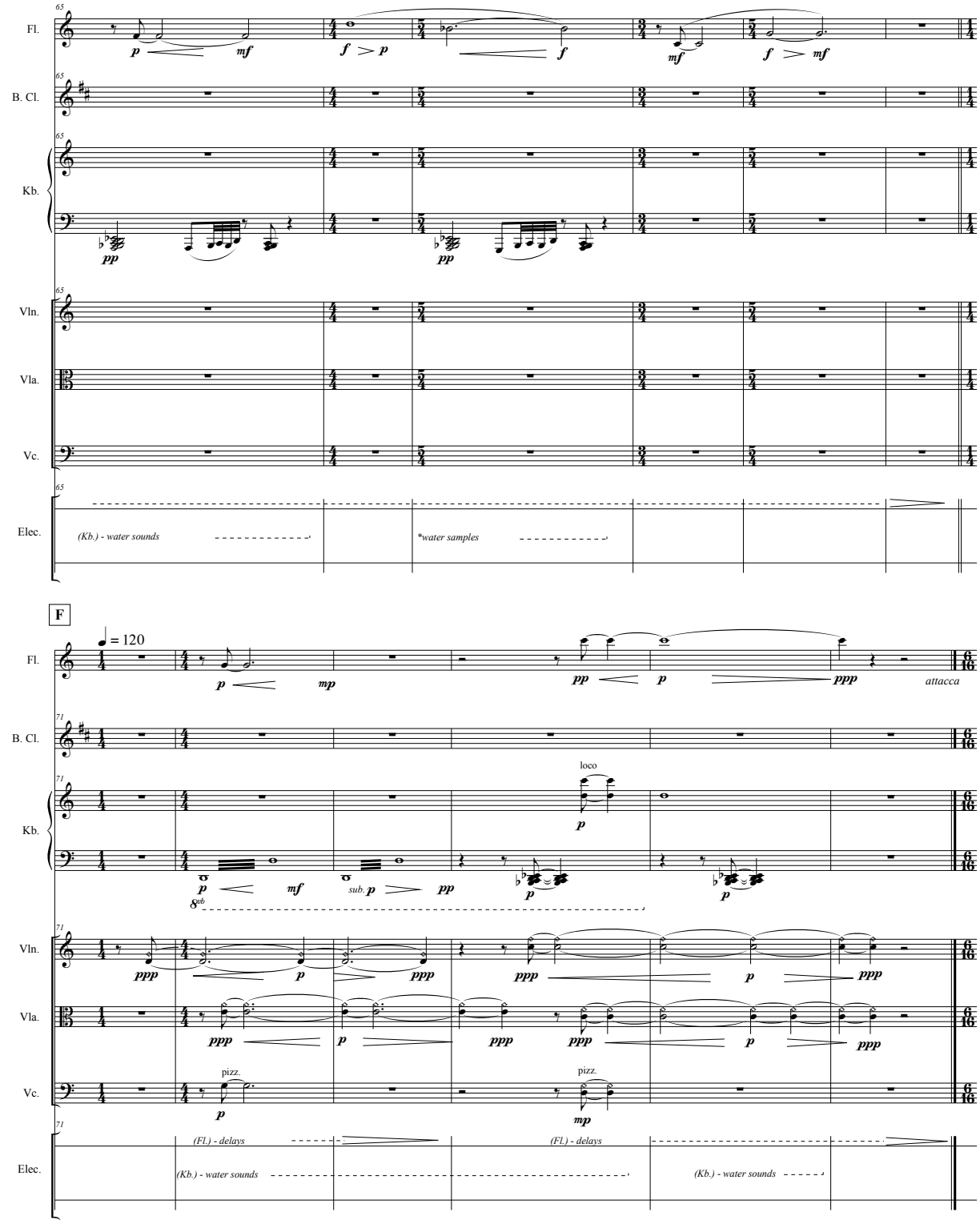



19
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
(Fl.) - delays
B
C
♩ = 65
accel.
(♩ = 75)
rit.
♩ = 50
28
plodding rubato
8vb
(Kb.) - water sounds
(Fl.) - delays

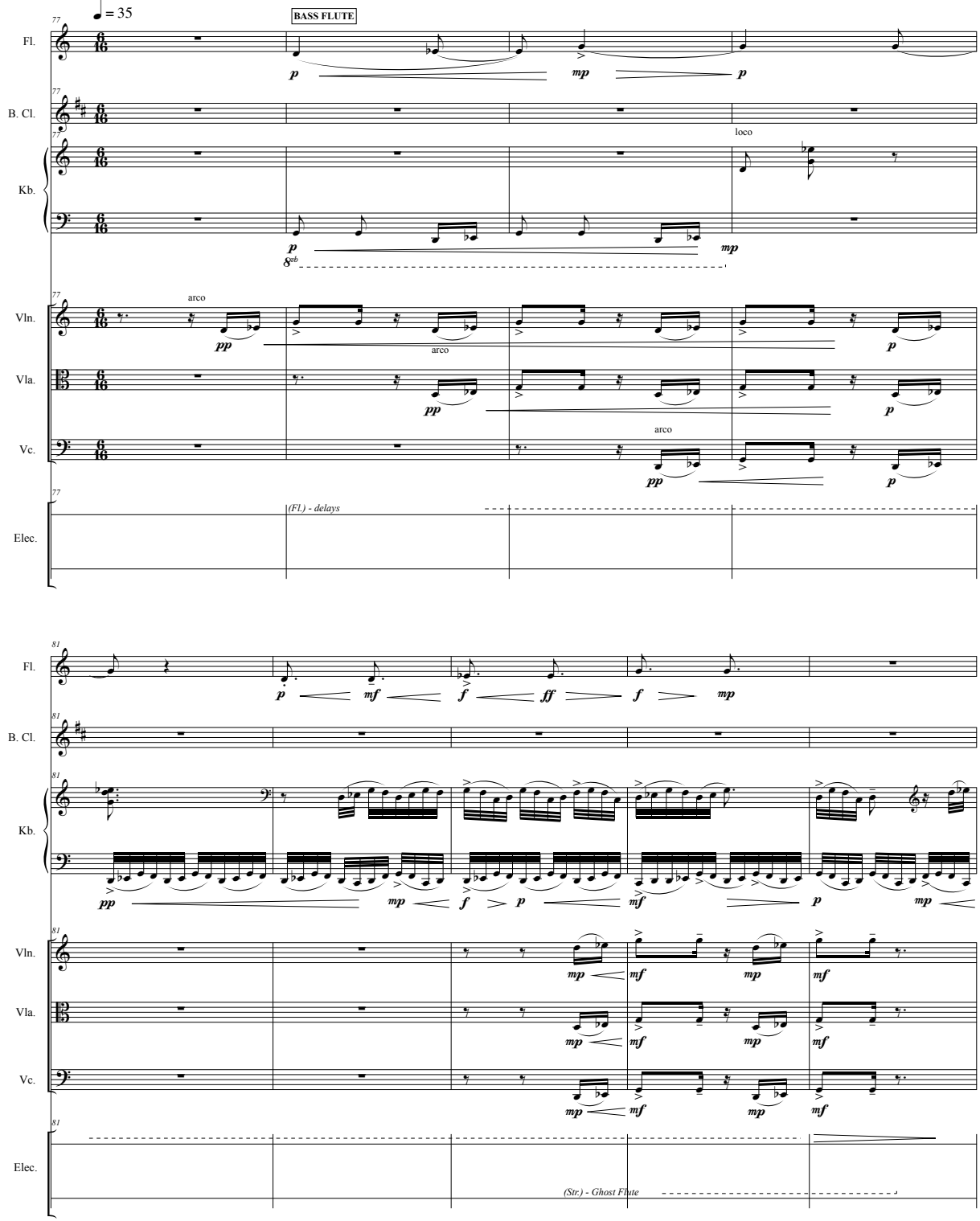

32
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
loco
8vb
(Kb.) - water sounds
(Vla.) - Ghost Flute
36
(Vla.) - Ghost Flute
(Vla.) - Ghost Flute
(Vla.) - Ghost Flute

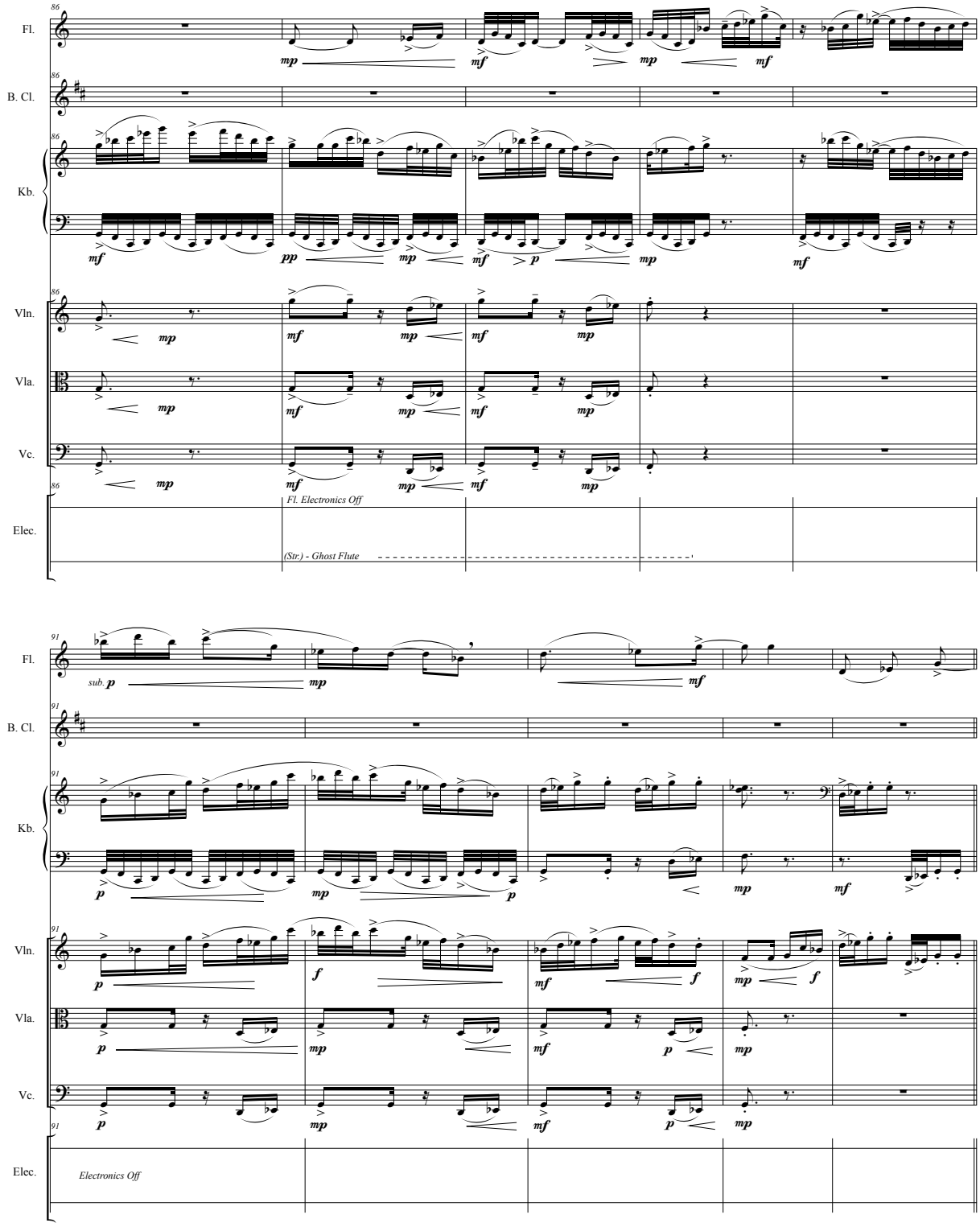

40
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
mp mf p mp
p mf mp
p mp
pp mp
pp p
8vb
mp
(Vla.) - Ghost Flute
(Kb.) - water sounds
D
44
p mf
mp mf
p mf
p mp p
p mp
loco
8vb
(Kb.) - water sounds
(Fl.) - delays

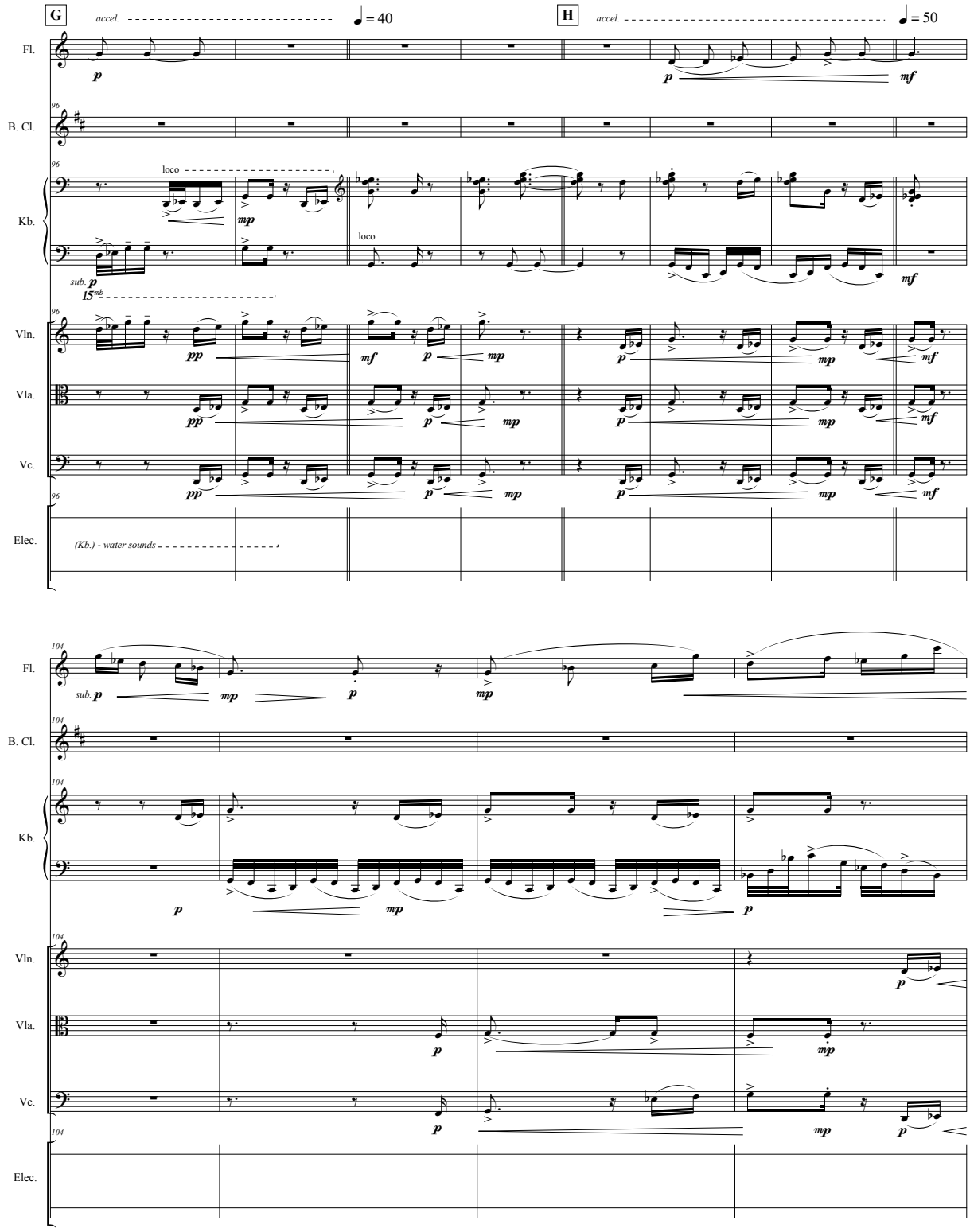

51
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
mp p p mf p mf p mp p mf
pp
E
57
p mf p f mp mf mp mf p mf p mf
pp p pp p
8vb
loco
(Kb.) - water sounds
(Fl.) - delays

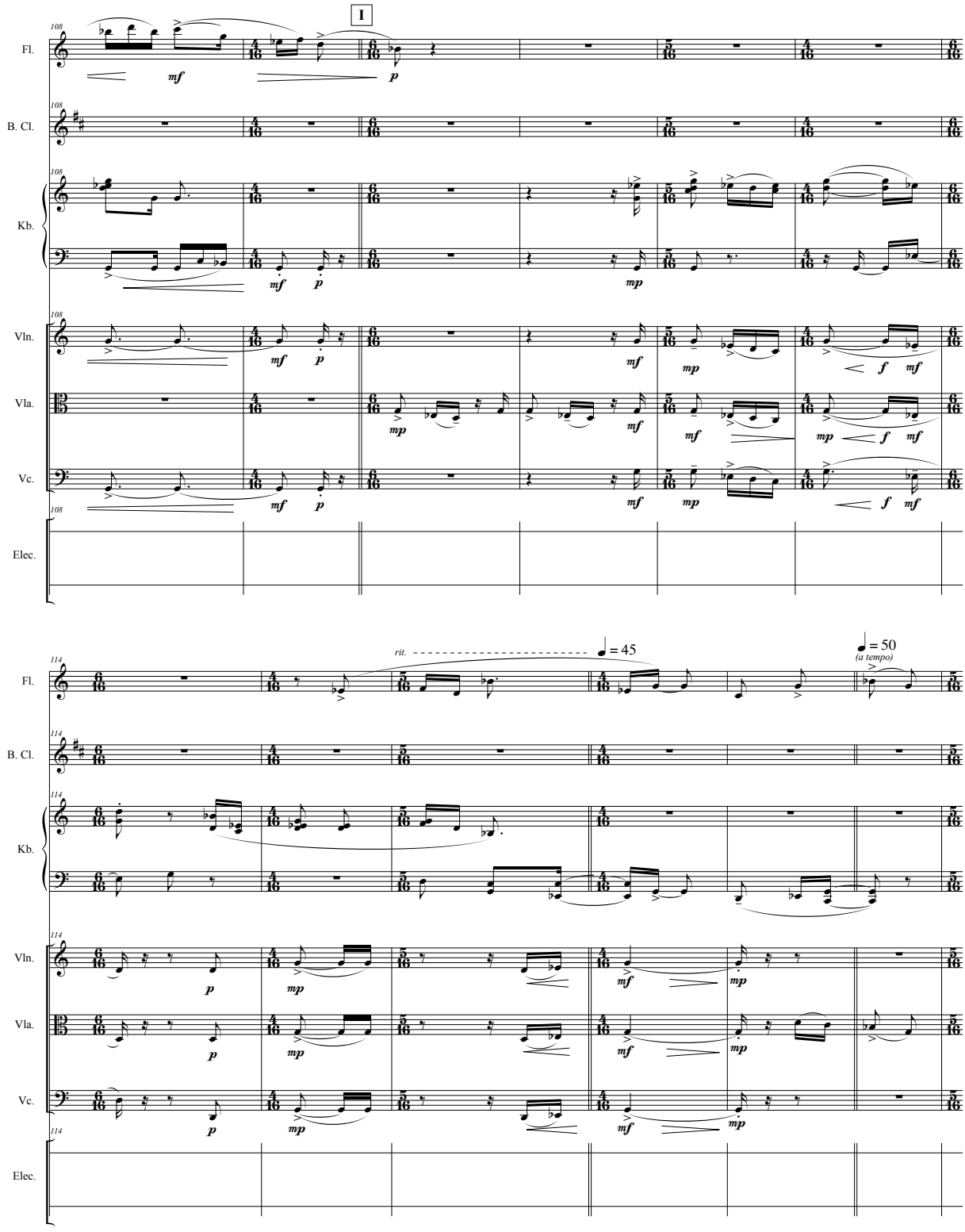

65
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
(Kb.) - water sounds
*water samples
F
= 120
71
loco
pizz.
pizz.
(Fl.) - delays
(Kb.) - water sounds
(Fl.) - delays
(Kb.) - water sounds
attacca

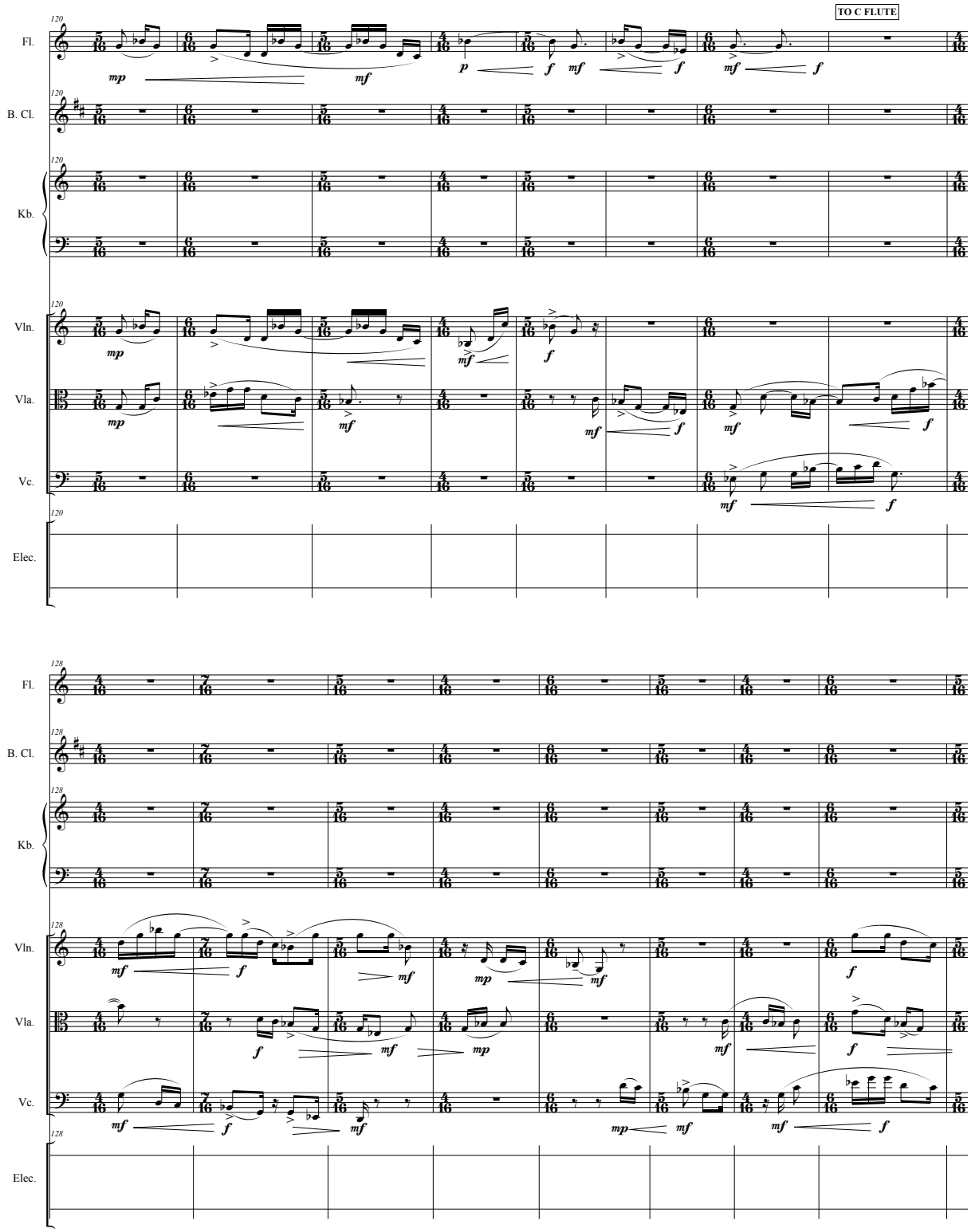
II. Return of the Shapeshifters

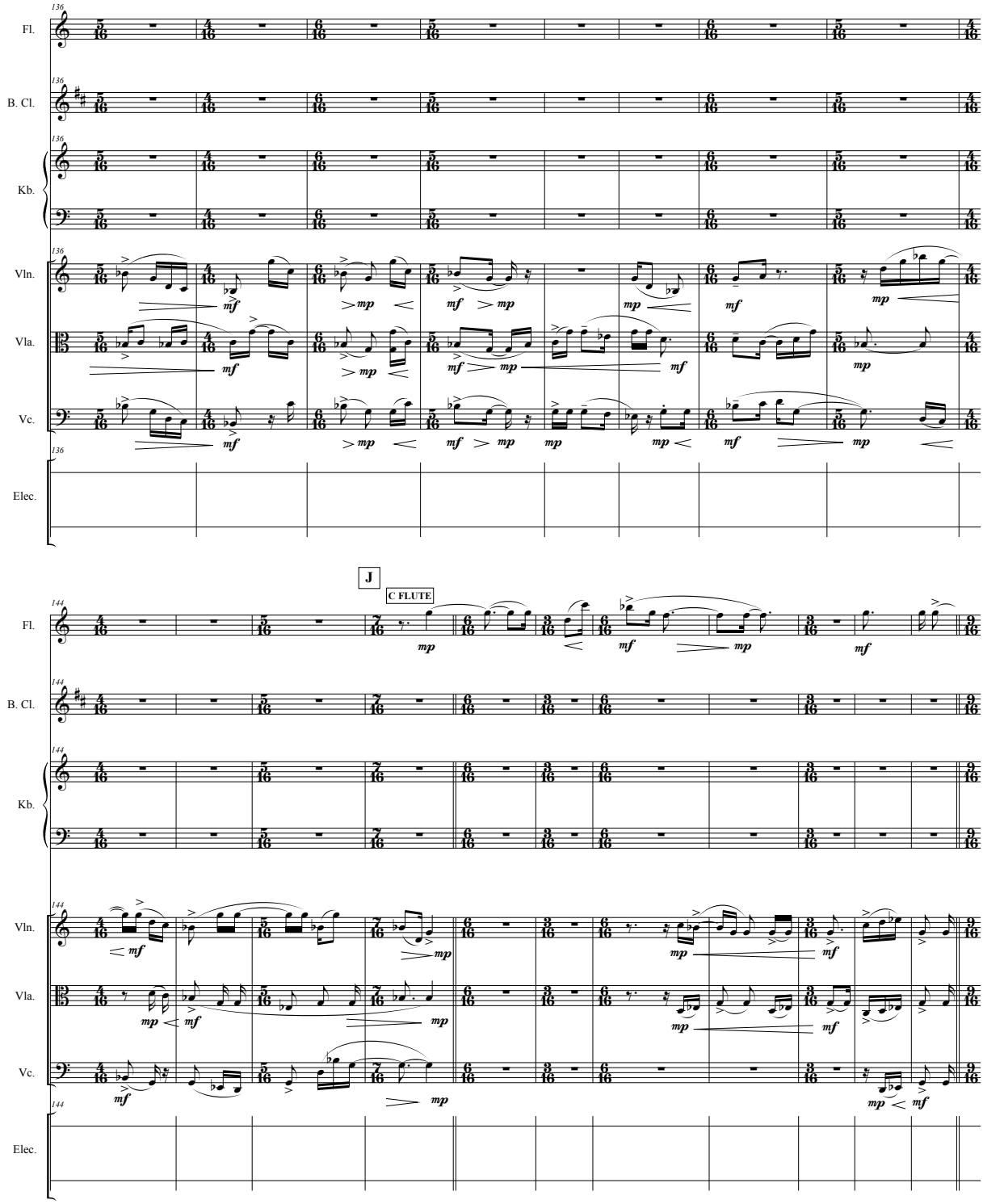


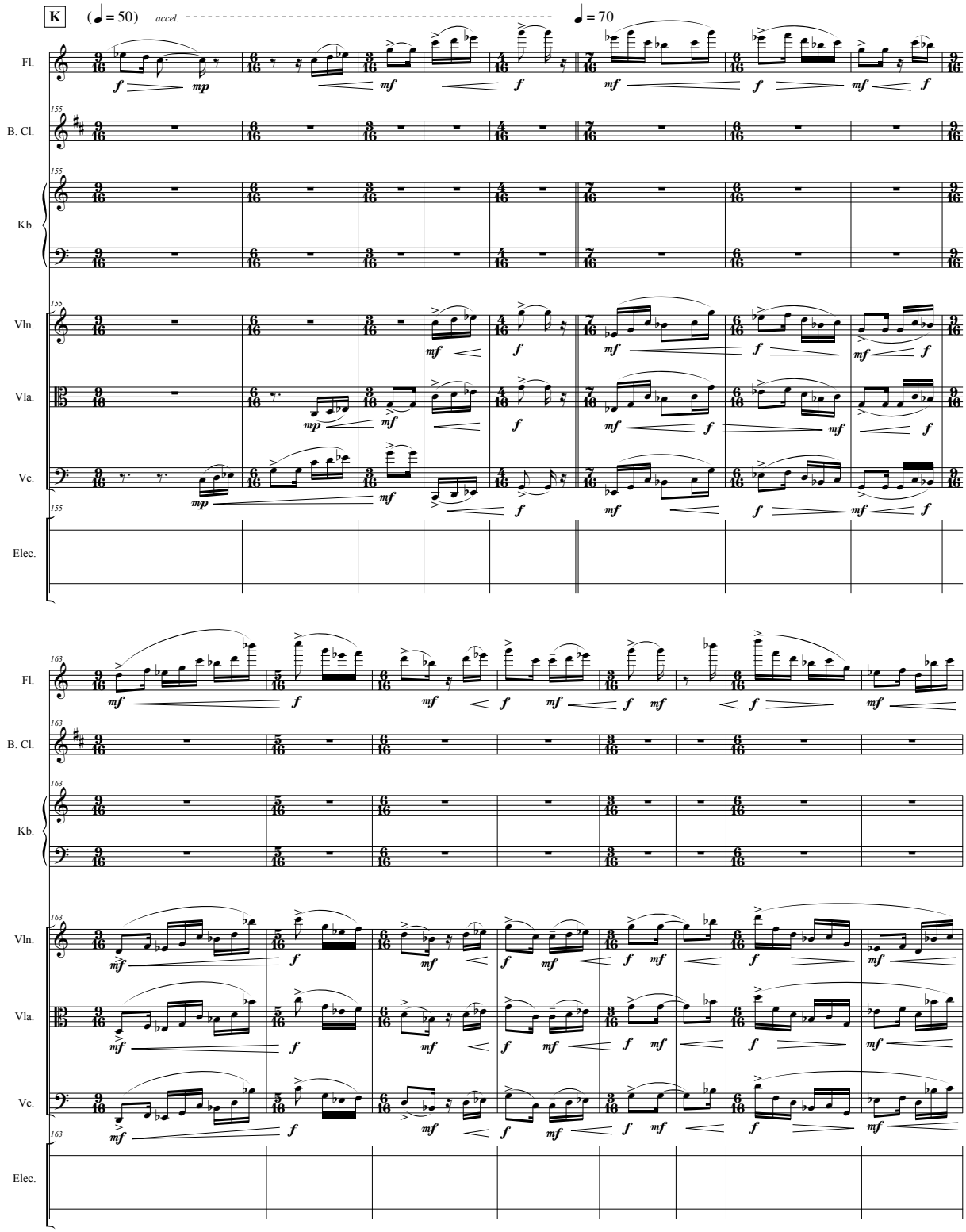

86
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
Fl. Electronics Off
(Str.) - Ghost Flute
91
sub. p
Electronics Off

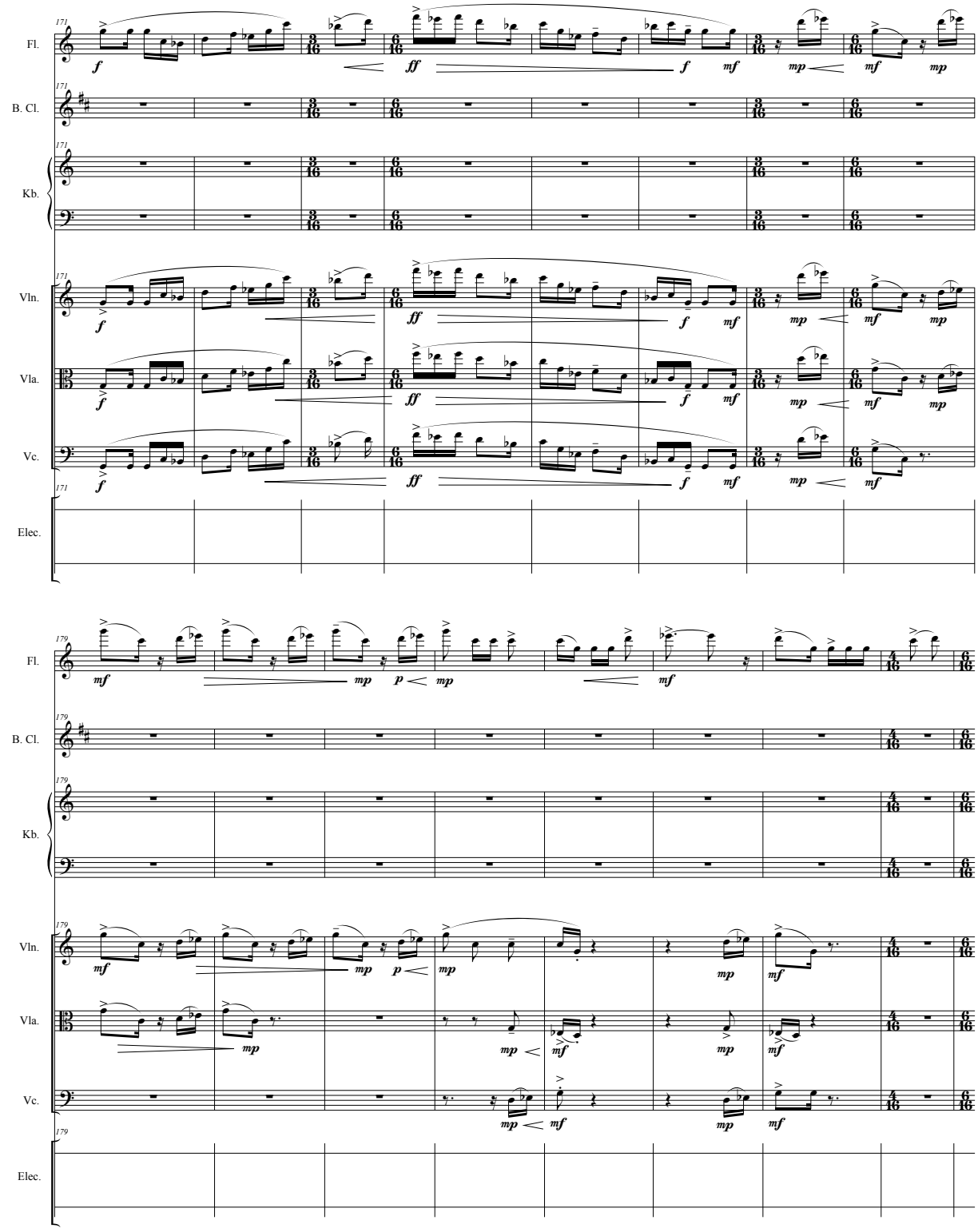

G
accel.
♩ = 40
H
accel.
♩ = 50
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
loco
sub. p
15mb
(Kb.) - water sounds
104

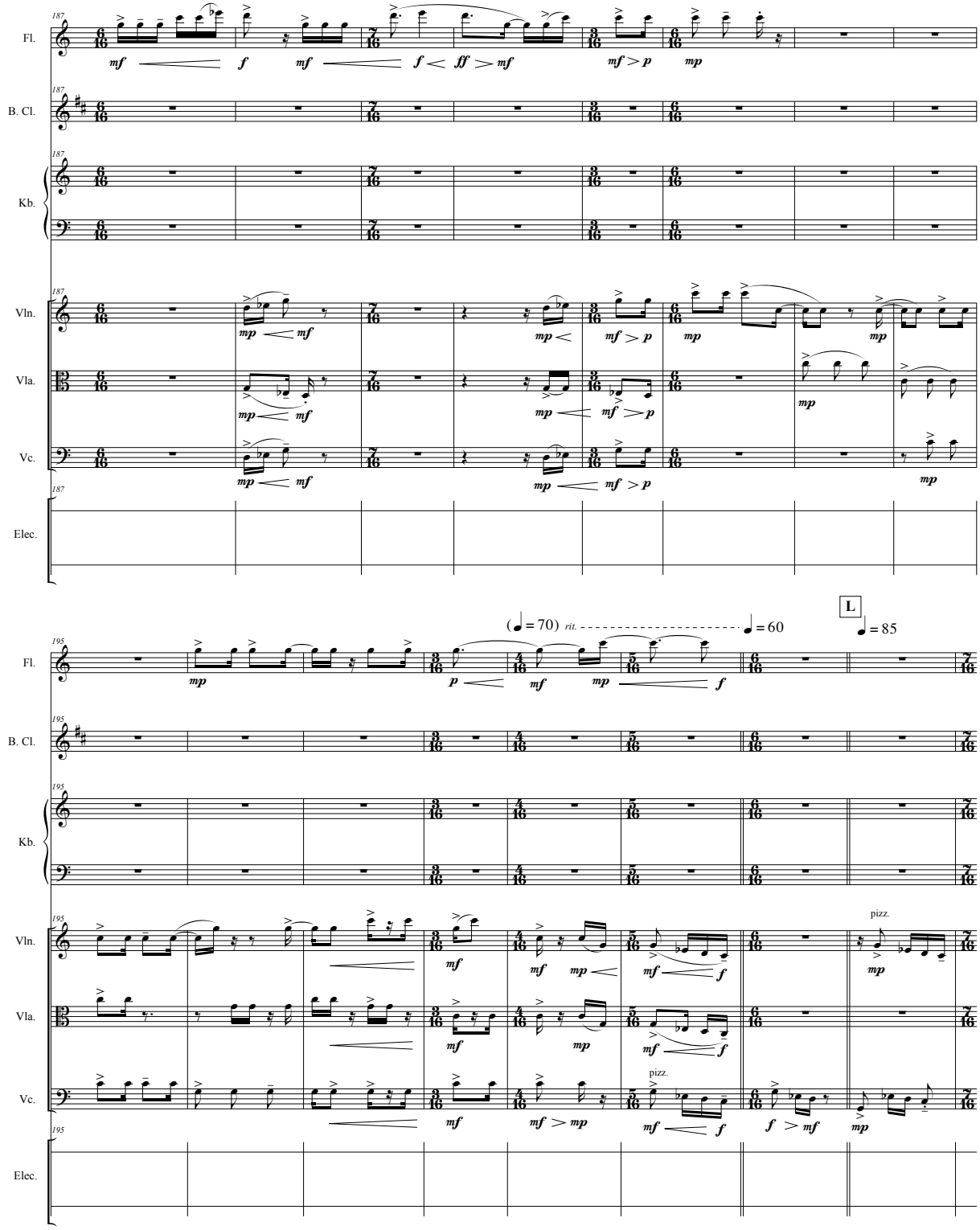

I
108
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
mf
p
mp
f
114
rit.
= 45
= 50
(a tempo)

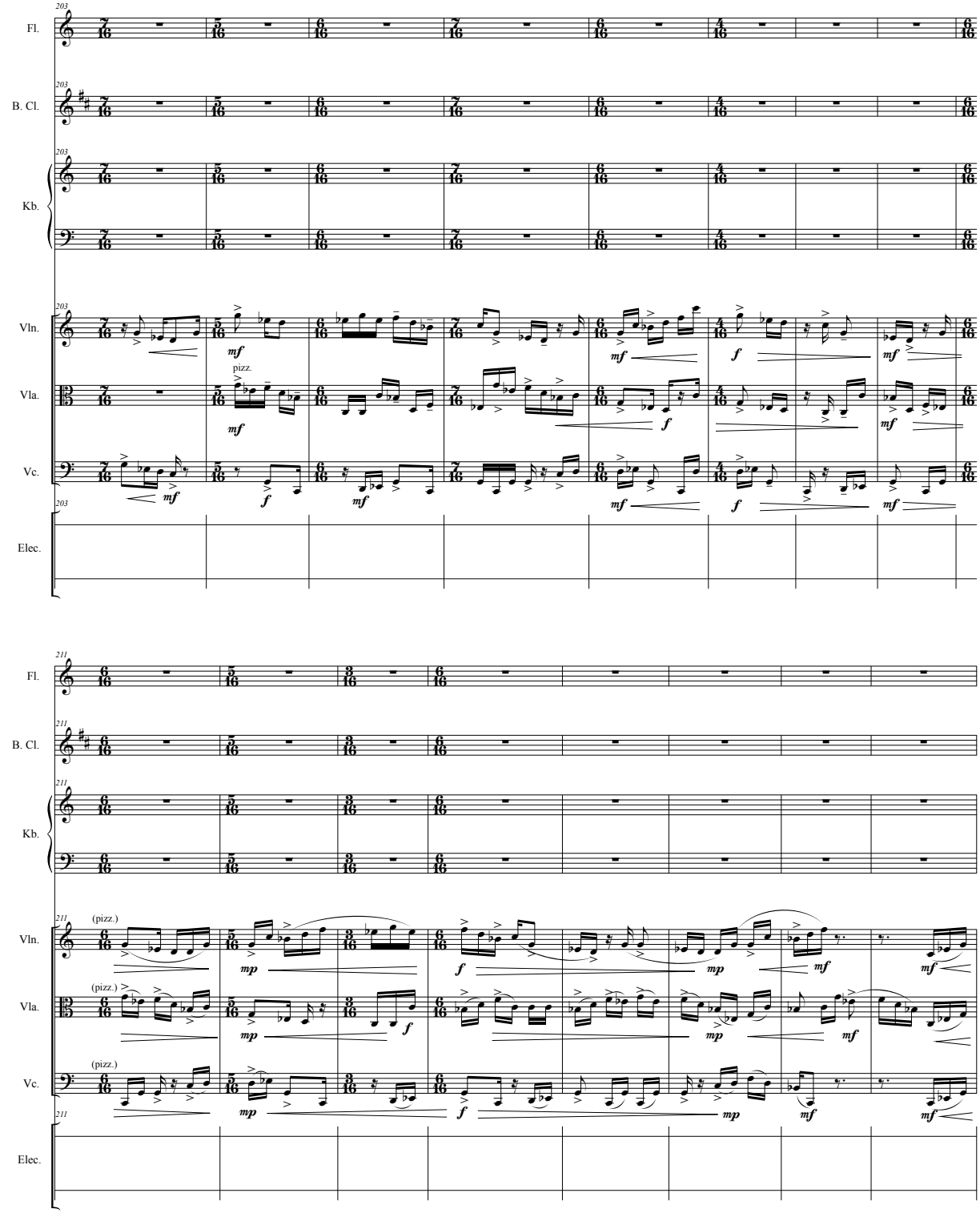

TO C FLUTE
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.

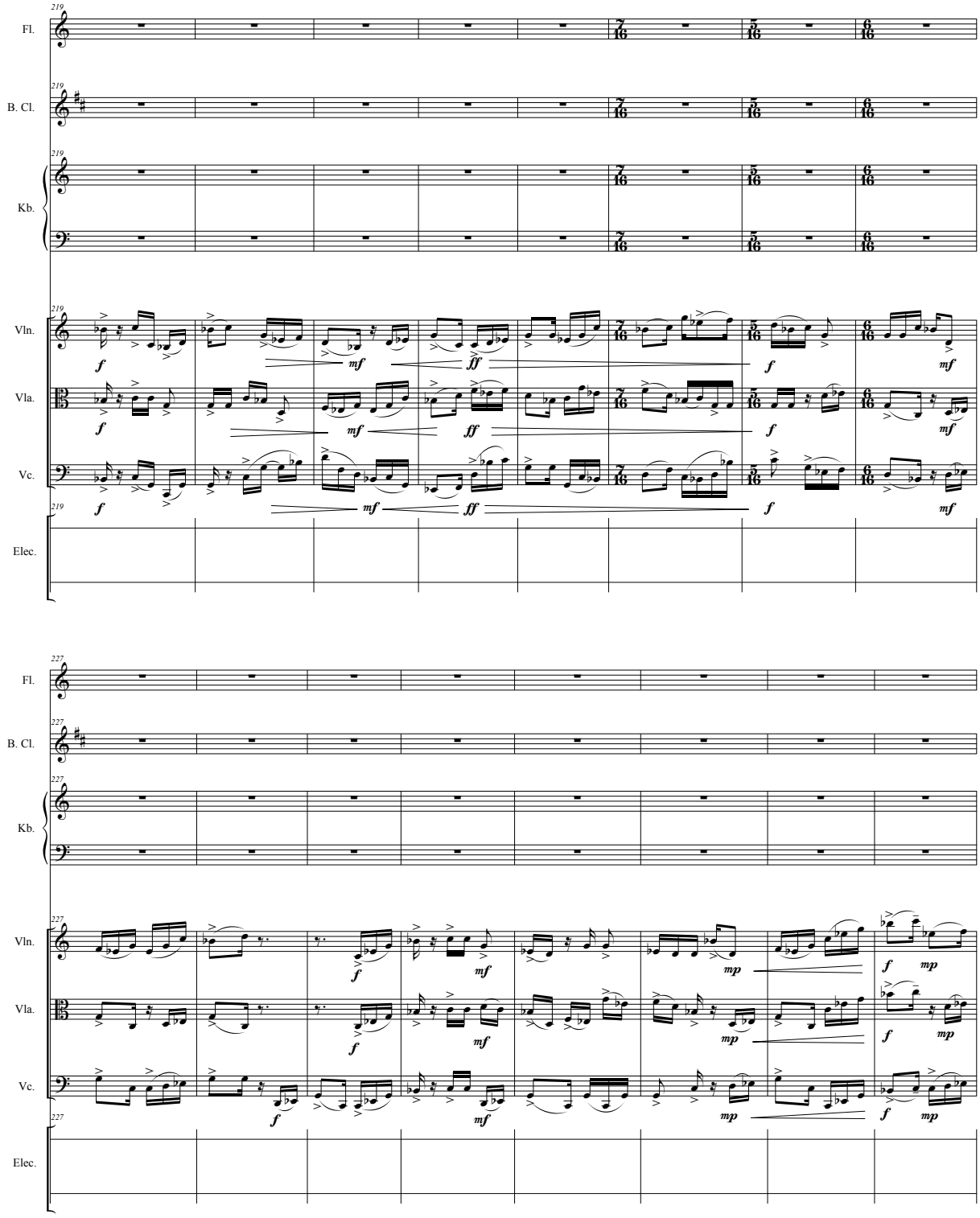

136
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
J
C FLUTE
144

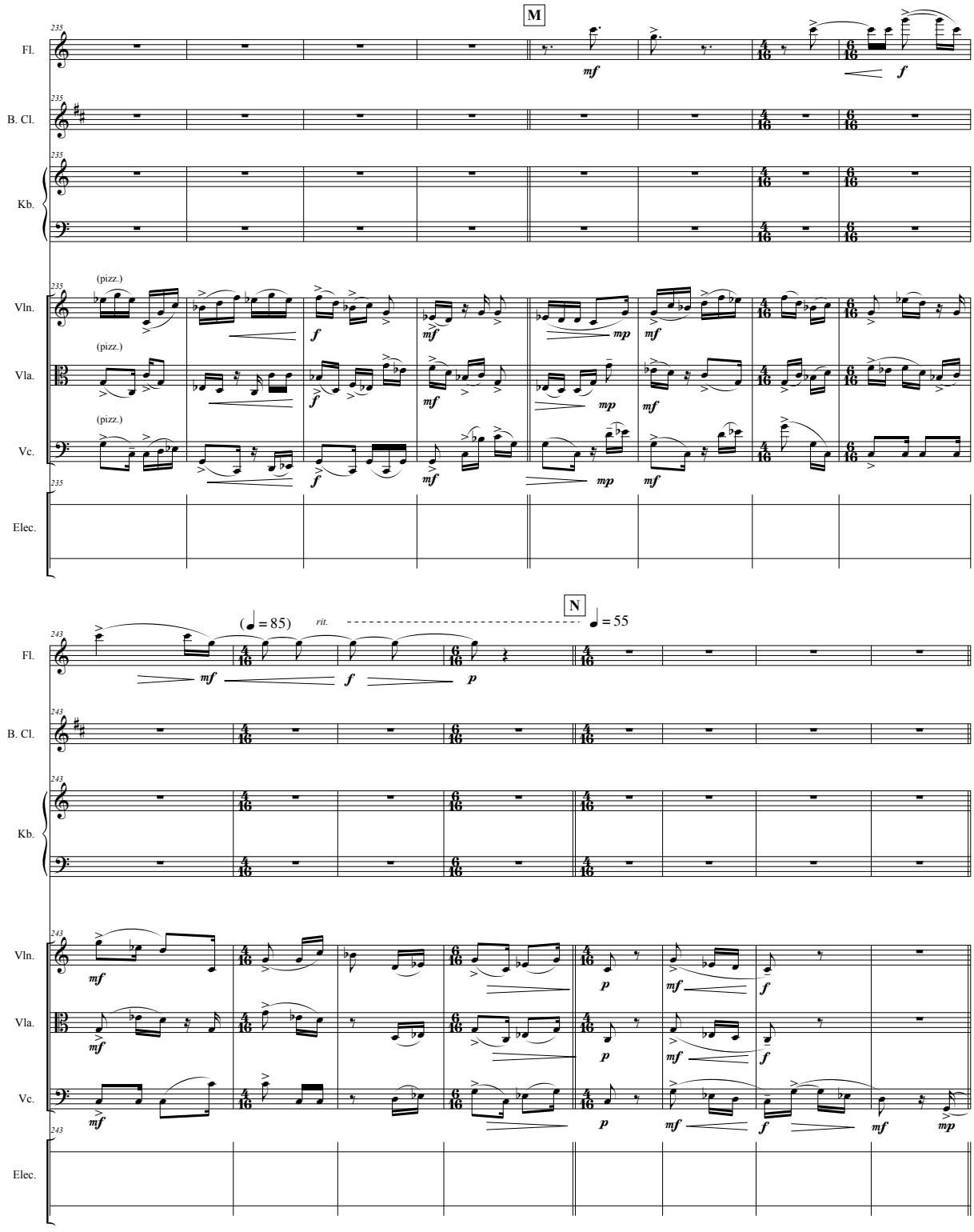

K
(♩= 50)
accel.
♩= 70
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
155
163

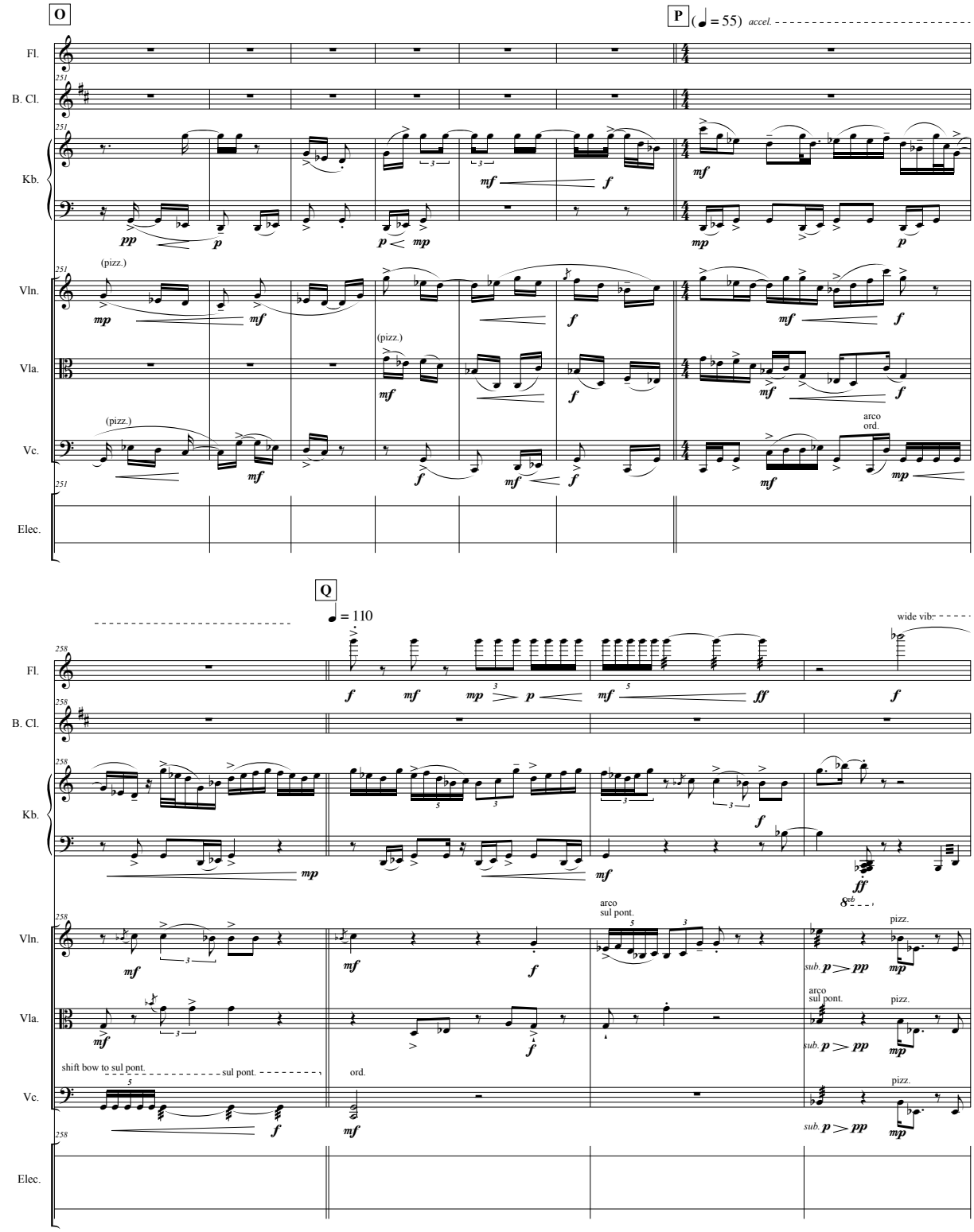

171
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
179

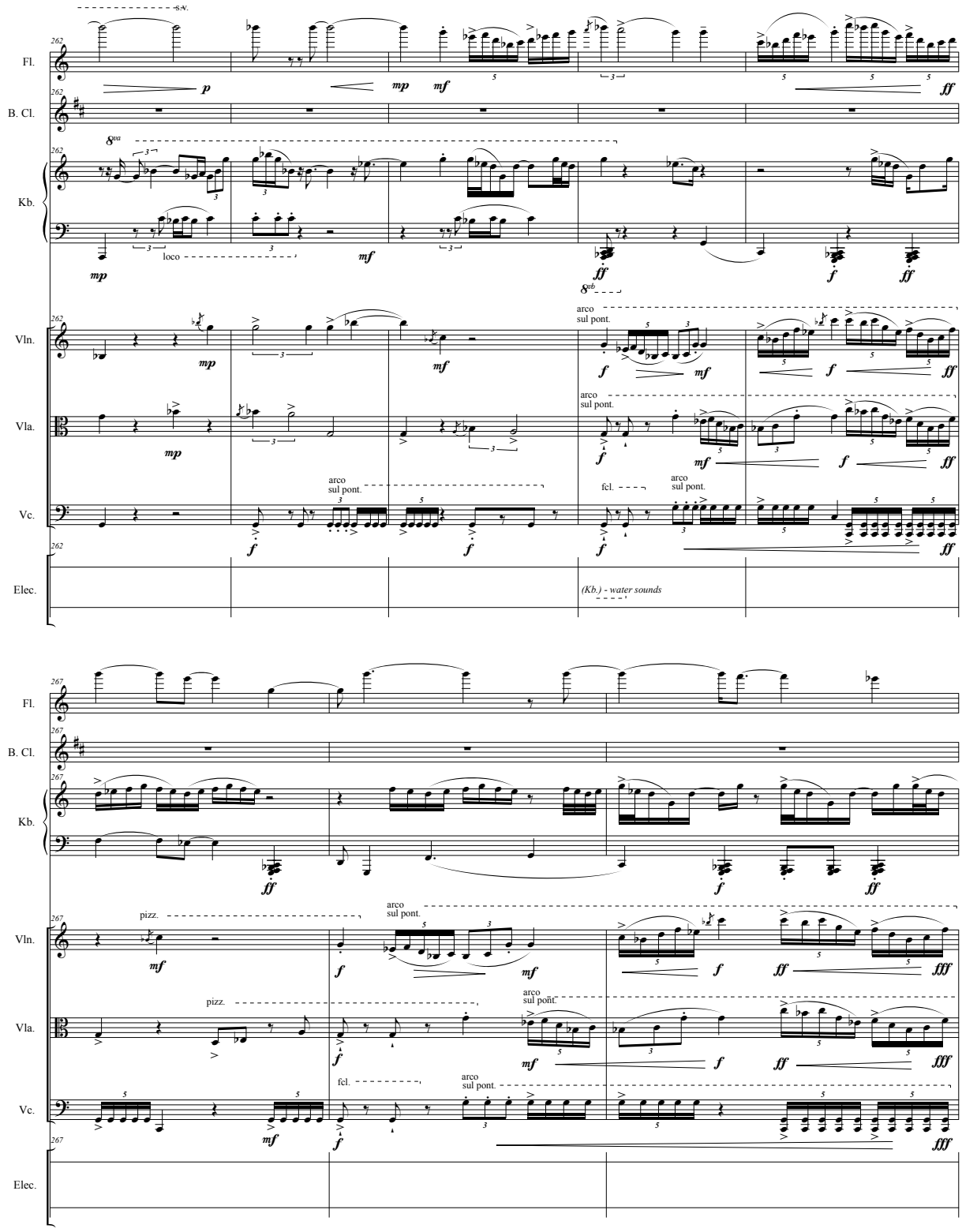

187
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
mf
f
ff
mf > p
mp
mp < mf
mp < mf > p
195
(♩= 70) rit.
♩= 60
L
♩= 85
p
mf
mp
f
mf > mp
f > mf
pizz.

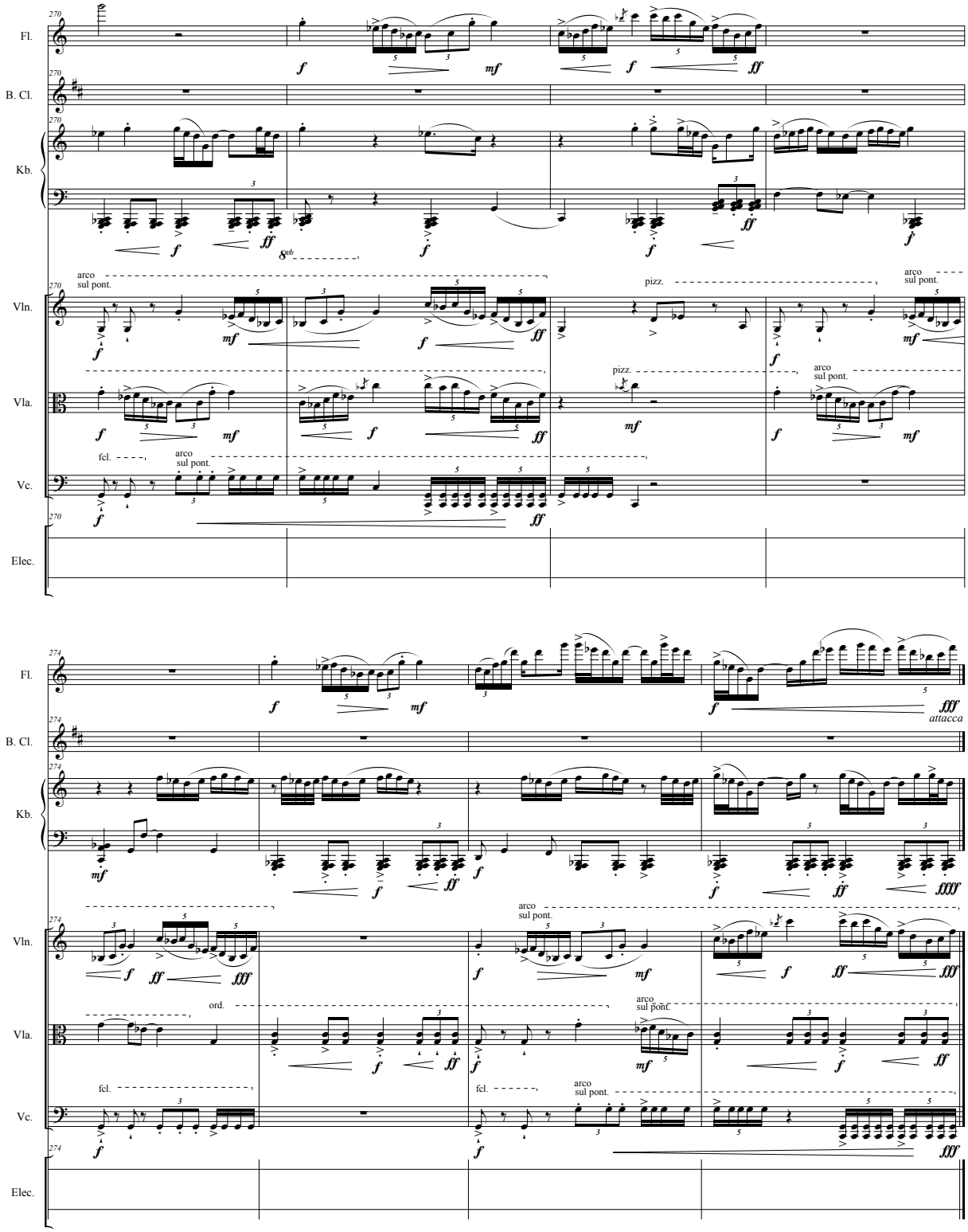

203
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
pizz.
211
(pizz.)


219
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
227
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.

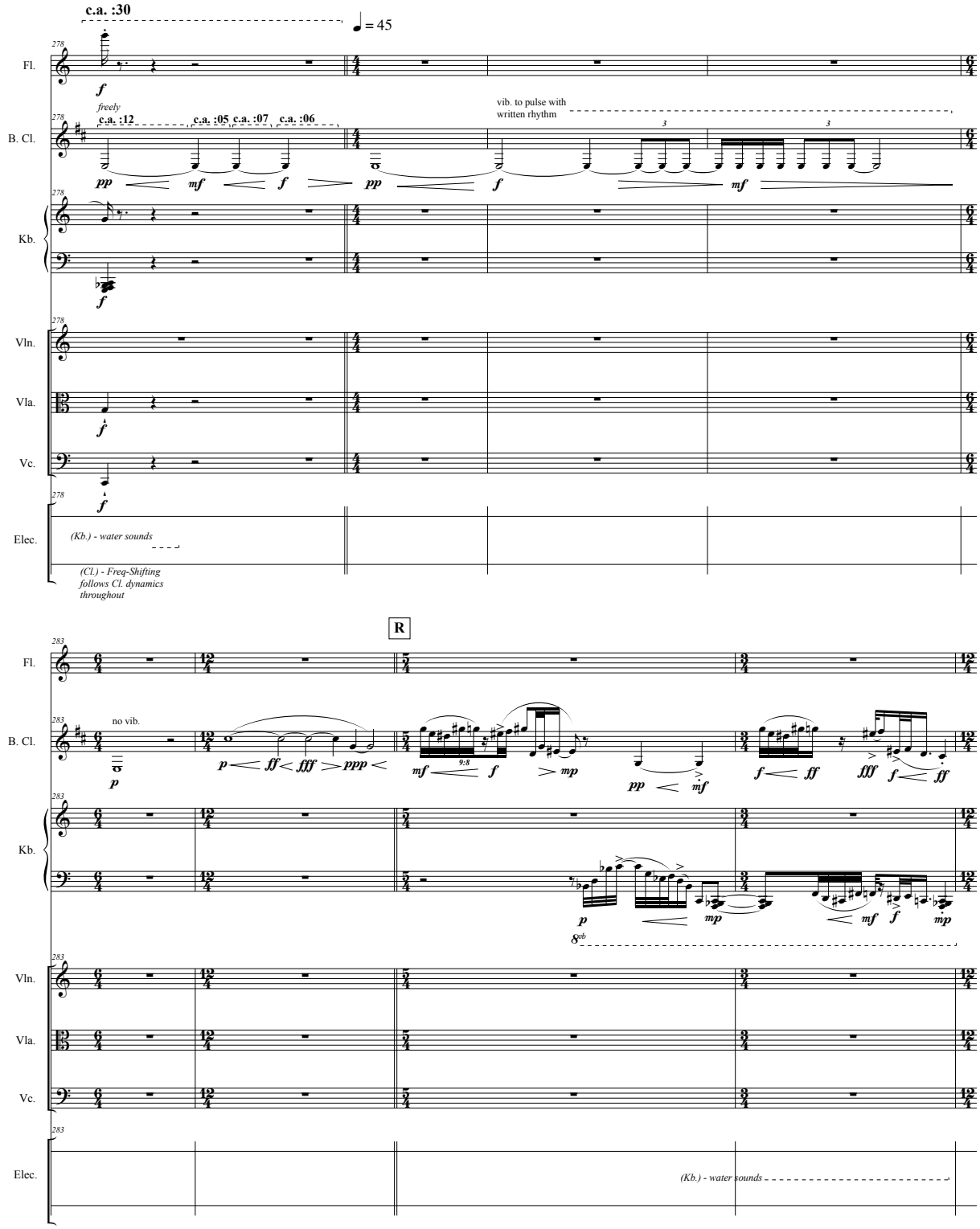

M
235
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
(pizz.)
mf
f
mp
N
243
(♩ = 85)
rit.
♩ = 55
p

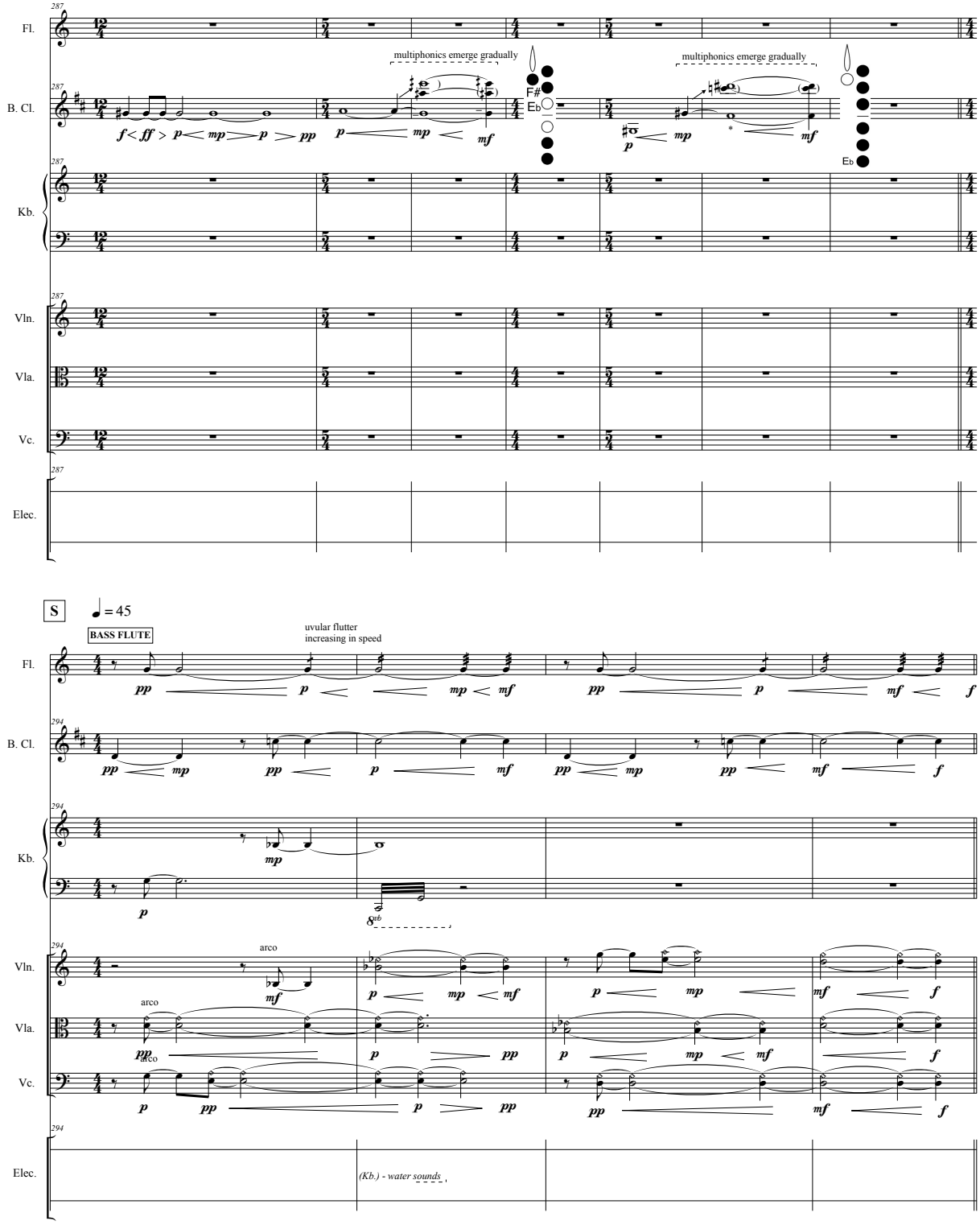

O
P
(♩ = 55) accel.
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
(pizz.)
arco
ord.
Q
♩ = 110
wide vib.
8va
arco
sul pont.
pizz.
sub. p > pp
shift bow to sul pont.
sul pont.
ord.

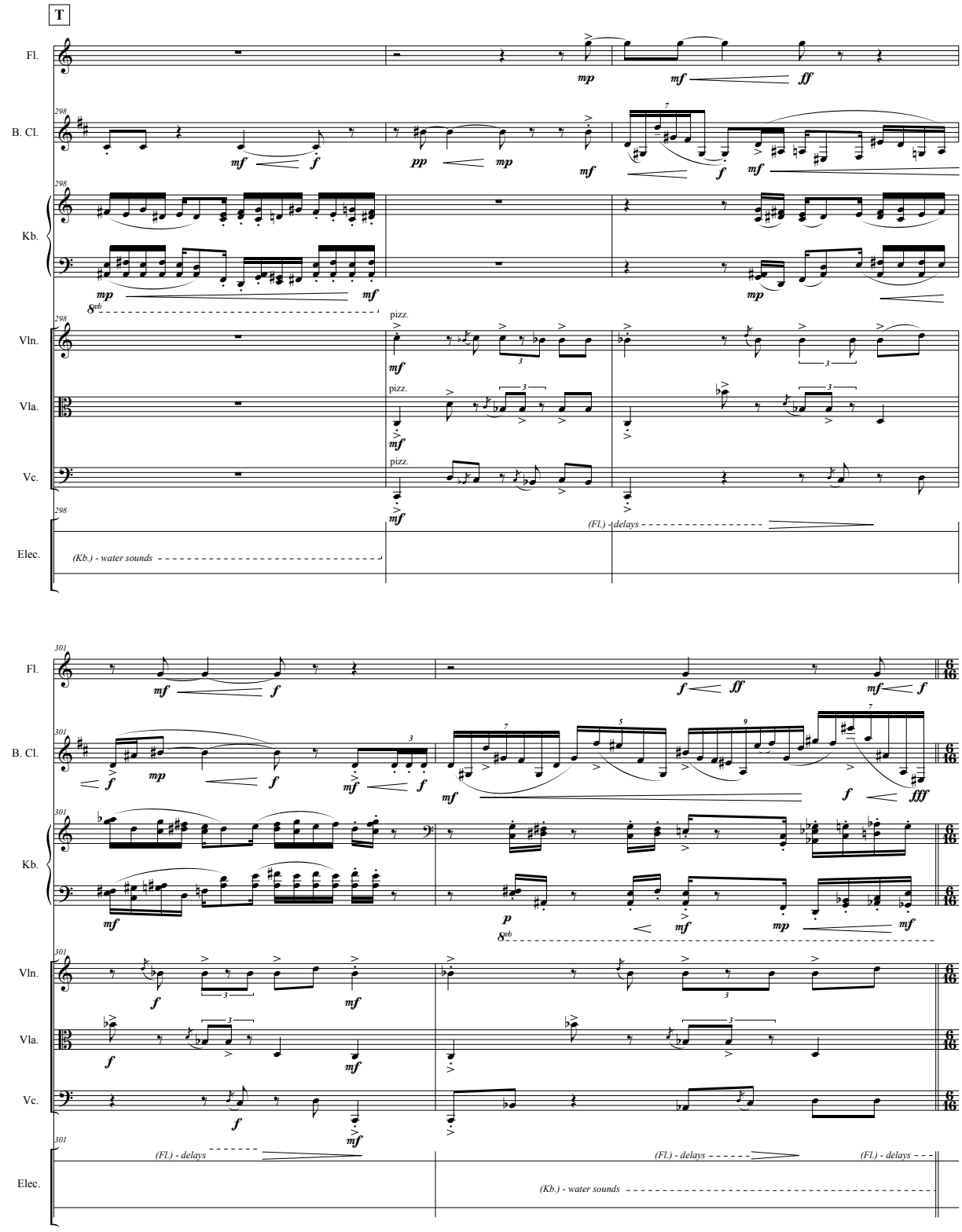

S.V.
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
loco
arco
sul pont.
fcl.
(Kb.) - water sounds
pizz.

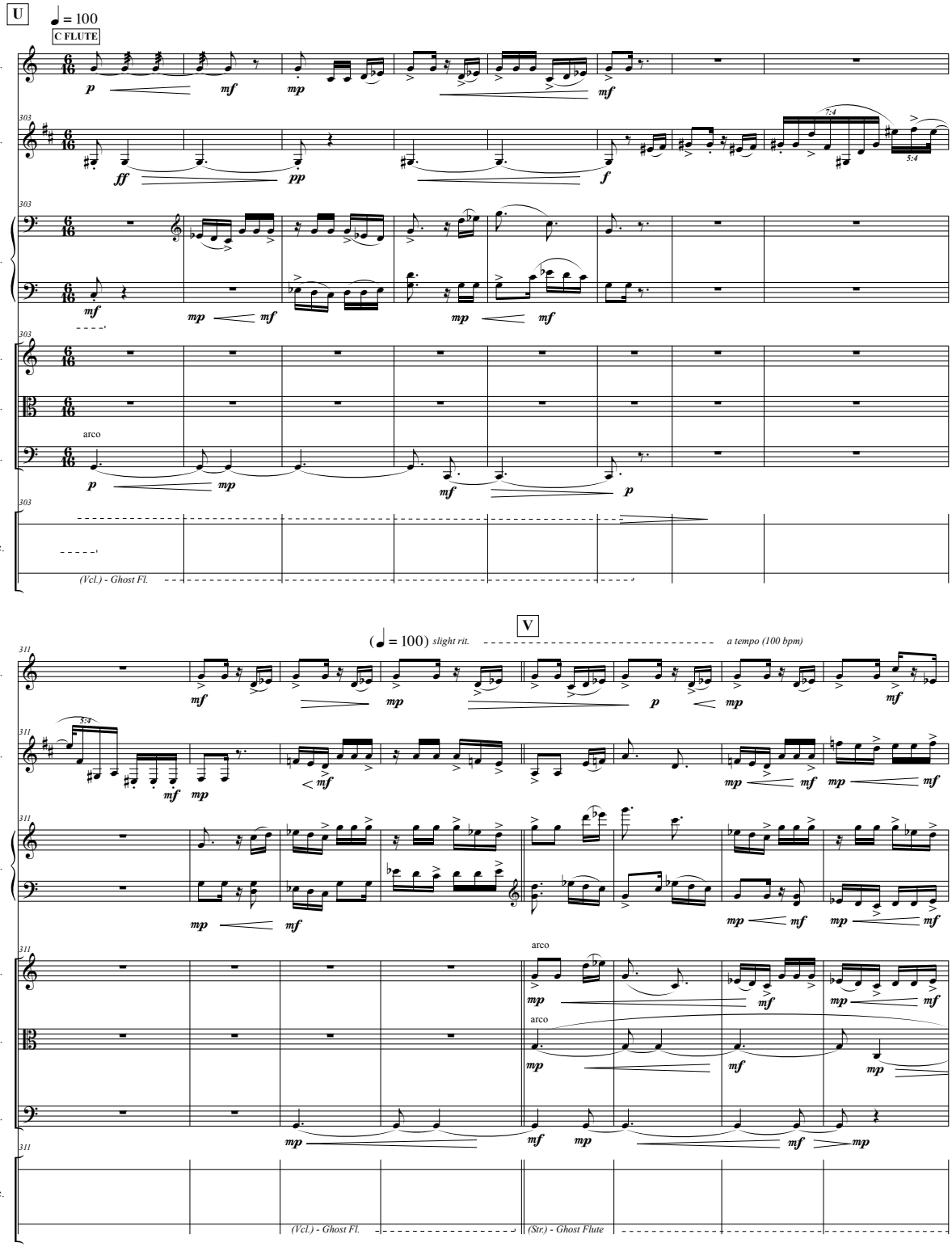

Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
arco
sul pont.
pizz.
fcl.
ord.
attacca

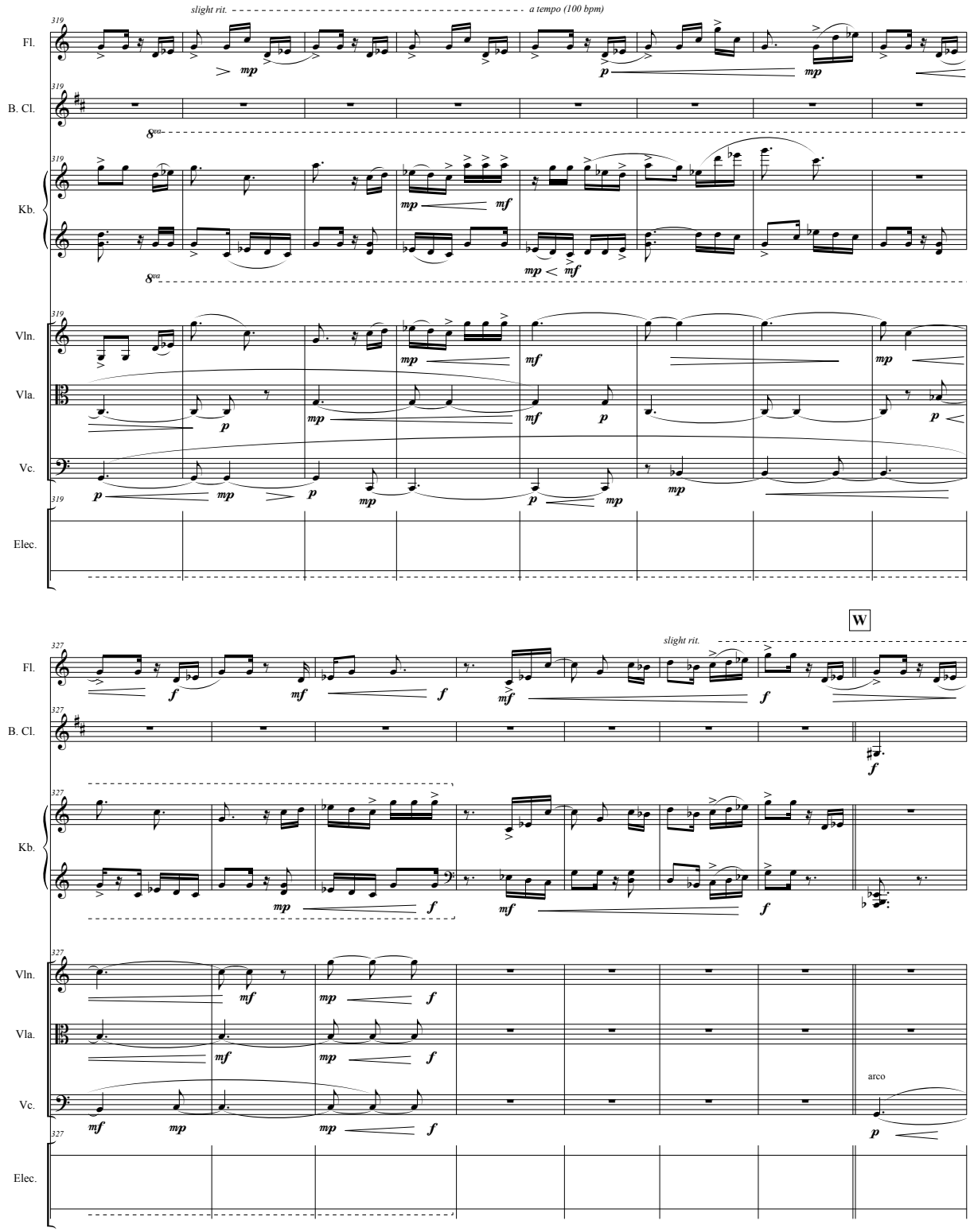
III. Machine Shadows

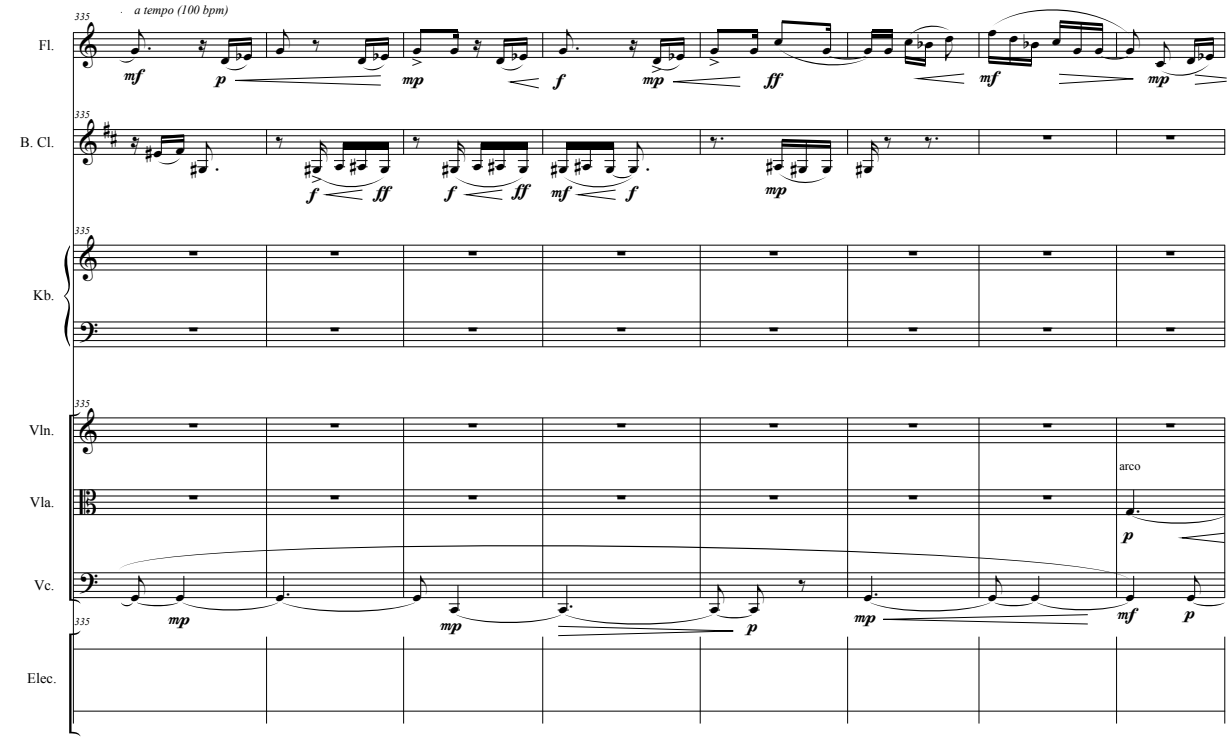


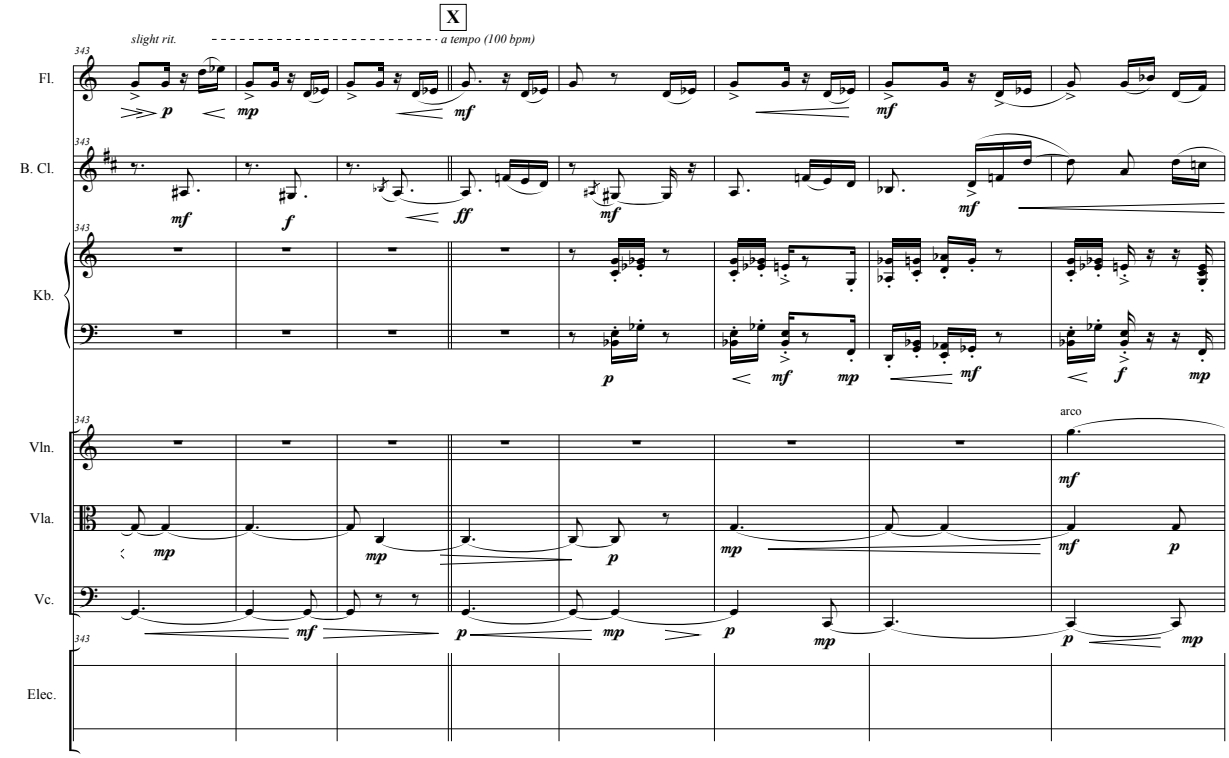

287
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
multiphonics emerge gradually
multiphonics emerge gradually
F#
Eb
Eb
S
♩ = 45
BASS FLUTE
uvular flutter
increasing in speed
294
arco
arco
arco
(Kb.) - water sounds

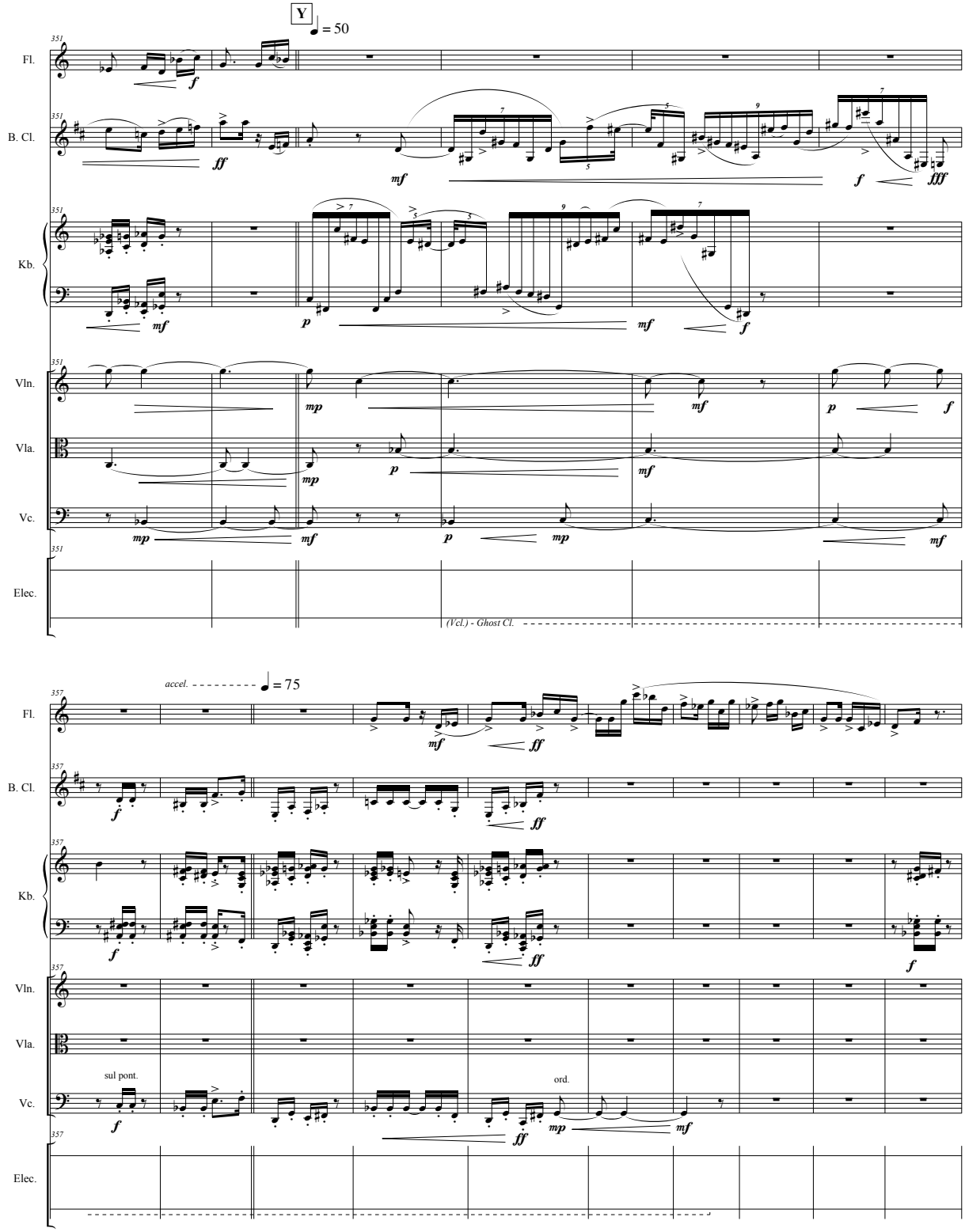

T
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
298
pizz.
(Kb.) - water sounds
(Fl.) - delays
301
(Fl.) - delays
(Kb.) - water sounds

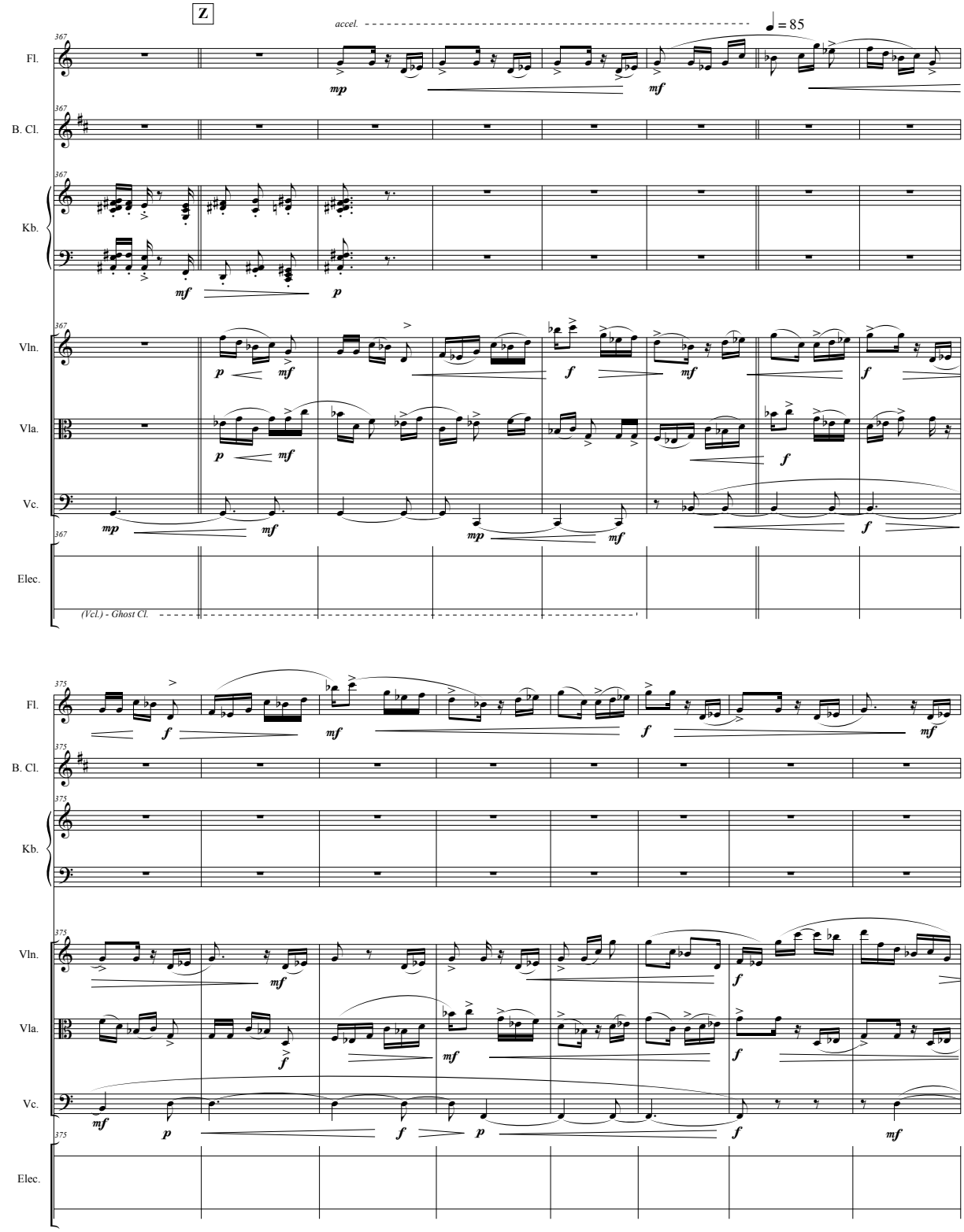

U
♩ = 100
C FLUTE
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
arco
(Vcl.) - Ghost Fl.
V
(♩ = 100) slight rit.
a tempo (100 bpm)
(Str.) - Ghost Flute

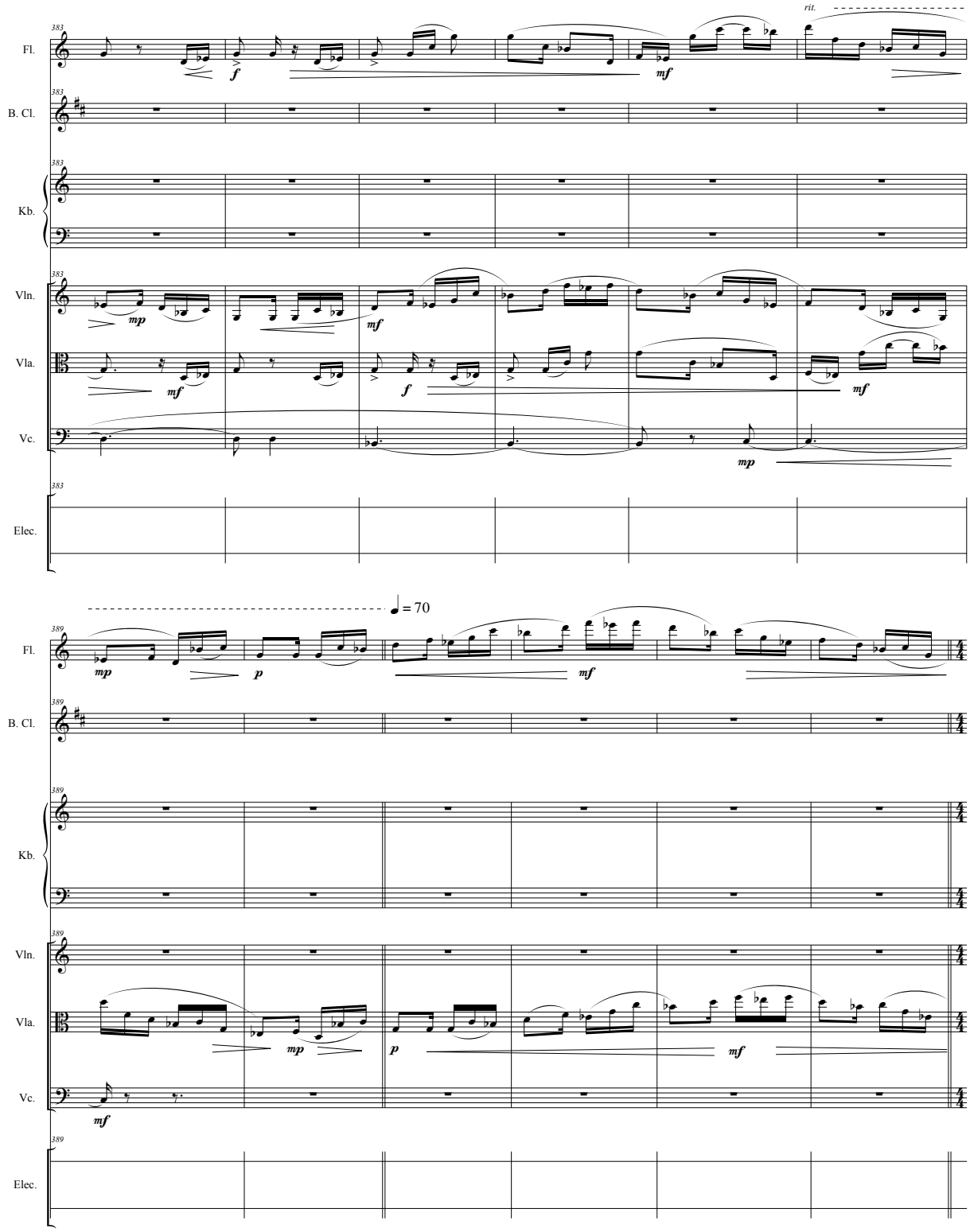

slight rit.
a tempo (100 bpm)
319
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
8va
mp
mf
p
W
327
slight rit.
f
arco

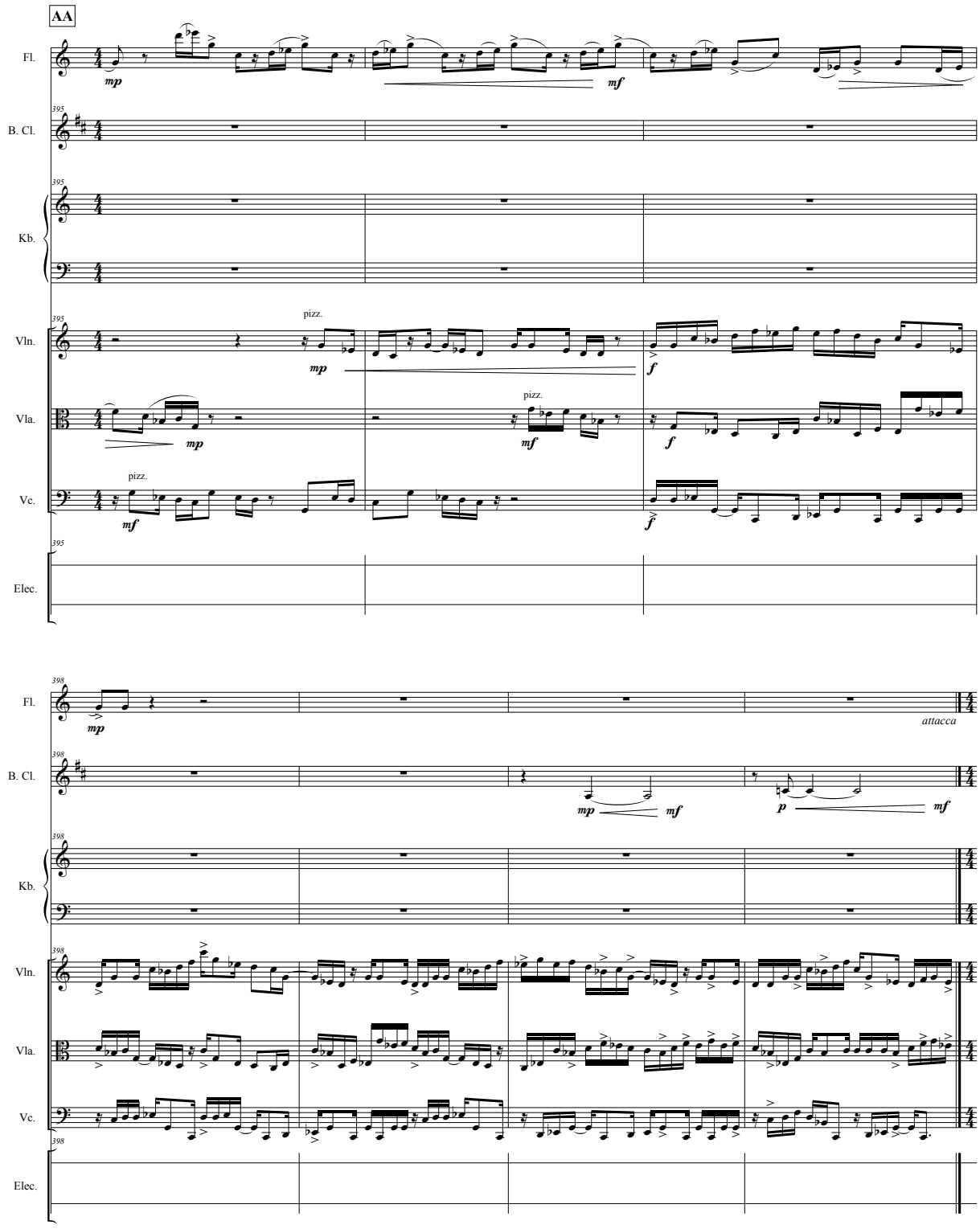

335
a tempo (100 bpm)
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
arco


X
343
slight rit.
a tempo (100 bpm)
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
arco

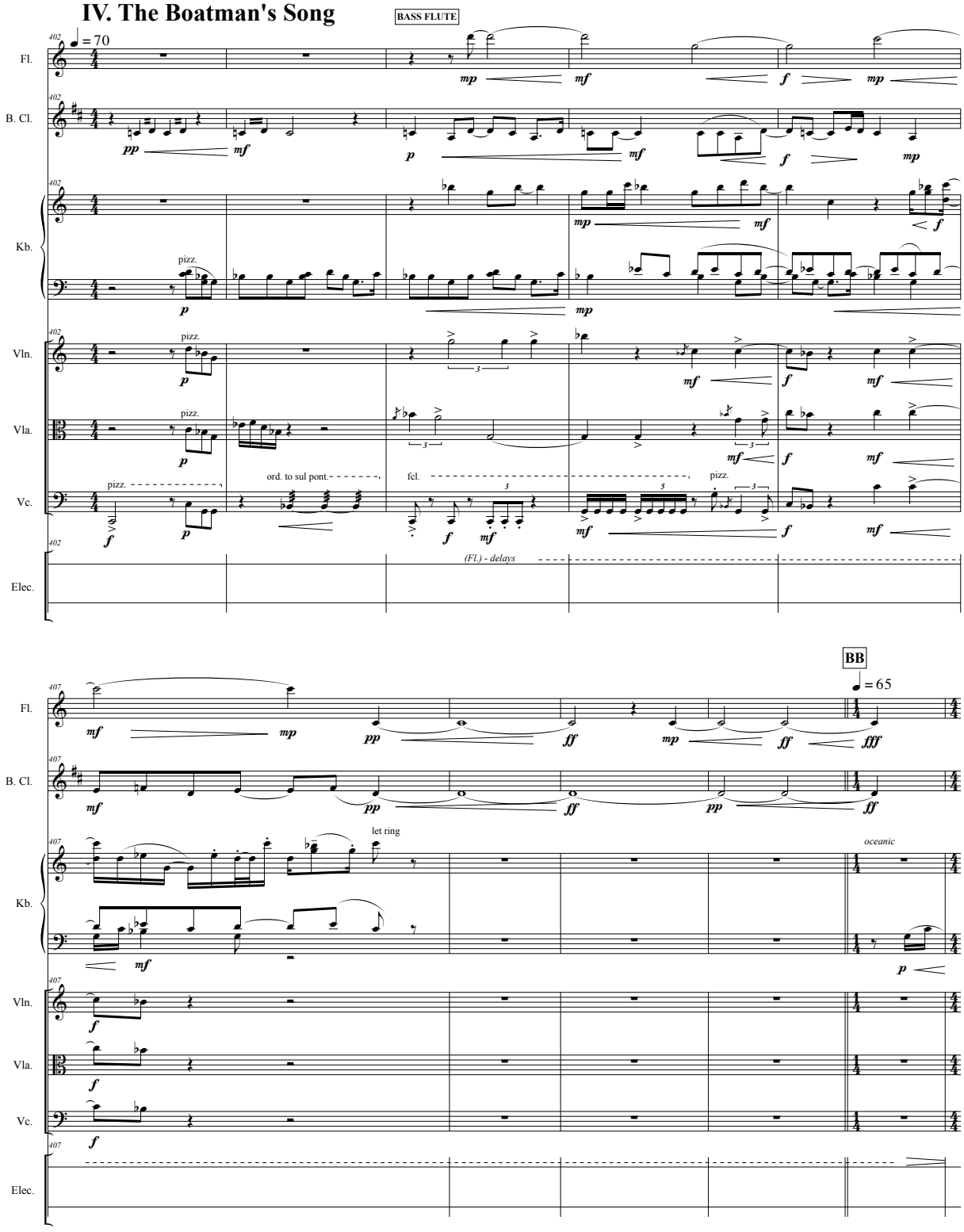

Y
♩ = 50
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
(Vcl.) - Ghost Cl.
accel.
♩ = 75
sul pont.
ord.

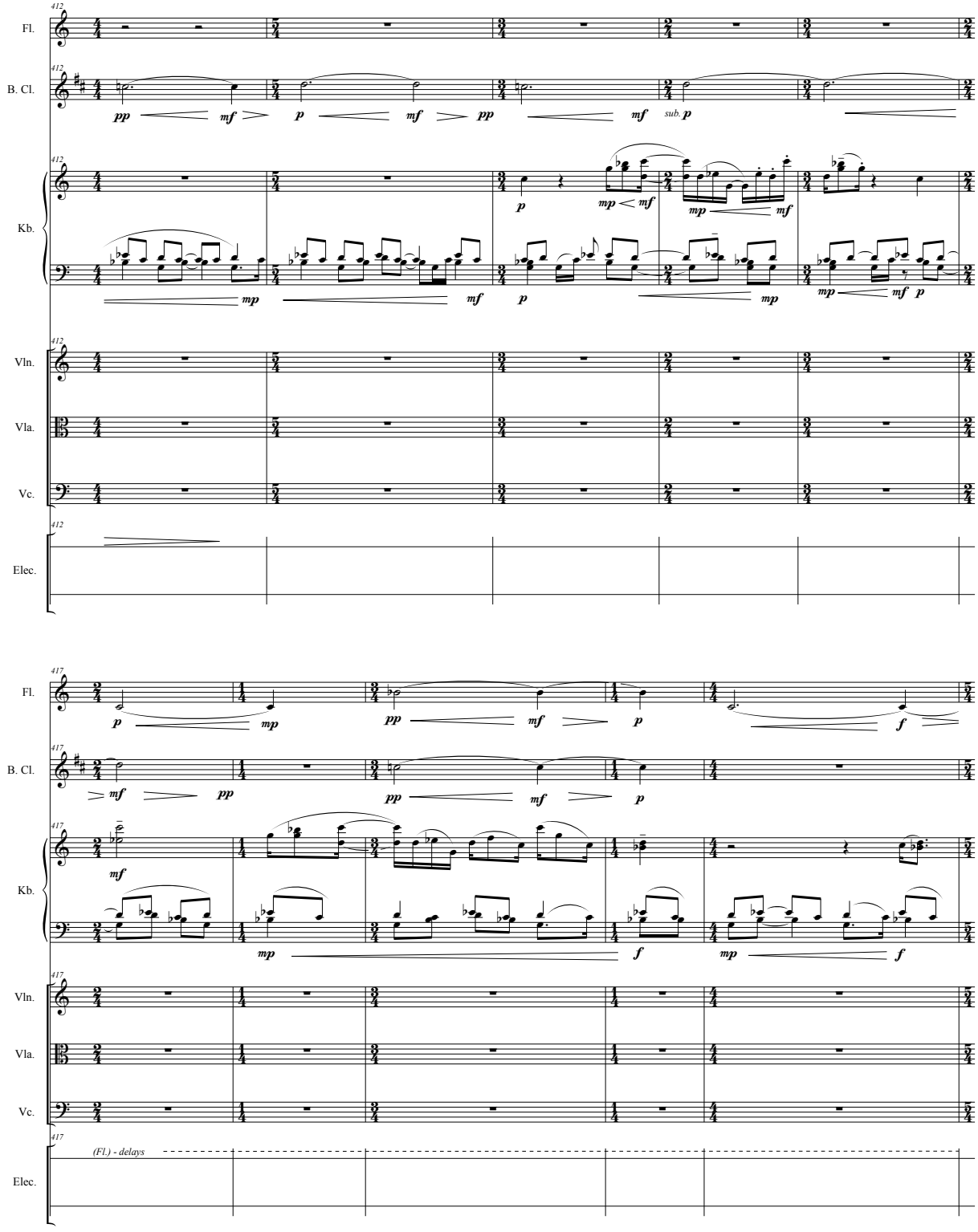

Z
accel.
♩ = 85
367
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
(Vcl.) - Ghost Cl.
375

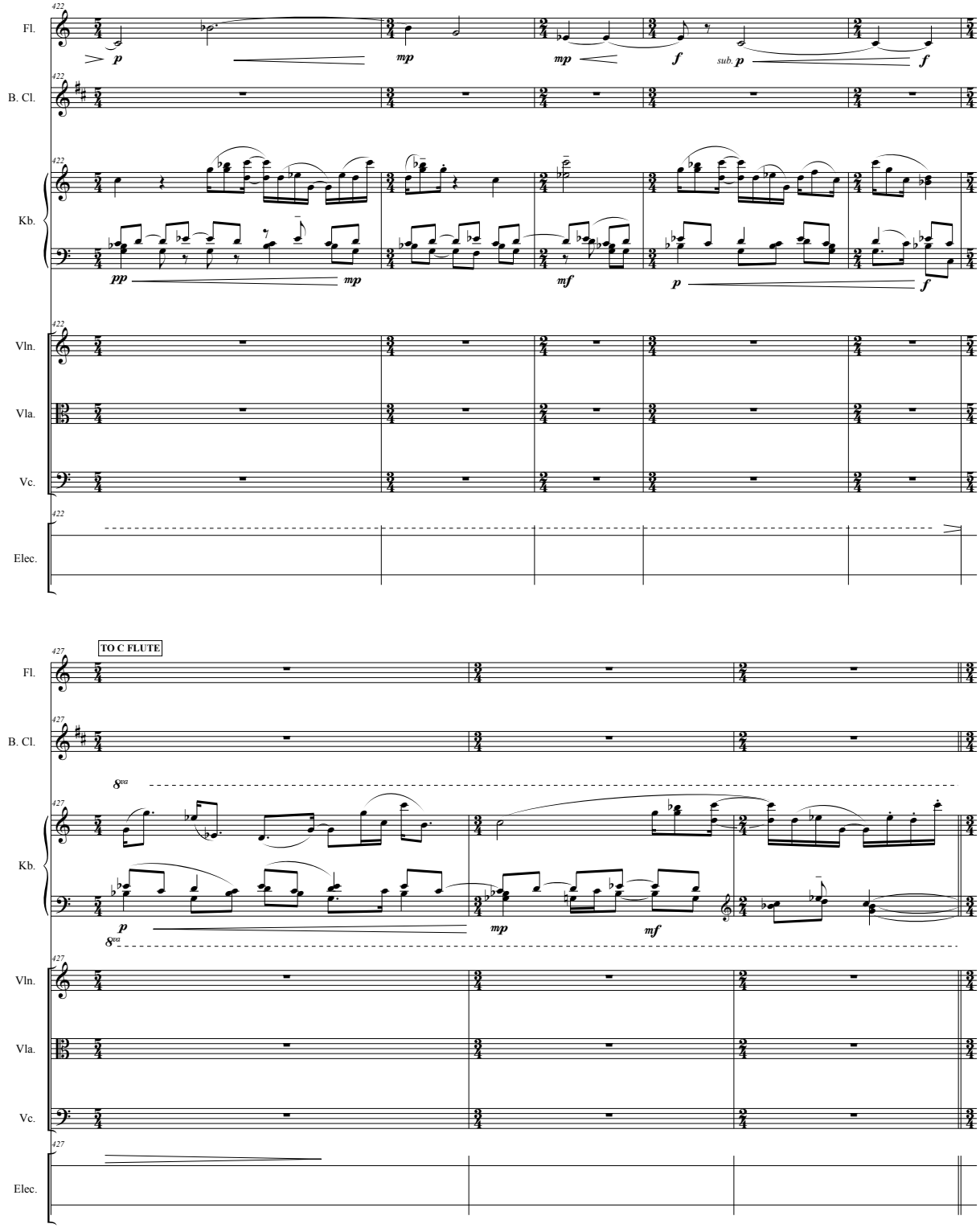

383
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
rit.
f
mf
mp
389
♩ = 70
p

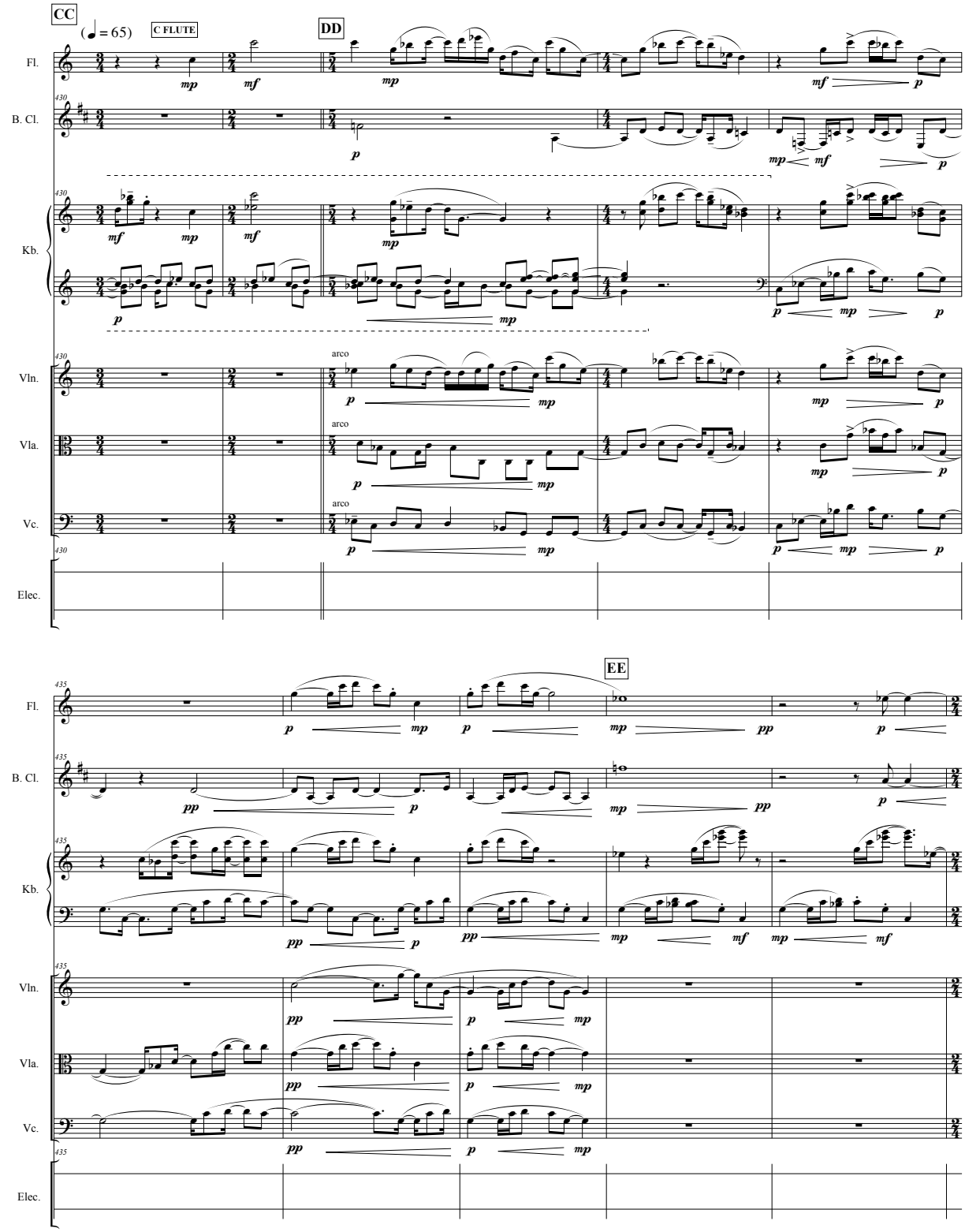

AA
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
395
398
pizz.
mp
mf
f
p
attacca

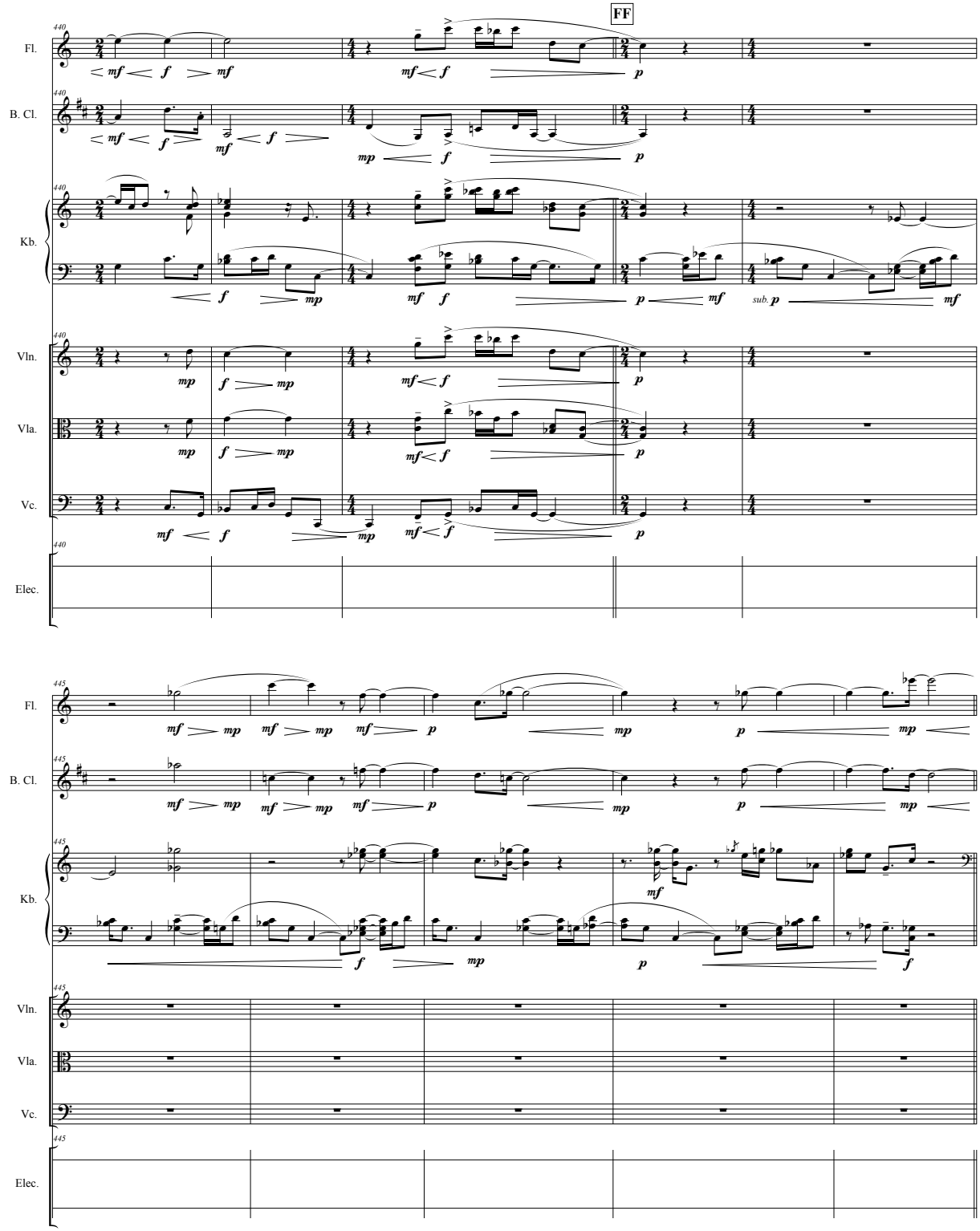
IV. The Boatman's Song

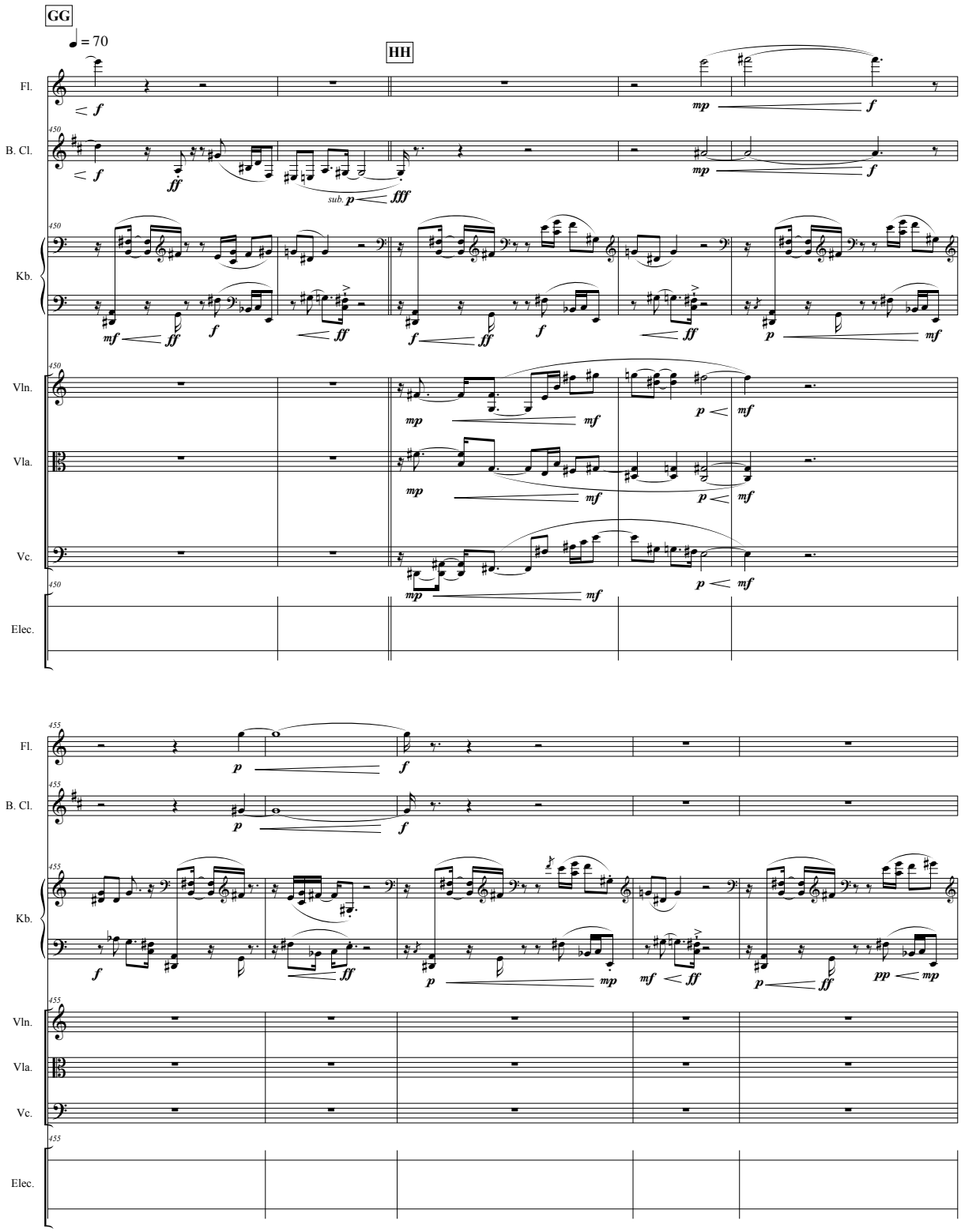


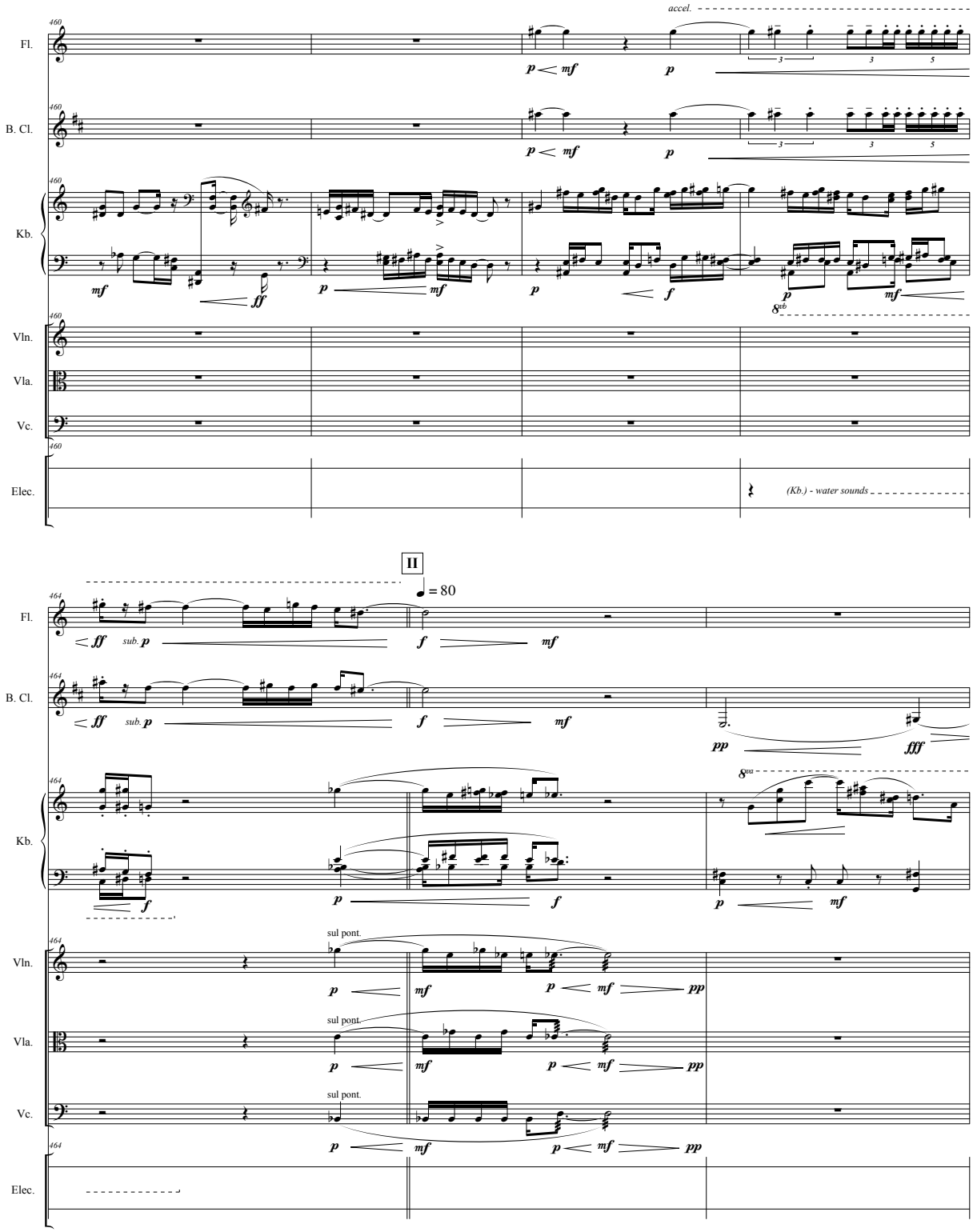

412
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
pp mf p mf pp mf sub. p
p mp mf mp mf
mp mf p mp mp mf p
417
(Fl.) - delays

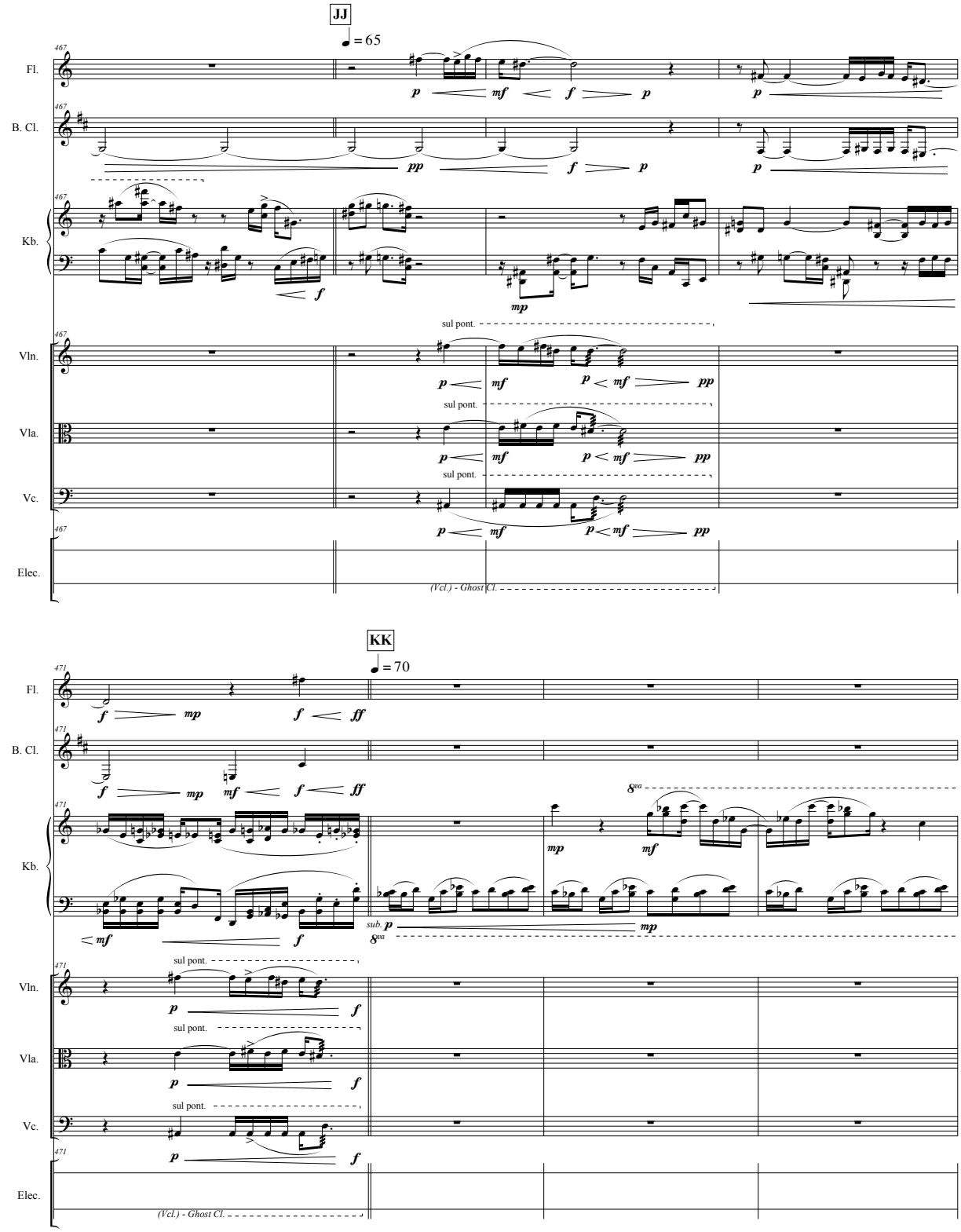

422
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
p
mp
mp
f
sub. p
f
pp
mp
mf
p
f
427
TO C FLUTE
8va
p
8va
mp
mf

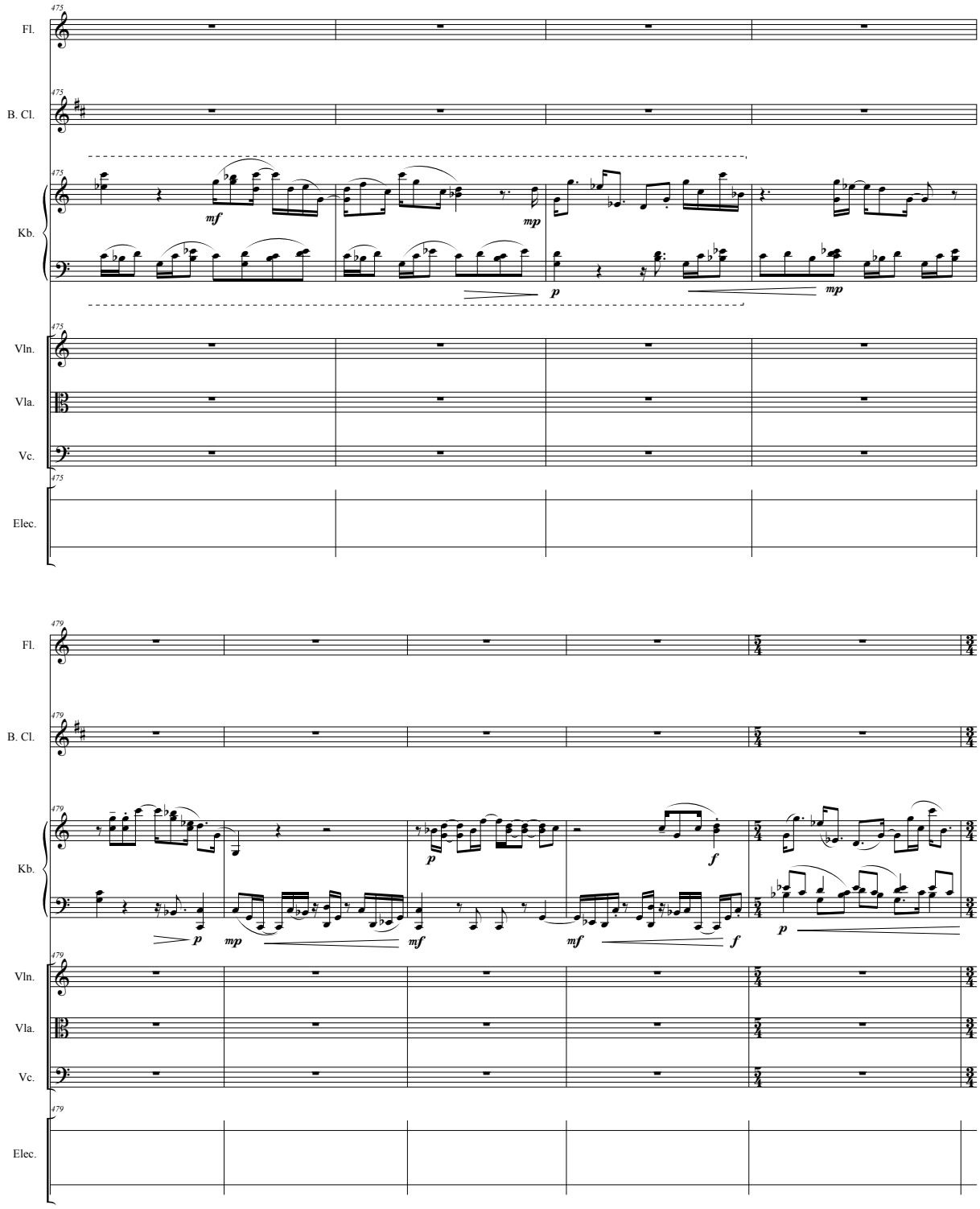

CC
(♩ = 65)
C FLUTE
DD
EE
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
arco

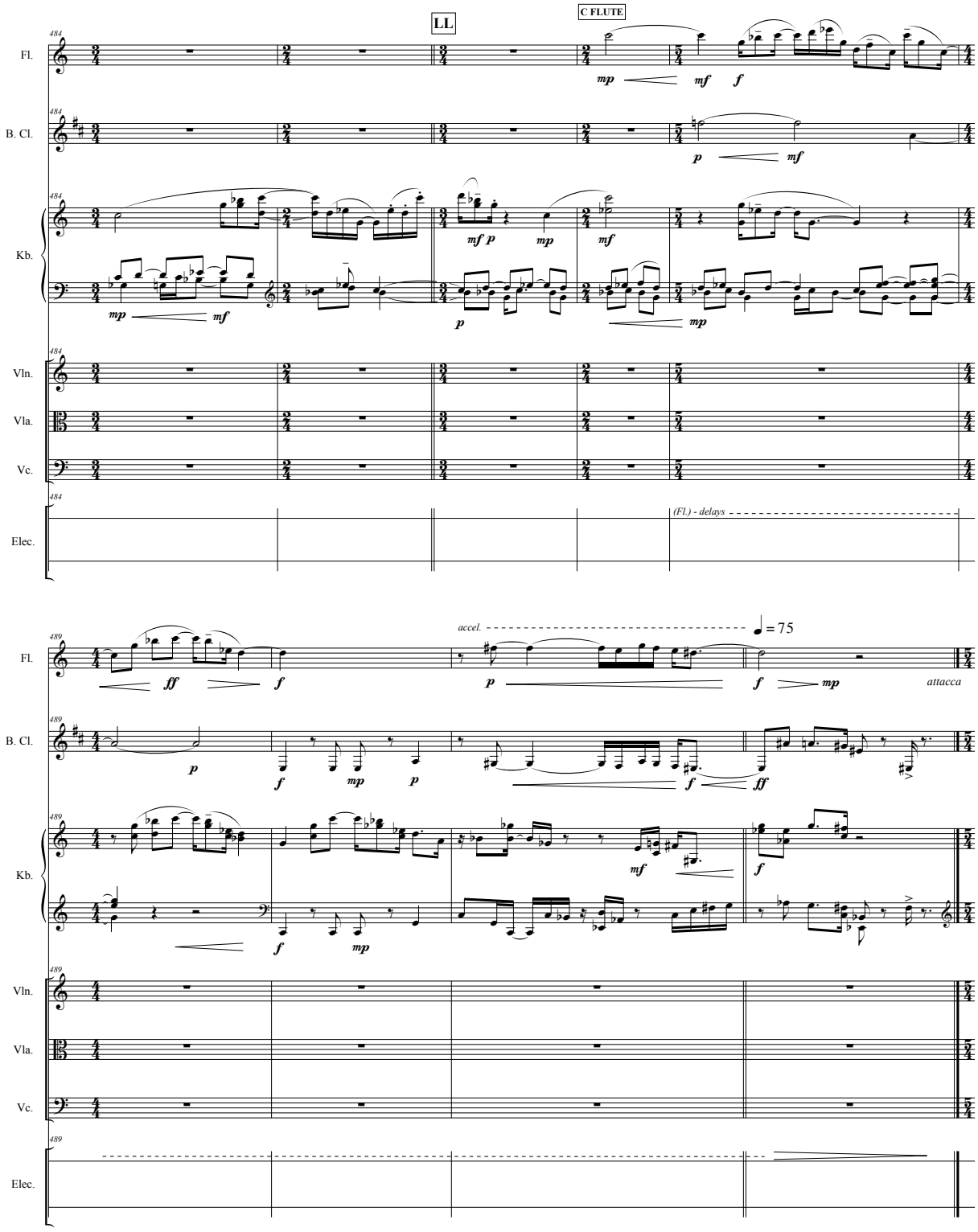

FF
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
440
445


GG
HH
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.

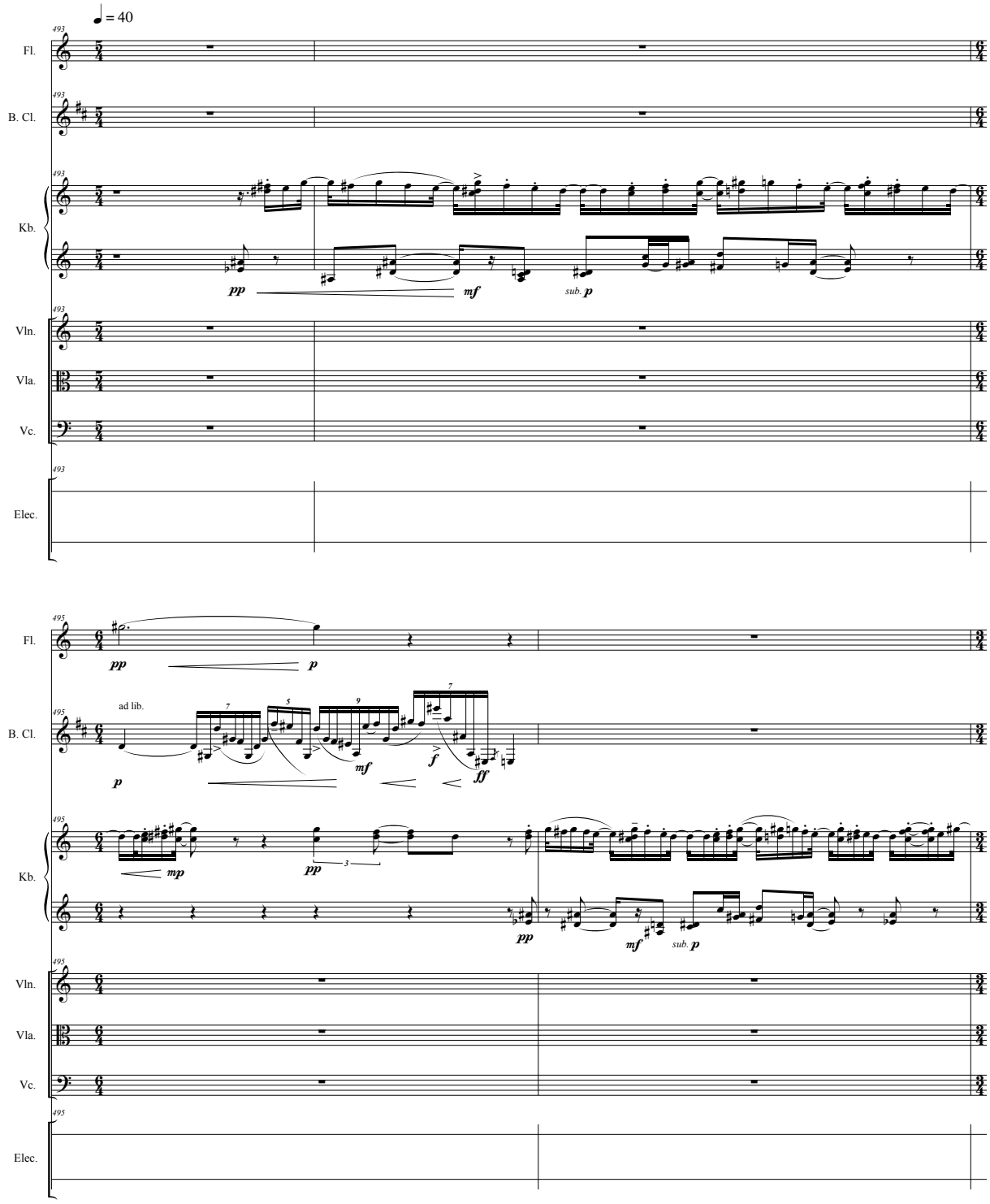

accel.
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
(Kb.) - water sounds
II
= 80
sub.
sul pont.

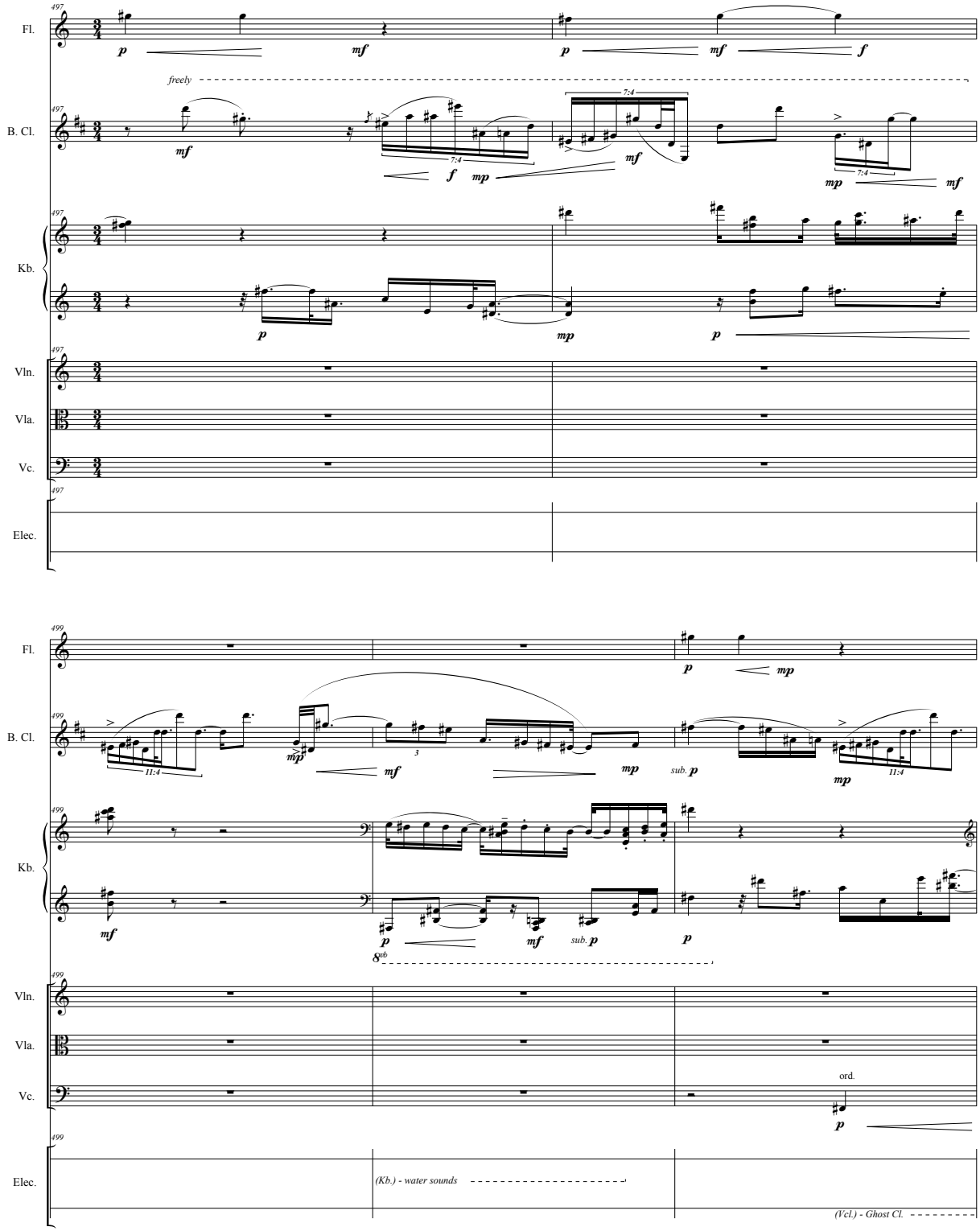

JJ
= 65
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
sul pont.
(Vcl.) - Ghost Cl.
KK
= 70
8va
sub. p

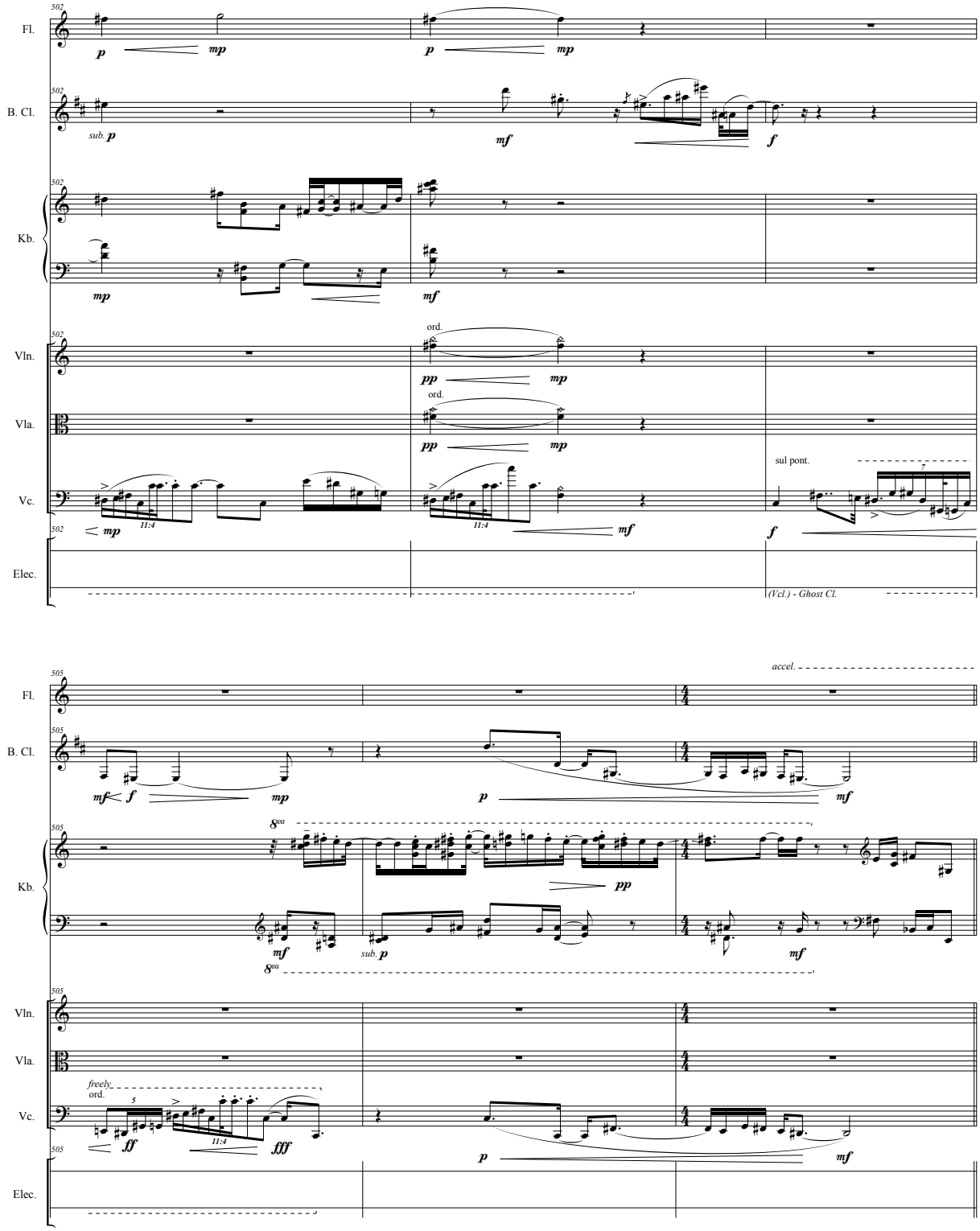

475
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
mf
mp
p
mp
479
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
p
mp
mf
mf
f
p

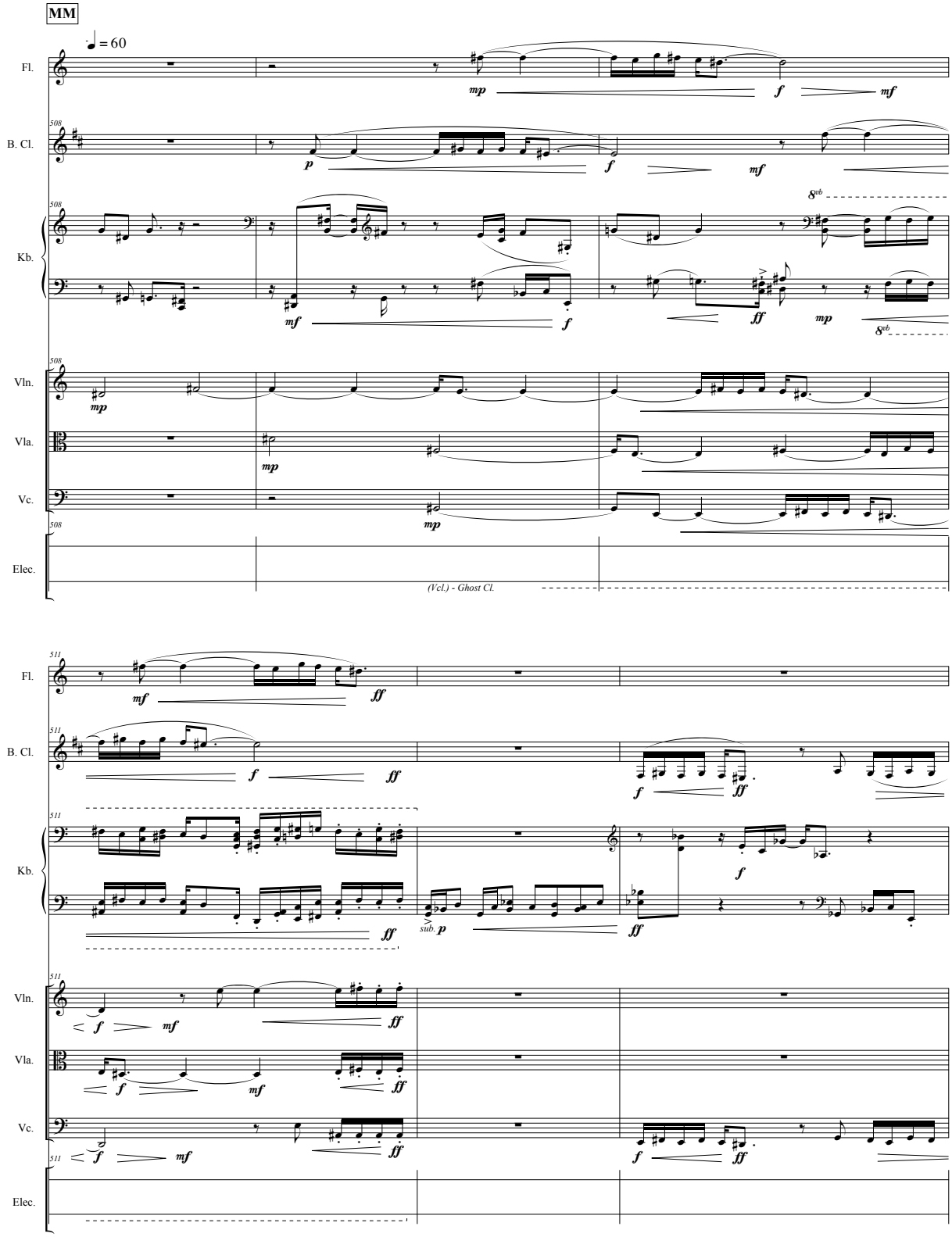

LL
C FLUTE
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
(Fl.) - delays
accel.
♩ = 75
attacca

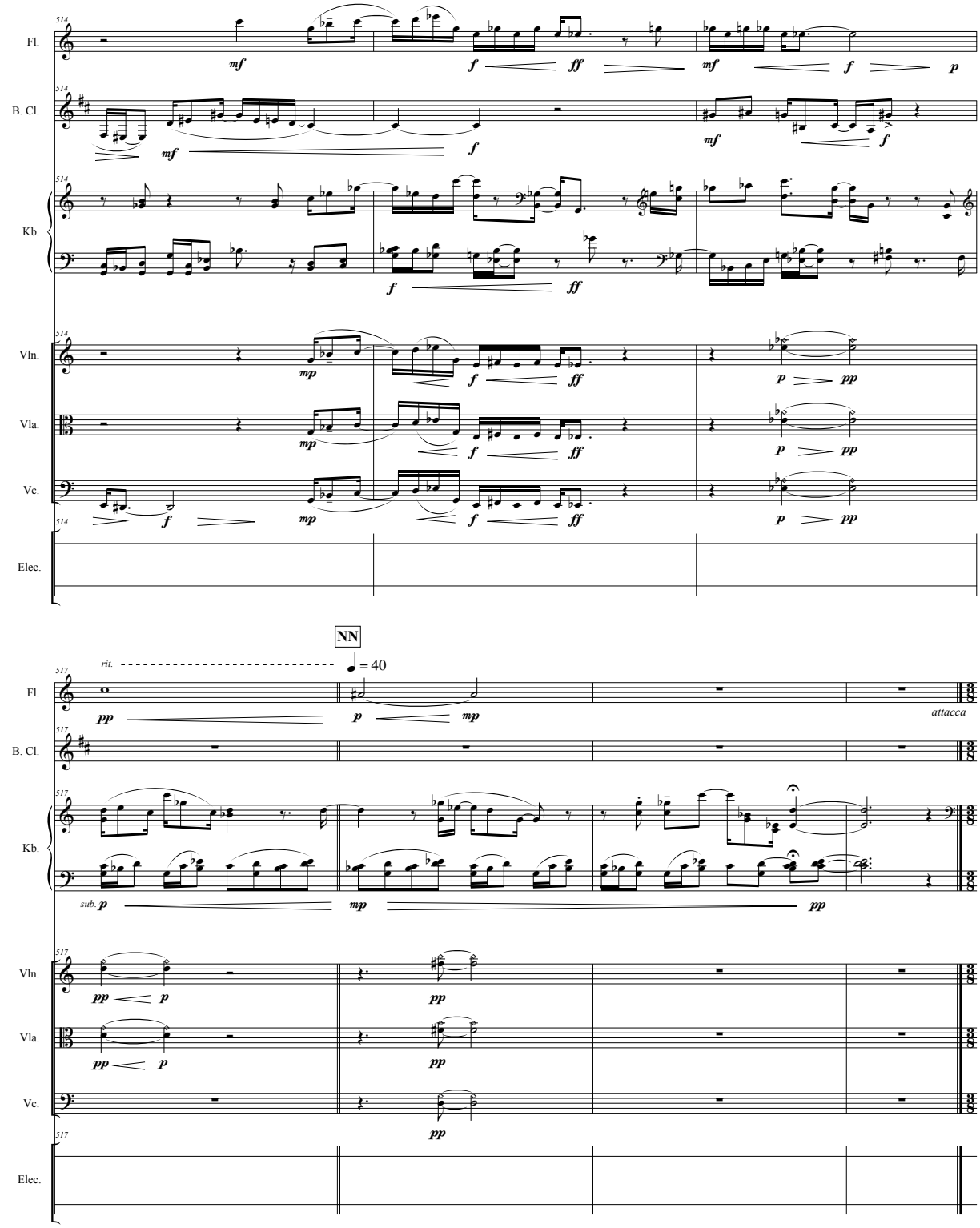
V. Shadow Dreaming



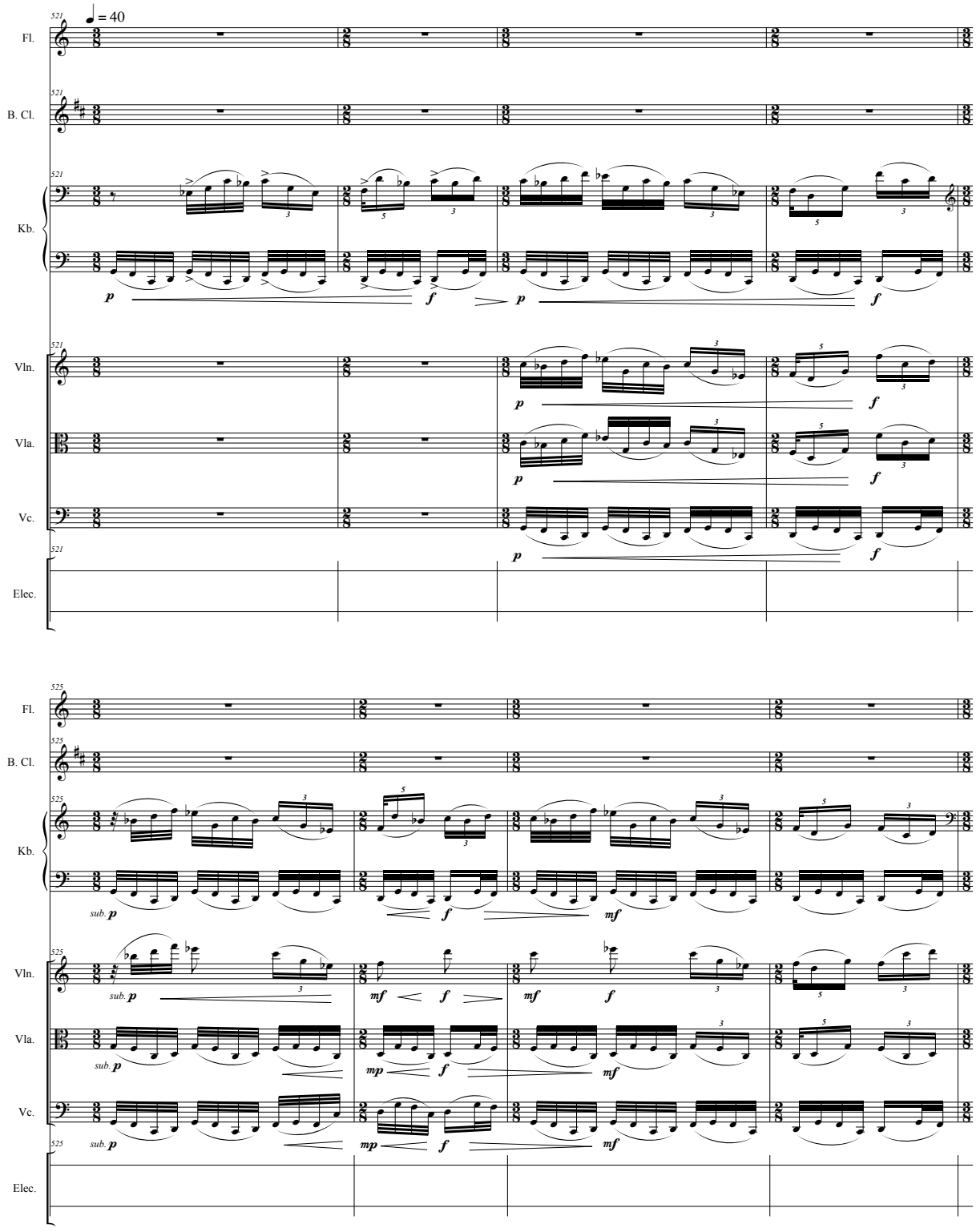

497
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
freely
7:4
11:4
499
sub. p
8va
ord.
(Kb.) - water sounds
(Vcl.) - Ghost Cl.

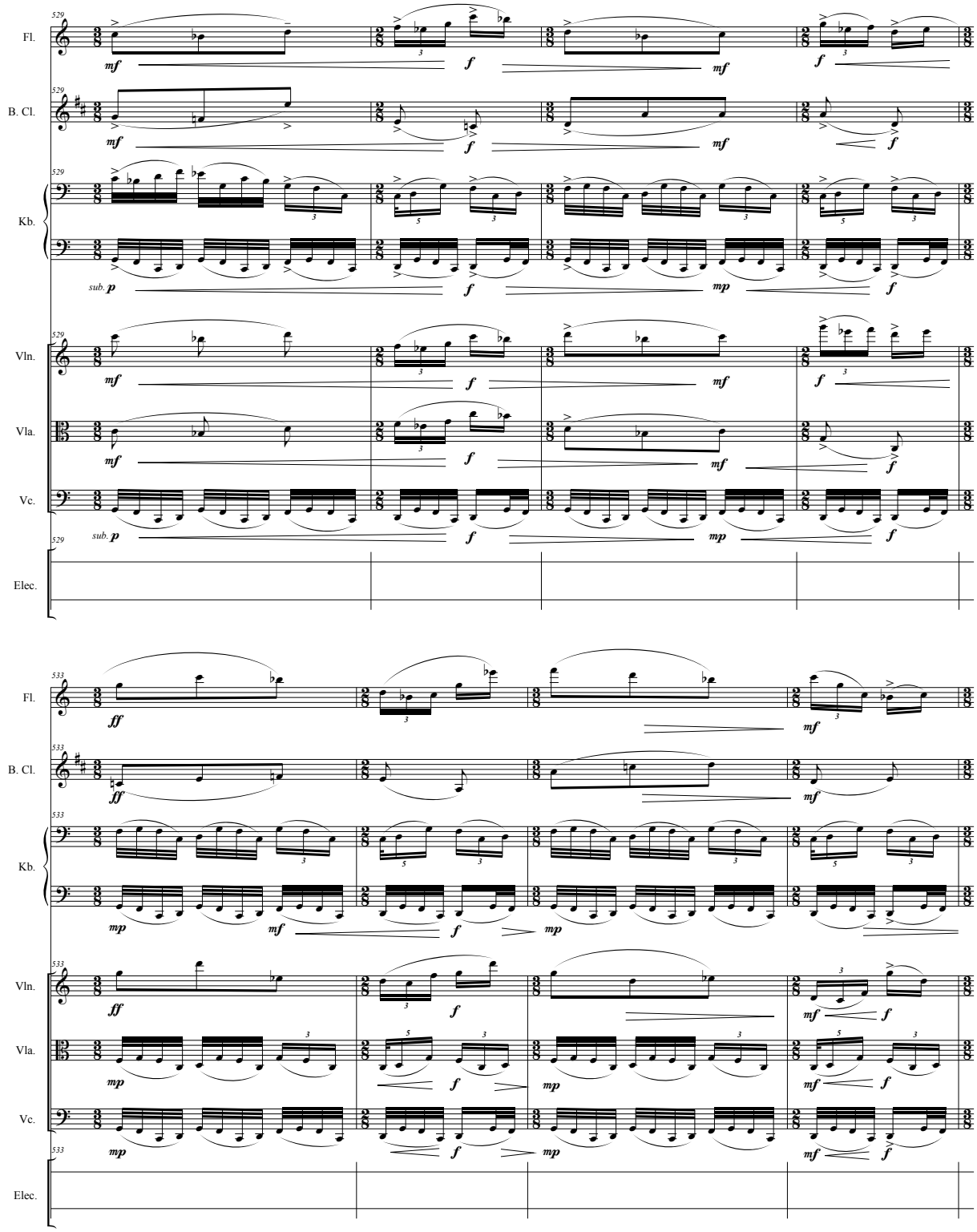

502
Fl.
p
mp
B. Cl.
sub. p
mf
f
Kb.
mp
mf
Vln.
ord.
pp
mp
Vla.
ord.
pp
mp
Vc.
sul pont.
mp
11:4
mf
f
Elec.
(Vcl.) - Ghost Cl.
505
accel.
Fl.
B. Cl.
mf
f
mp
p
mf
Kb.
8va
pp
mf
sub. p
mf
8va
Vln.
Vla.
freely
ord.
Vc.
ff
11:4
fff
p
mf
Elec.

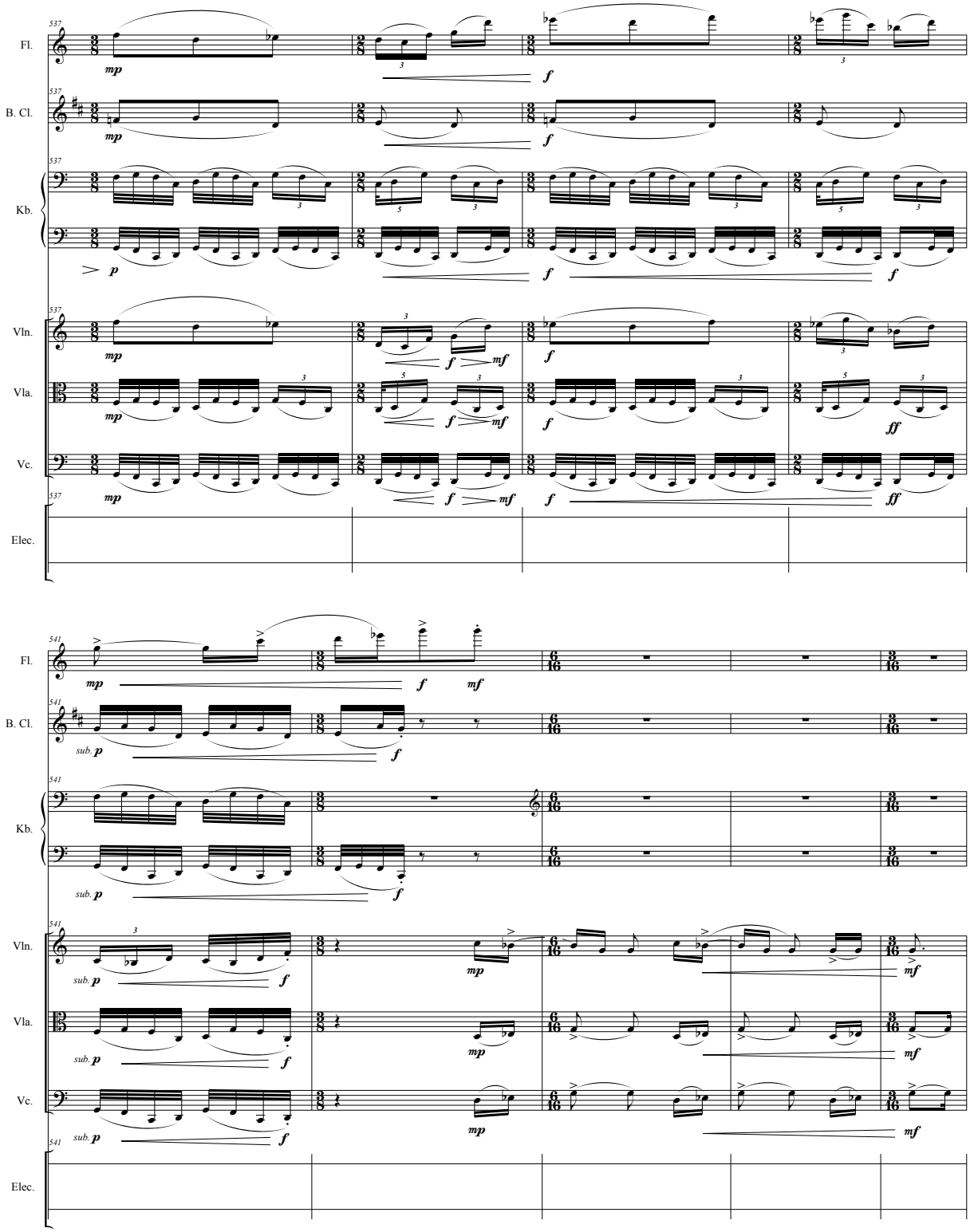

MM
♩ = 60
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
508
511
(Vcl.) - Ghost Cl.
8vb
sub.

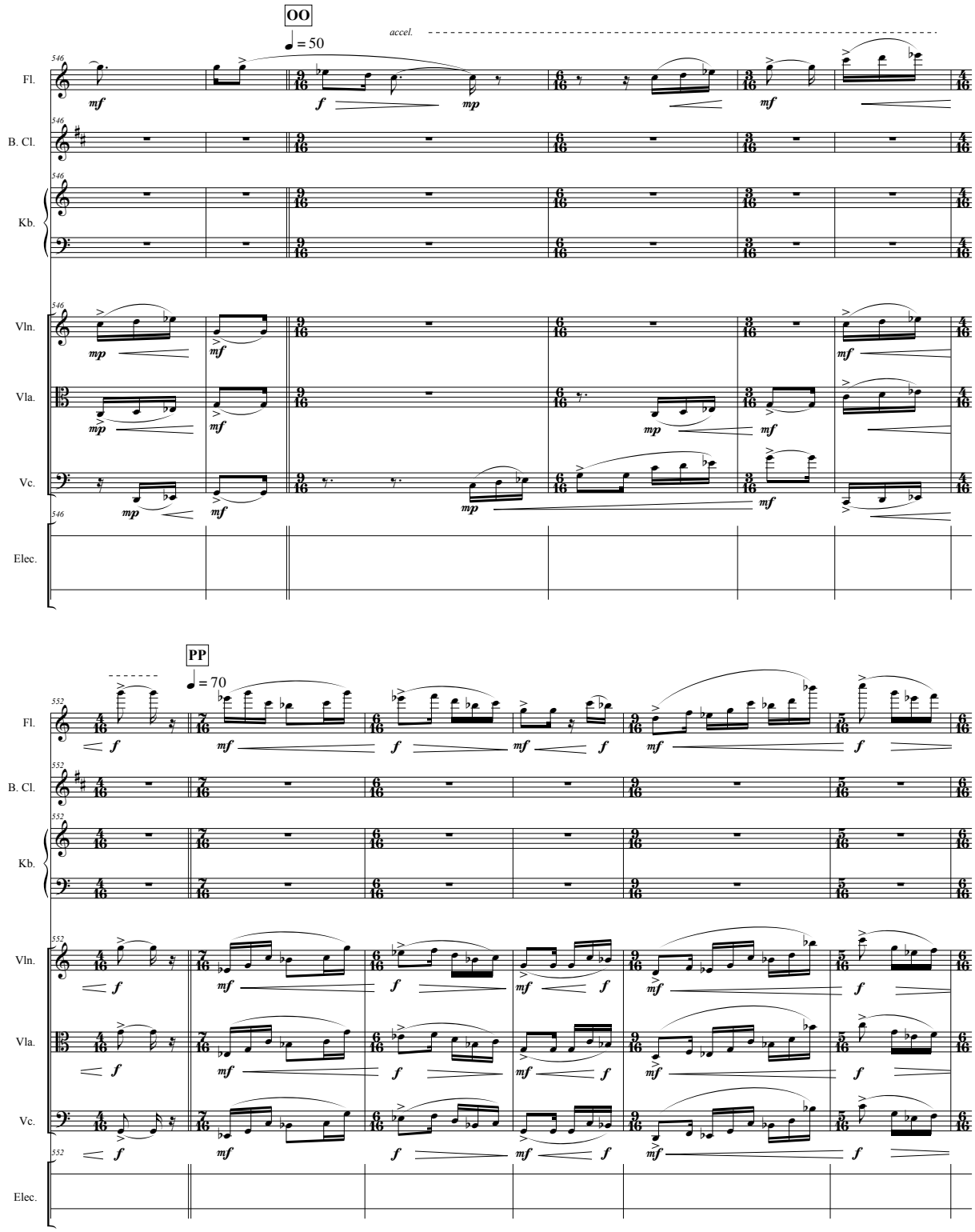

514
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
mf
f
ff
mf
f
p
mf
f
mp
f
ff
p
pp
517
NN
rit.
♩ = 40
pp
p
mp
attacca
sub. p
mp
pp

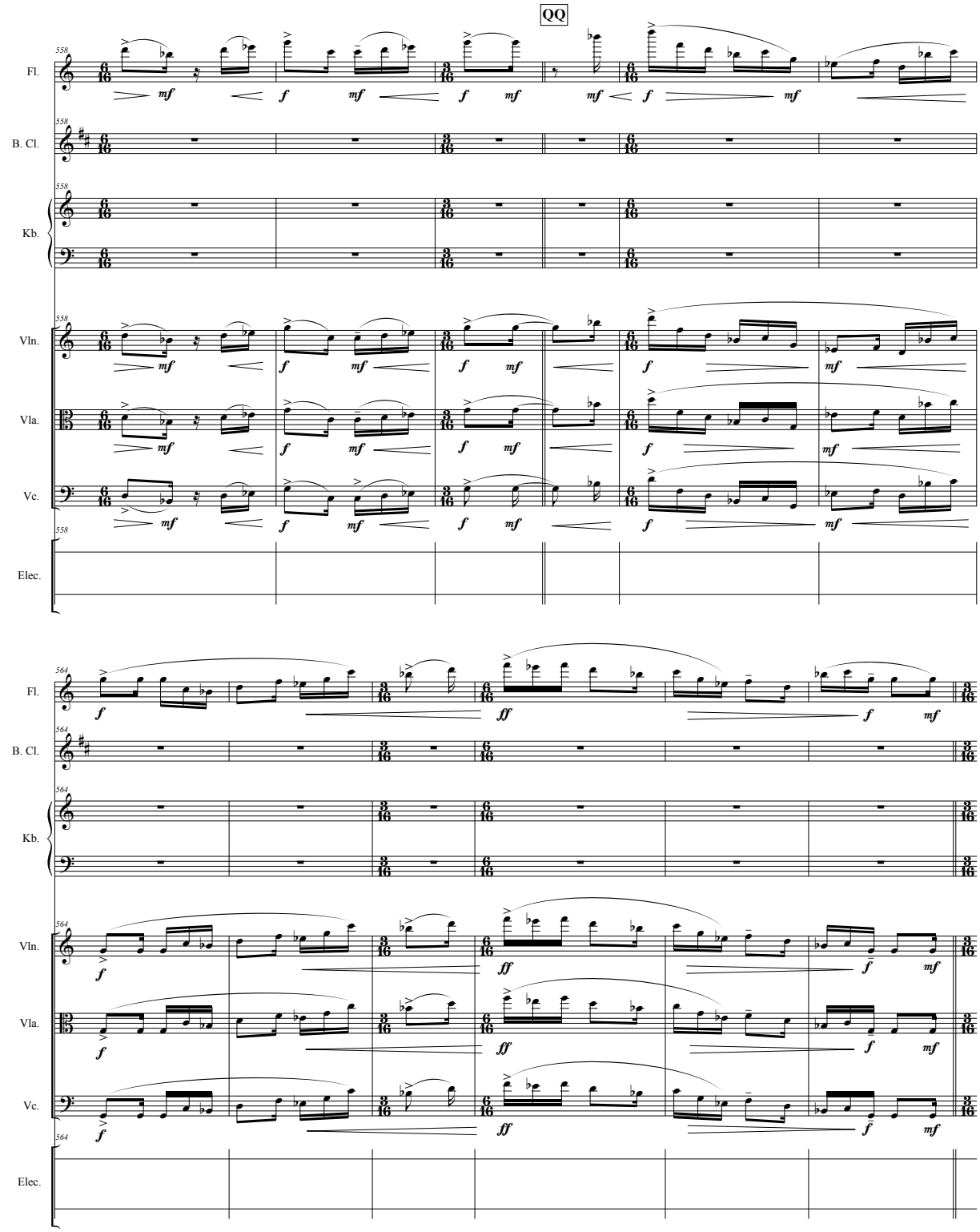
VI. Run River

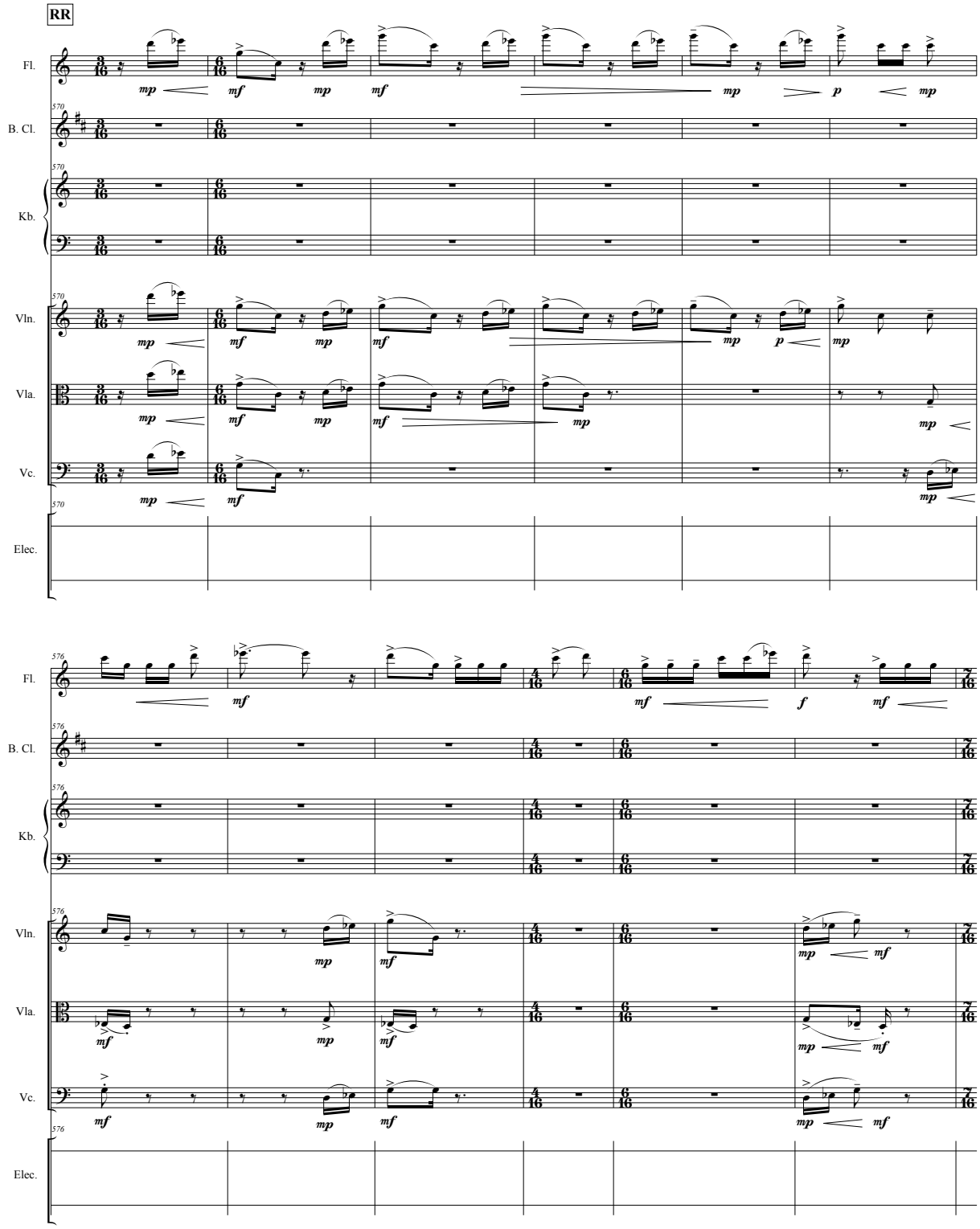


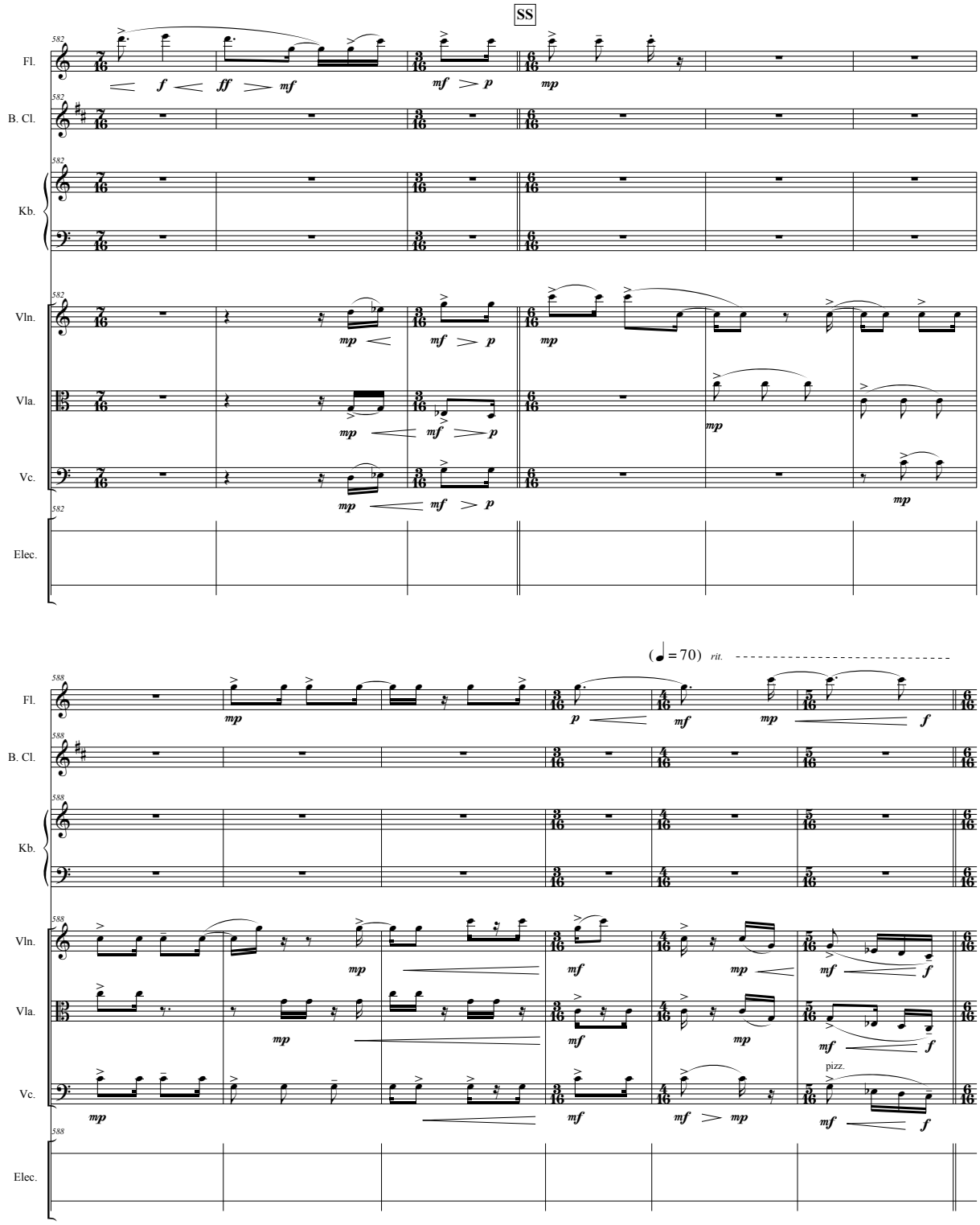

529
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
mf
f
mf
f
sub. p
f
mp
f
533
ff
mf
mp
mf
f
mp

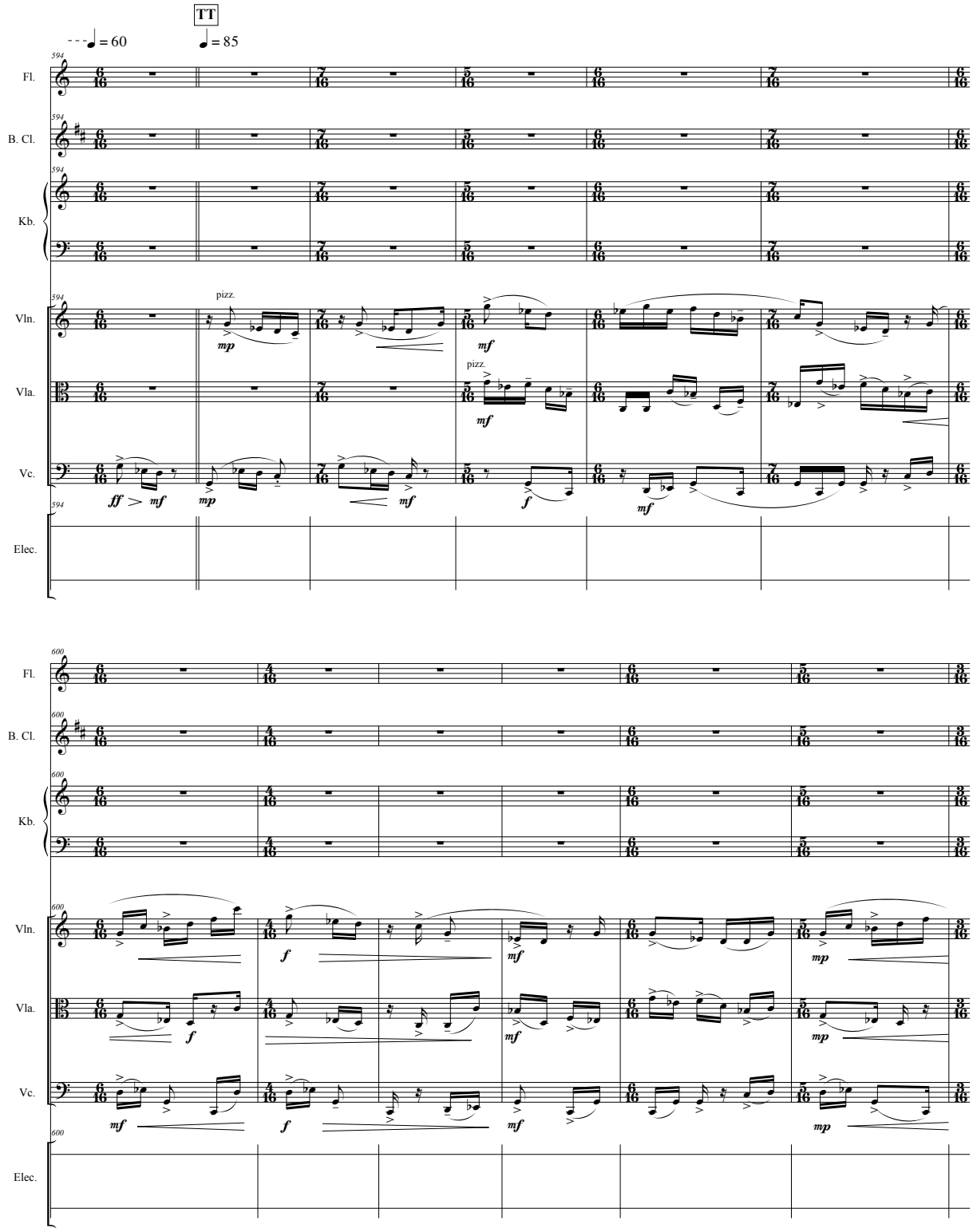

537
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
mp
f
mf
p
ff
541
sub. p

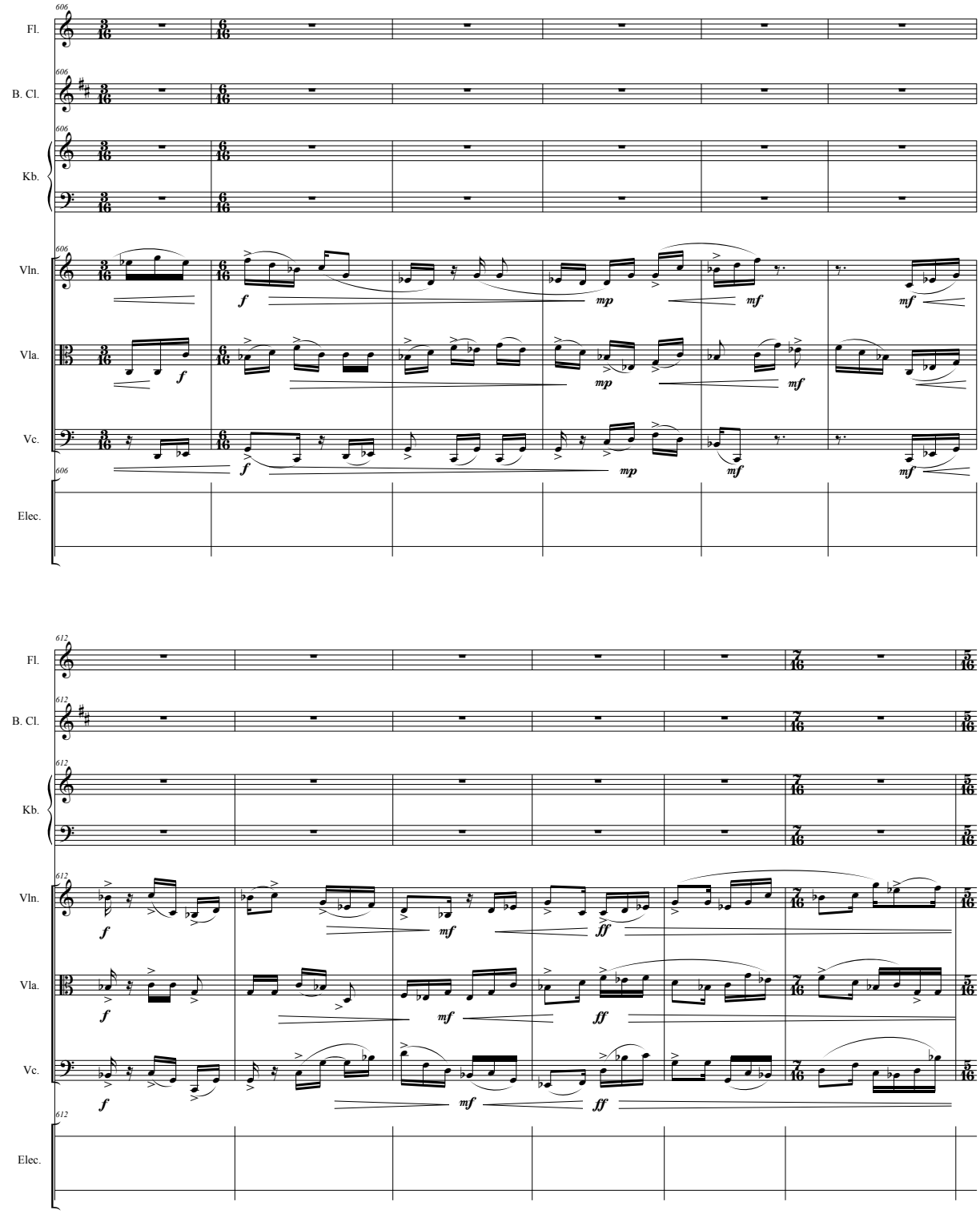

OO
accel.
♩ = 50
546
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
mf
f
mp
PP
♩ = 70
552

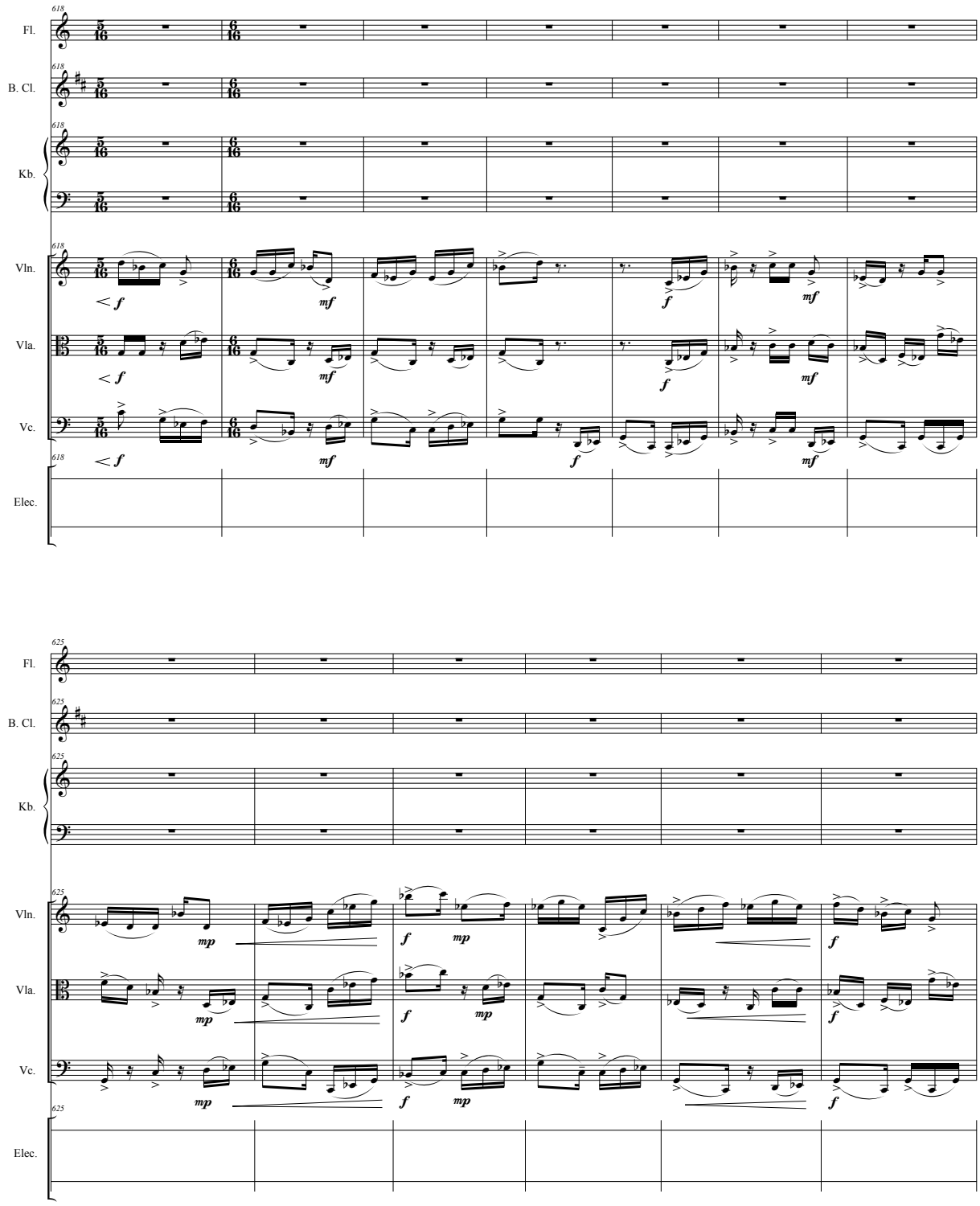

QQ
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
558
564
mf
f
ff

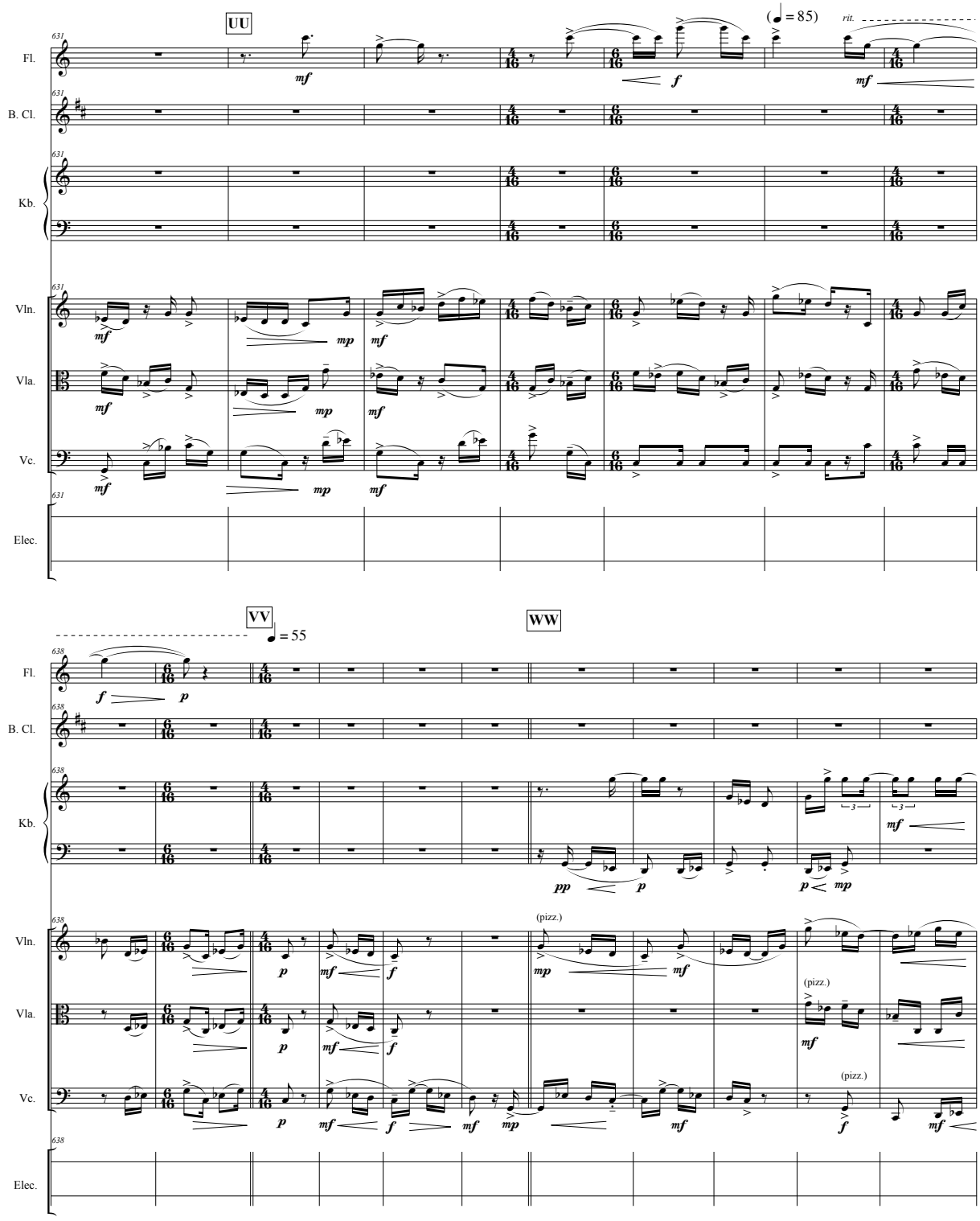

RR
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
570
576

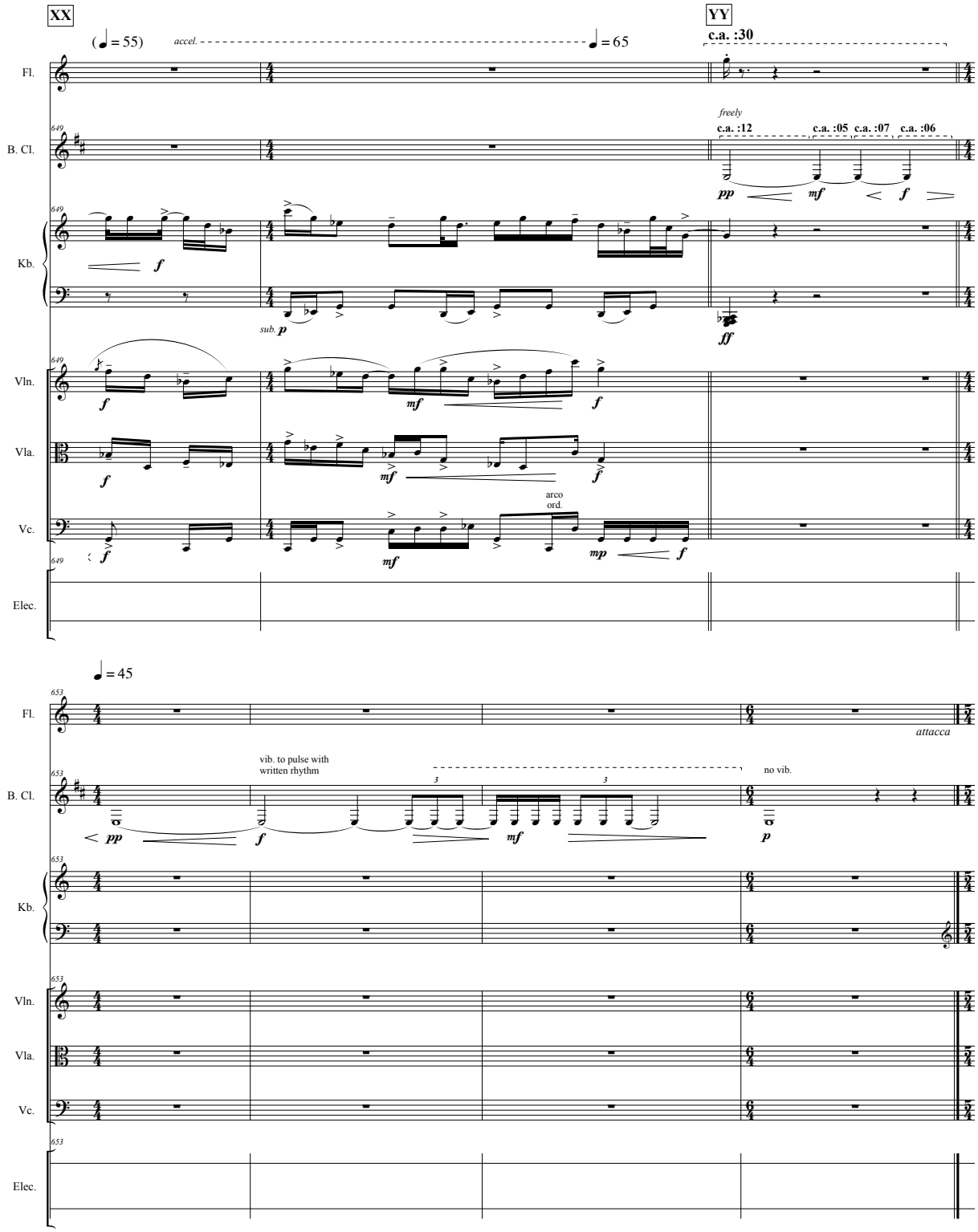

SS
582
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
f ff mf mf p mp
mp mf p
588
(♩ = 70) rit.
pizz.


TT
♩ = 60
♩ = 85
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
pizz.
ff
mf
mp
f


606
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
f
mp
mf
612
ff

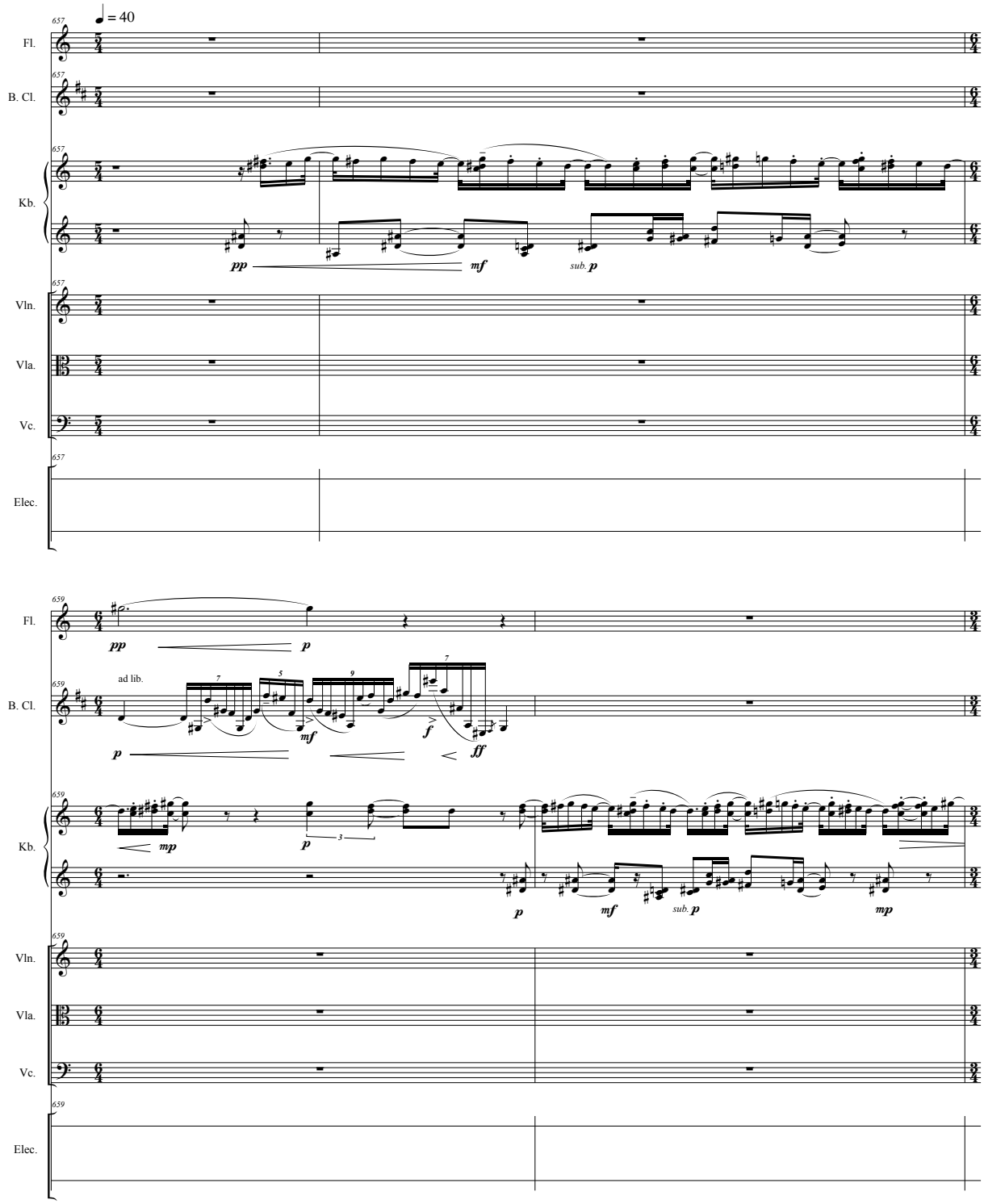

618
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
f
mf
625
mp

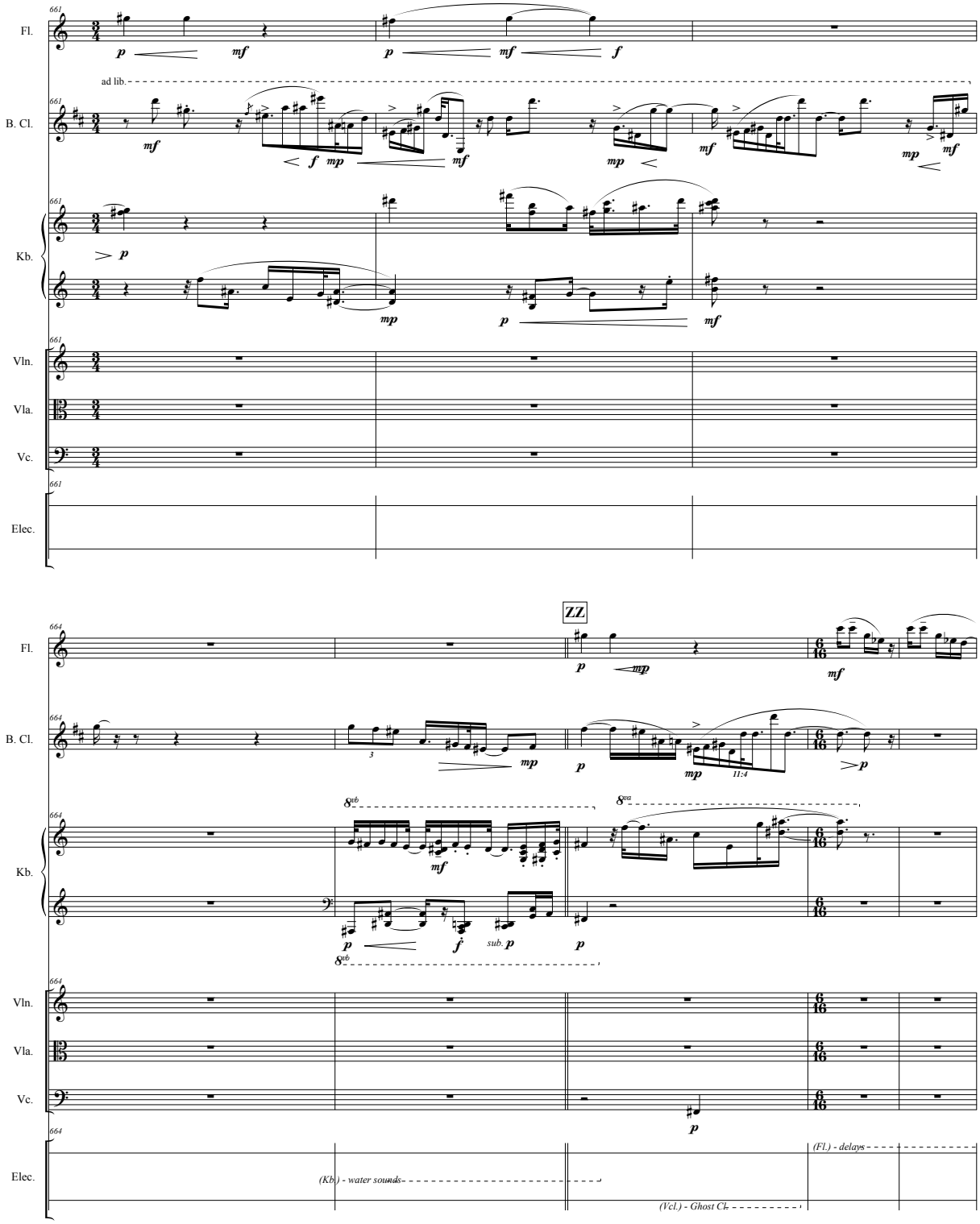

UU
(♩ = 85)
rit.
631
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
VV
♩ = 55
WW
638
(pizz.)

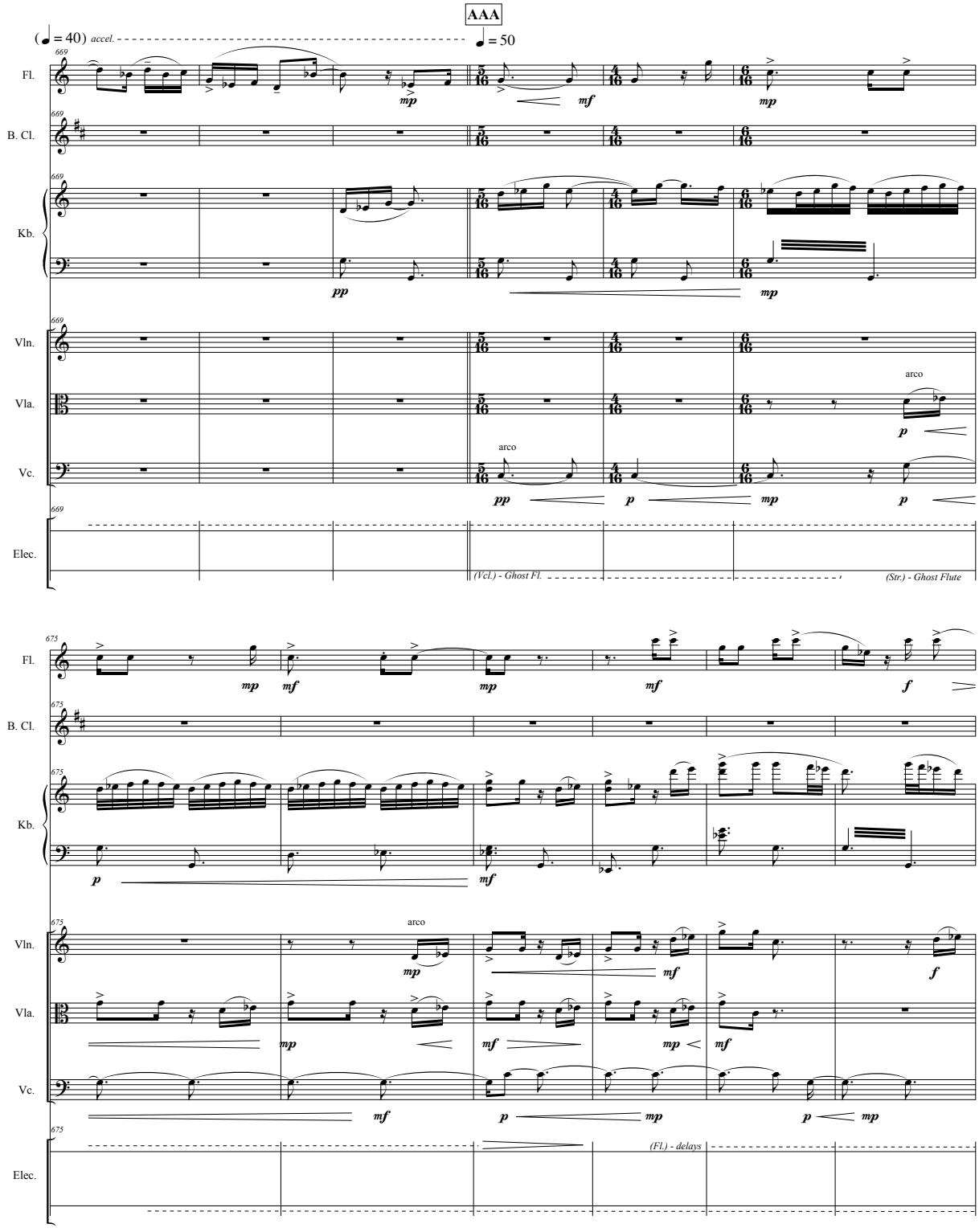

XX
YY
(♩ = 55)
accel.
♩ = 65
c.a. :30
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
649
freely
c.a. :12
c.a. :05
c.a. :07
c.a. :06
pp
mf
f
ff
sub. p
mp
arco
ord.
♩ = 45
653
attacca
vib. to pulse with
written rhythm
no vib.

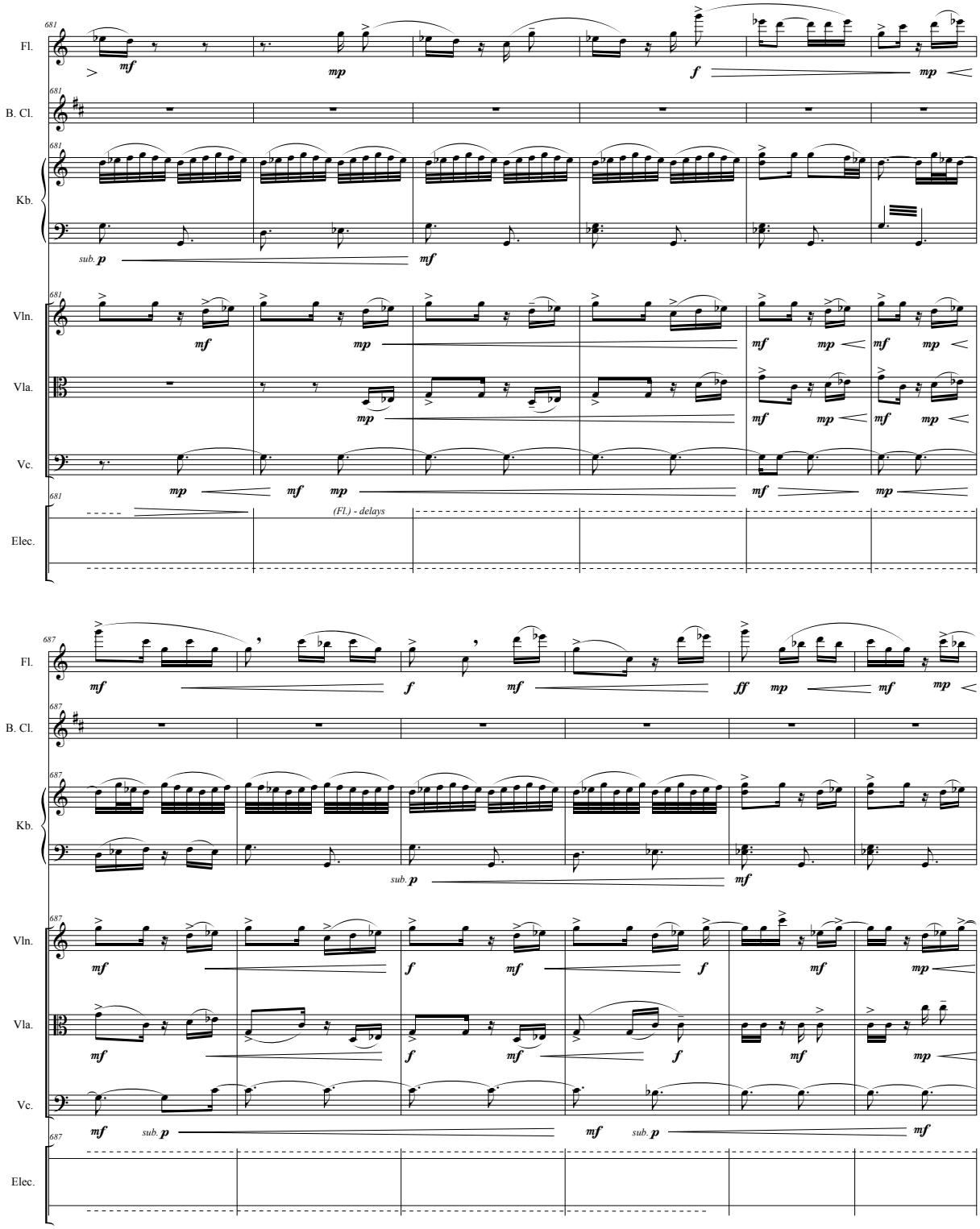
(ca. 27:14)

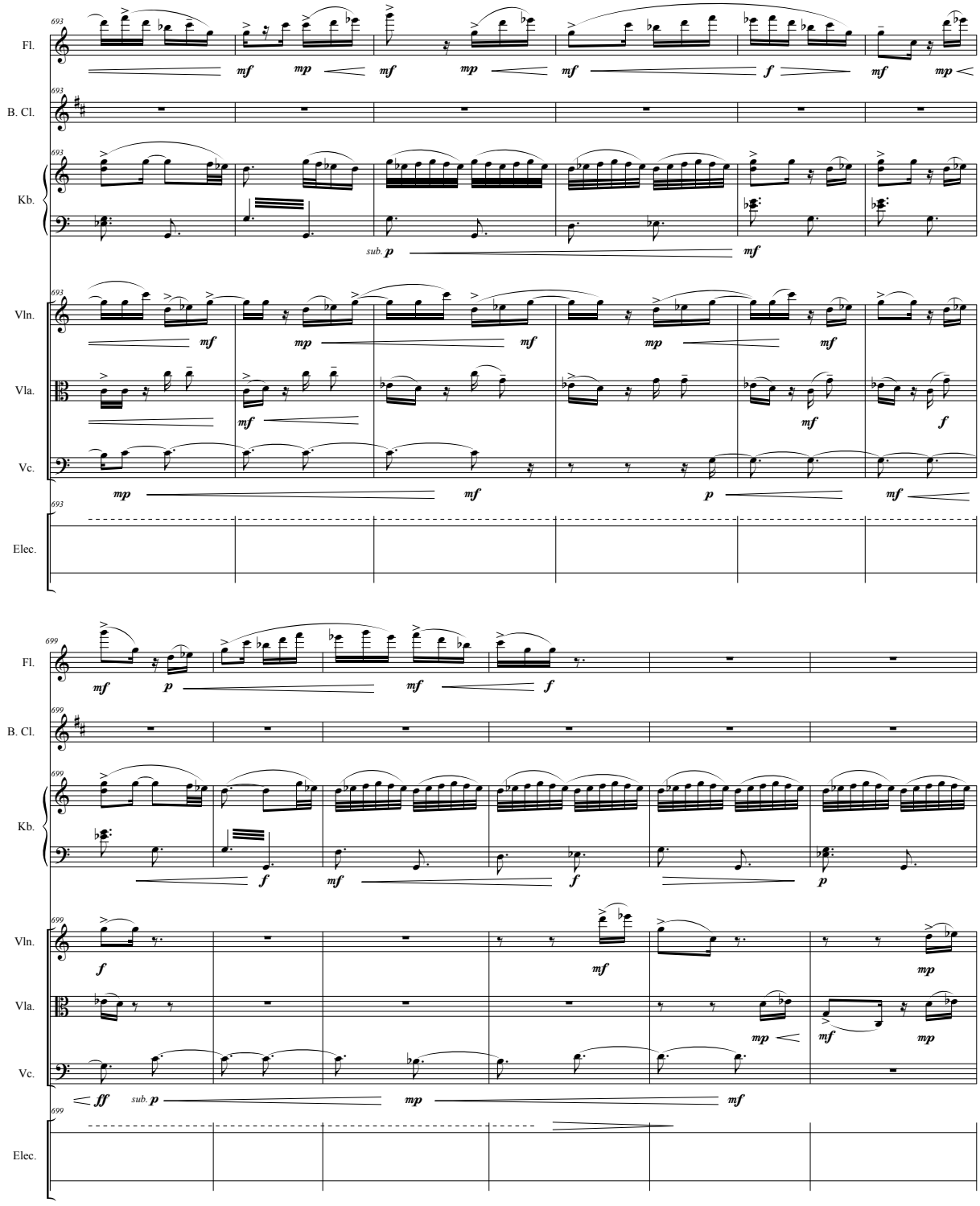
VII. Heroes Return

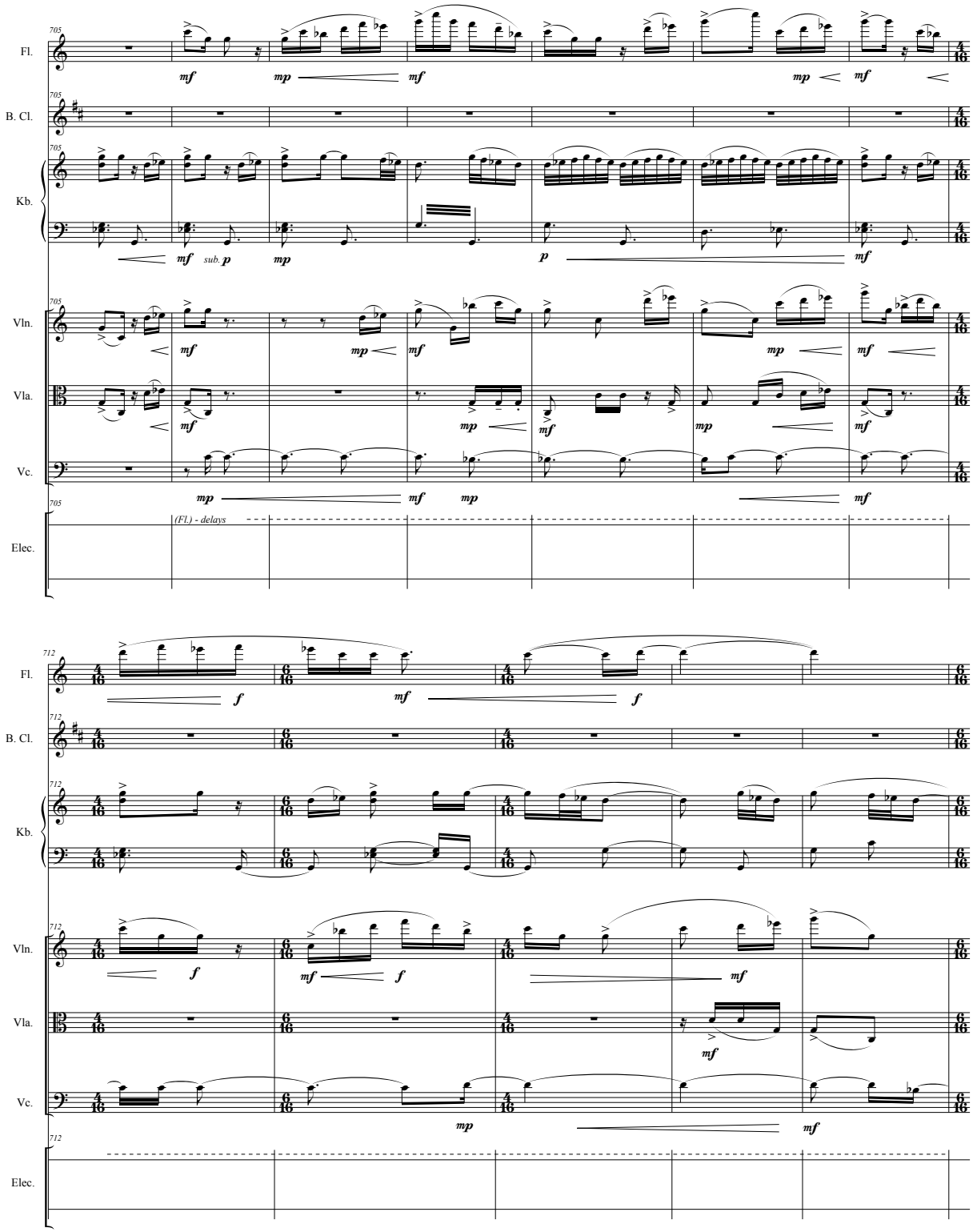


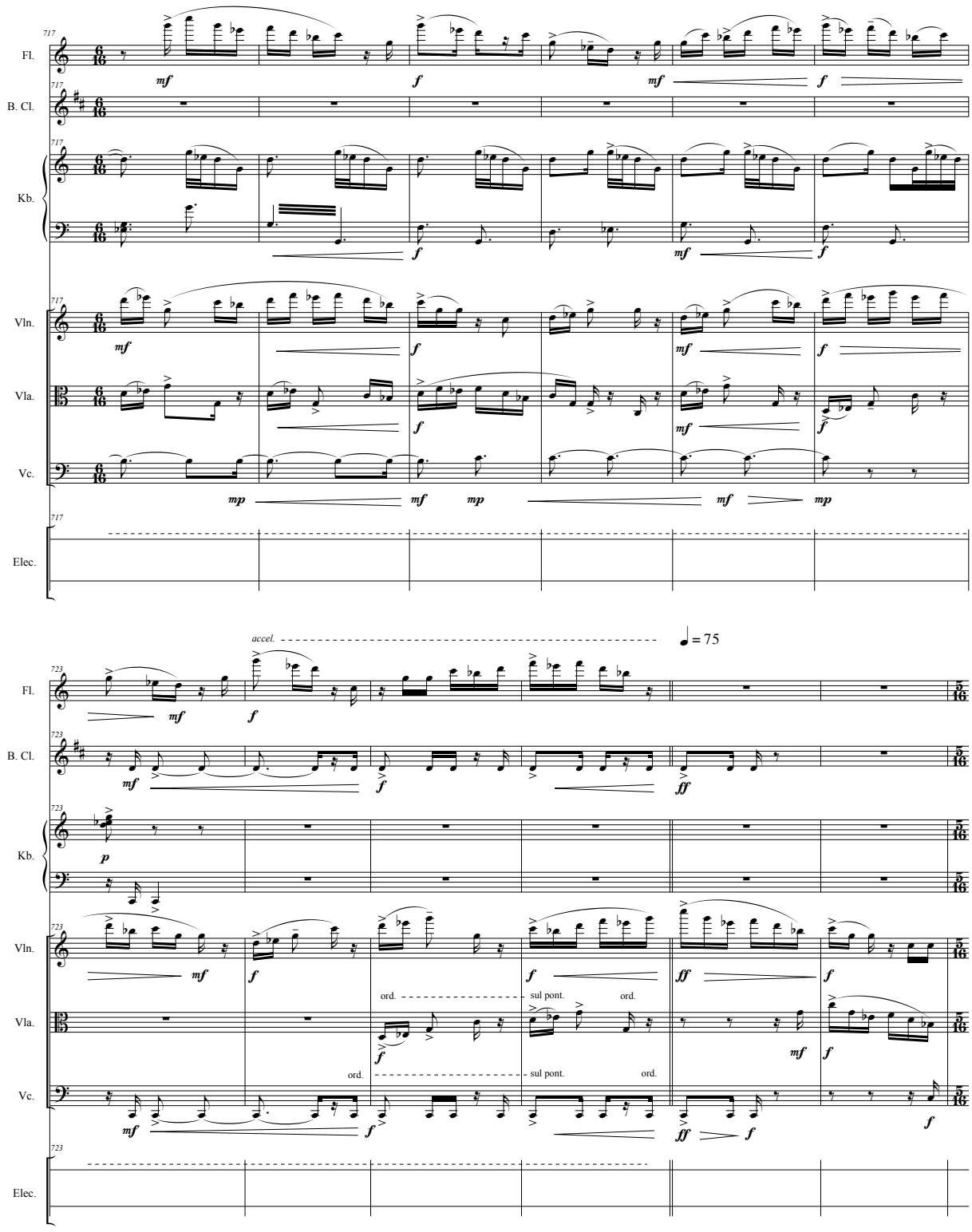

Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
ad lib.
661
664
ZZ
(Kb.) - water sounds
(Vcl.) - Ghost Cl.
(Fl.) - delays

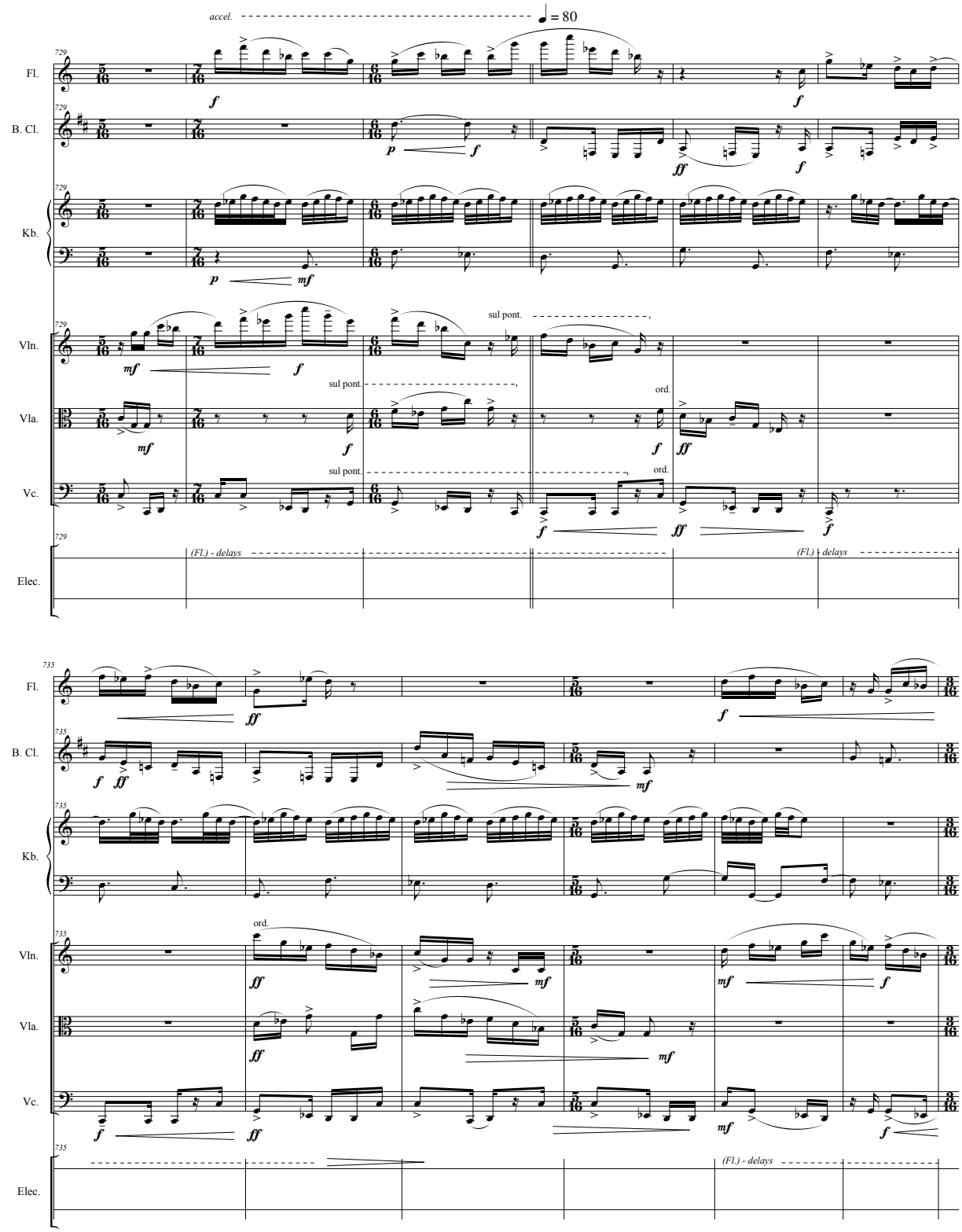

AAA
(♩ = 40) accel.
♩ = 50
669
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
arco
(Vcl.) - Ghost Fl.
(Str.) - Ghost Flute
675
(Fl.) - delays


681
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
(Fl.) - delays
687
sub. p
mf
f
ff
mp


693
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
mf
mp
f
sub. p
699
ff


705
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
(FL) - delays
712


717
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
mf
f
mp
accel.
♩ = 75
723
p
ff
ord.
sul pont.


accel.
♩ = 80
729
Fl.
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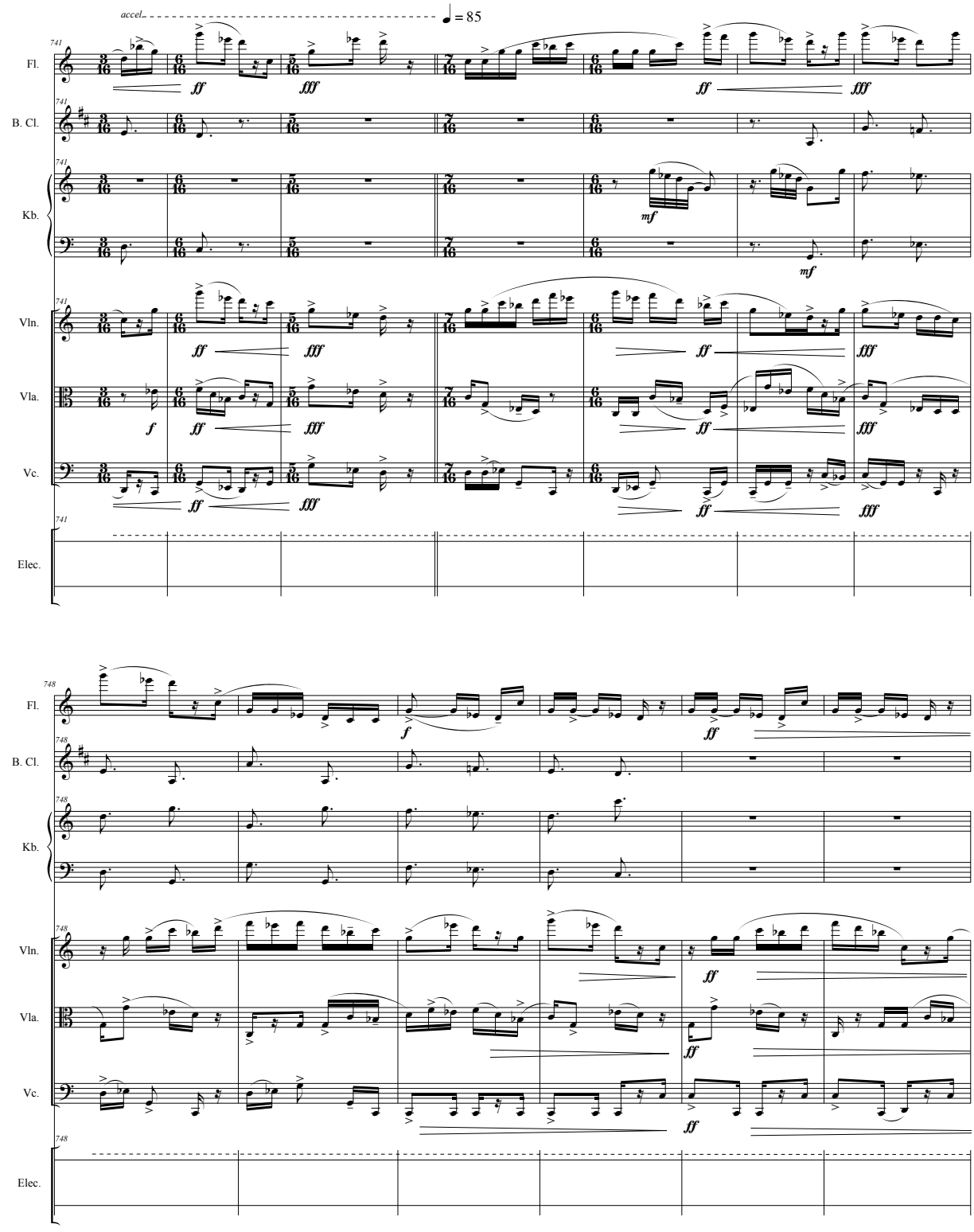
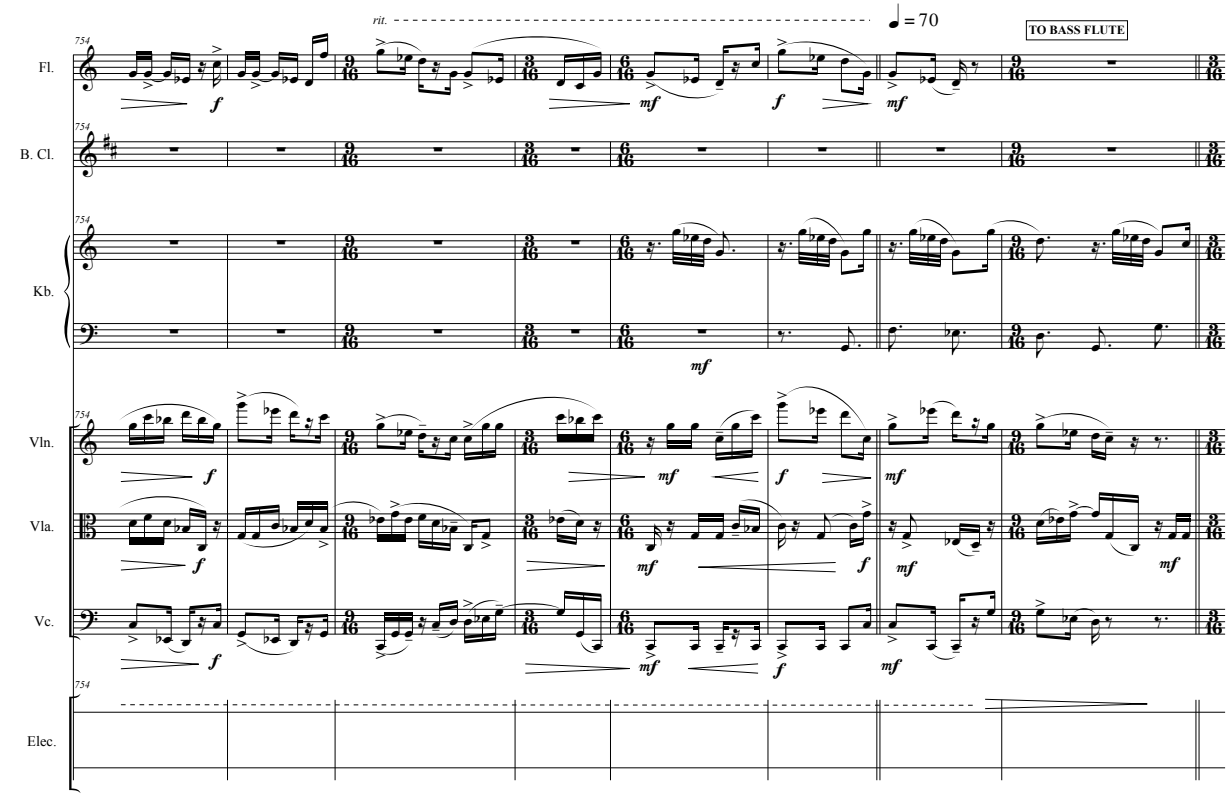
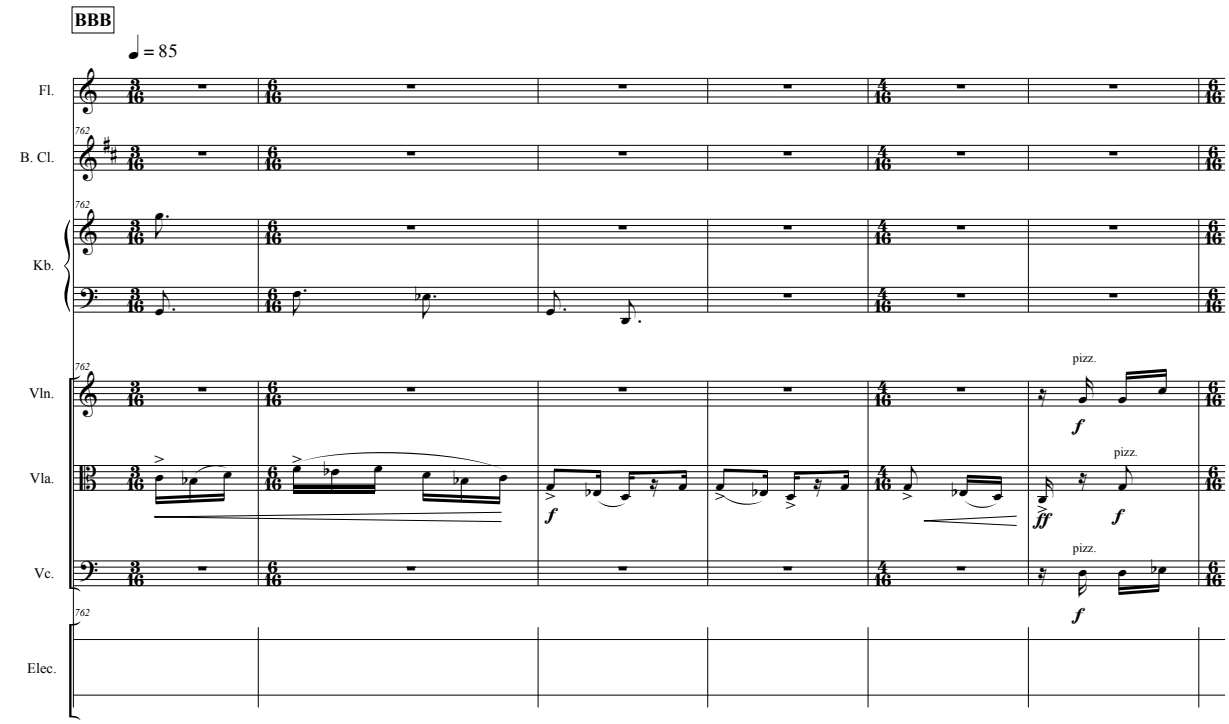
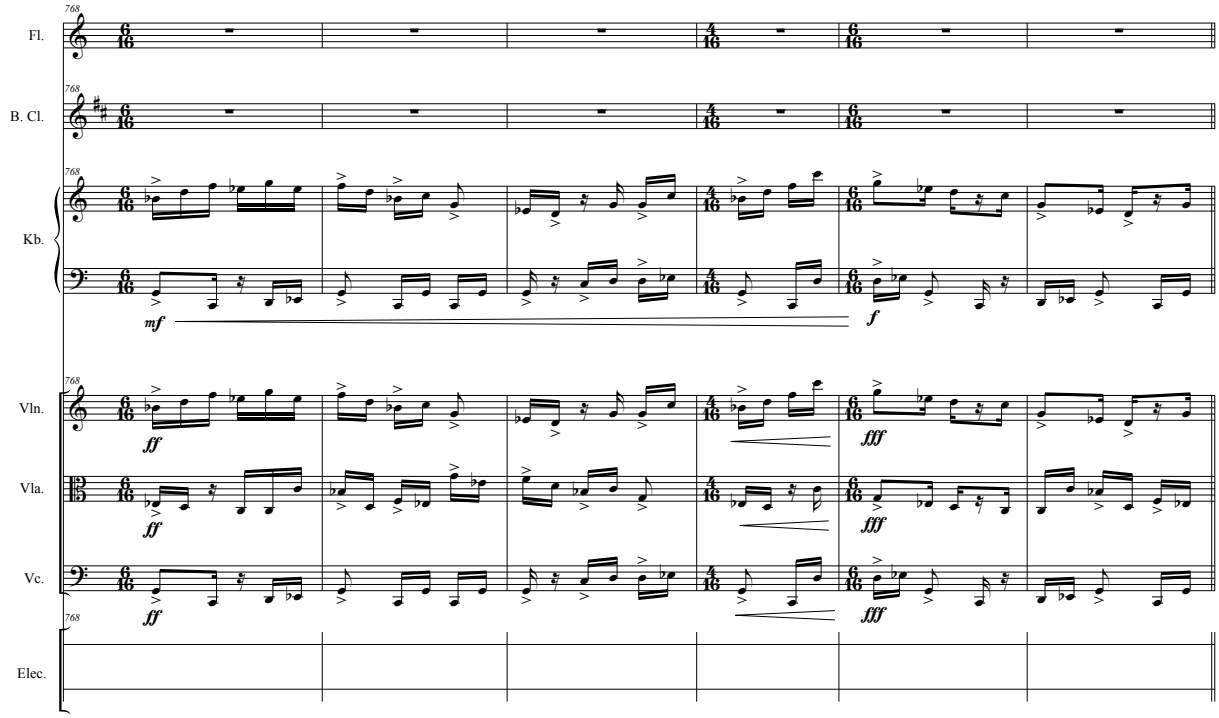
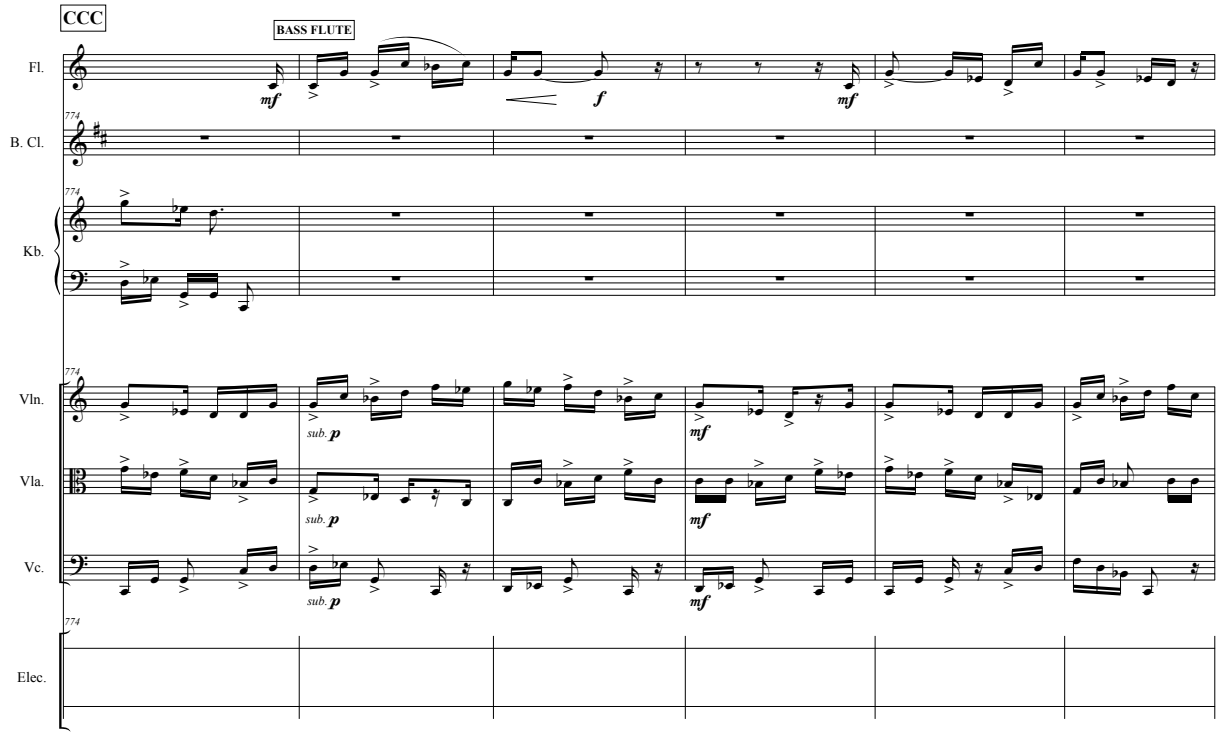
Kb.
Vln.
Vla.
Vc.
Elec.
sul pont.
ord.
(Fl.) - delays
735

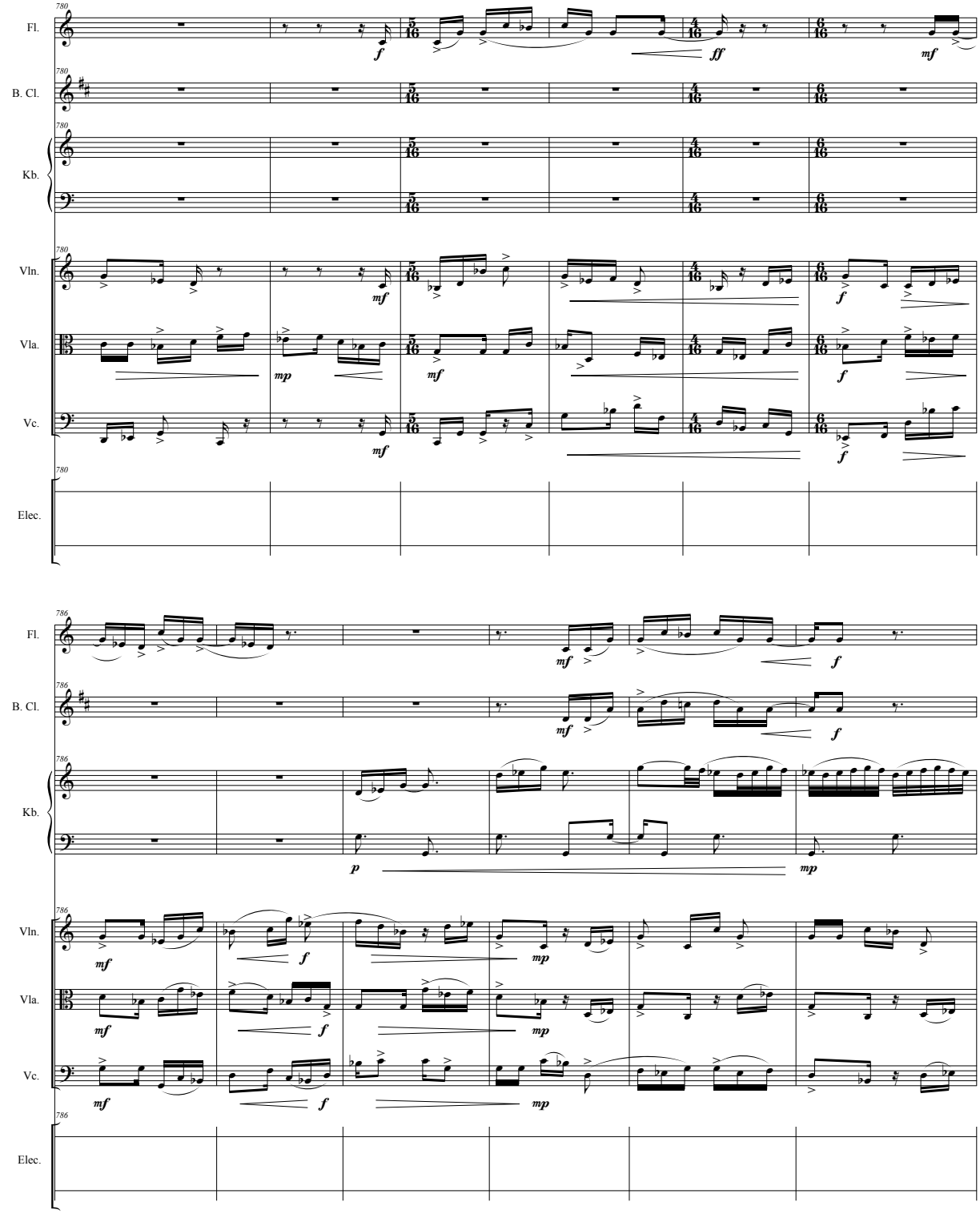

accel.
♩ = 85
741
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
ff
fff
mf
f
748

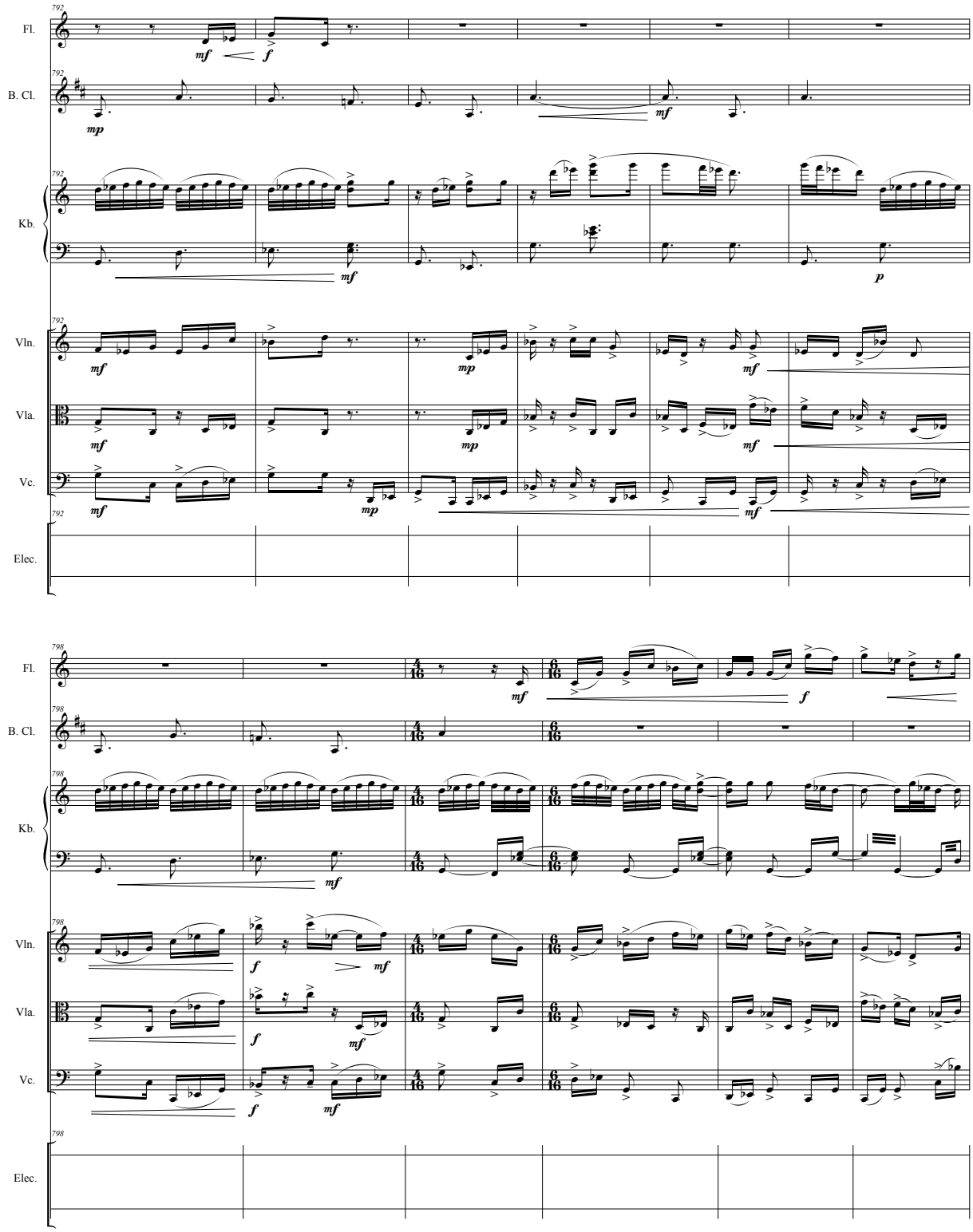

rit.
♩ = 70
TO BASS FLUTE
754
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
f
mf

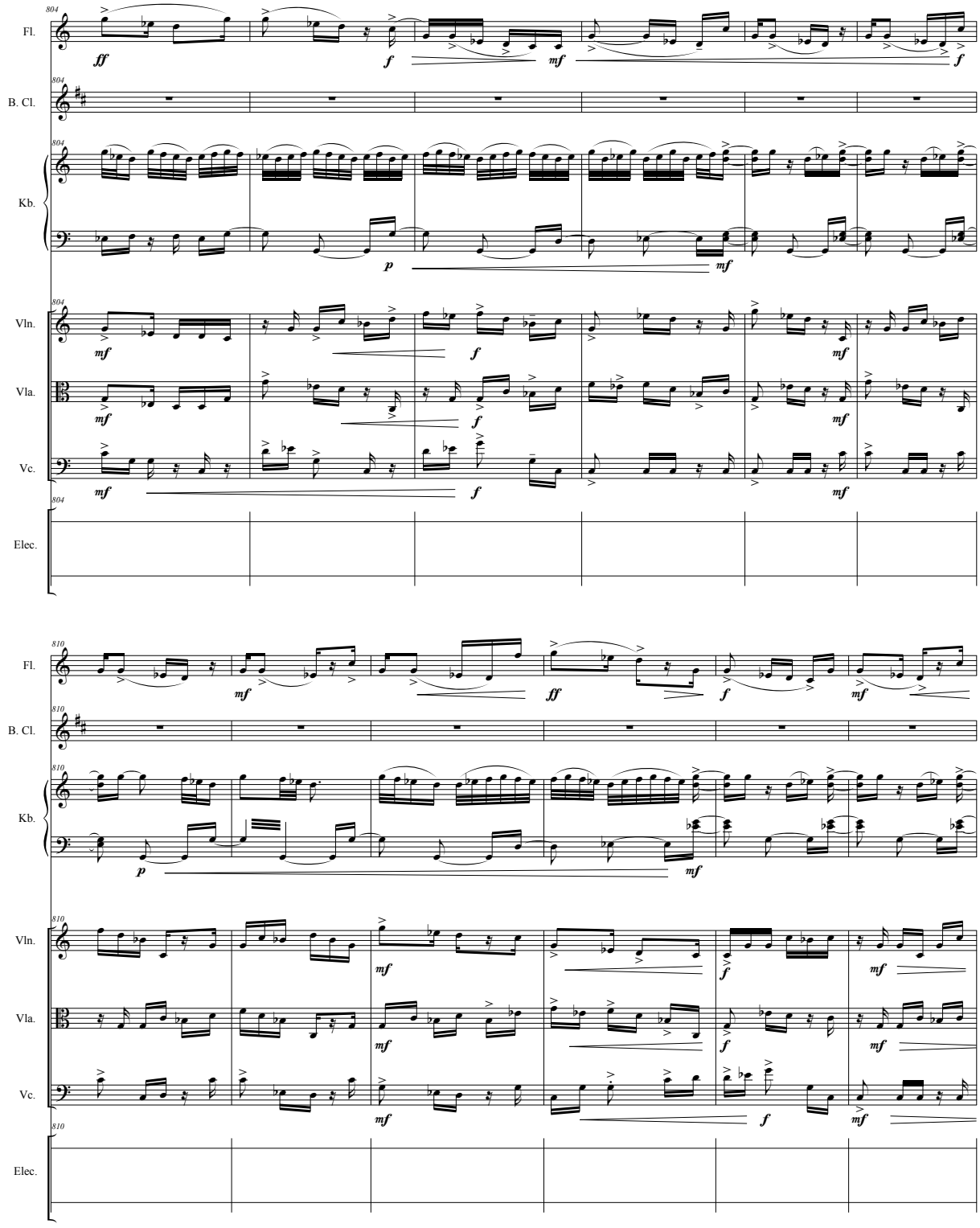

BBB
♩ = 85
762
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
pizz.
f
ff

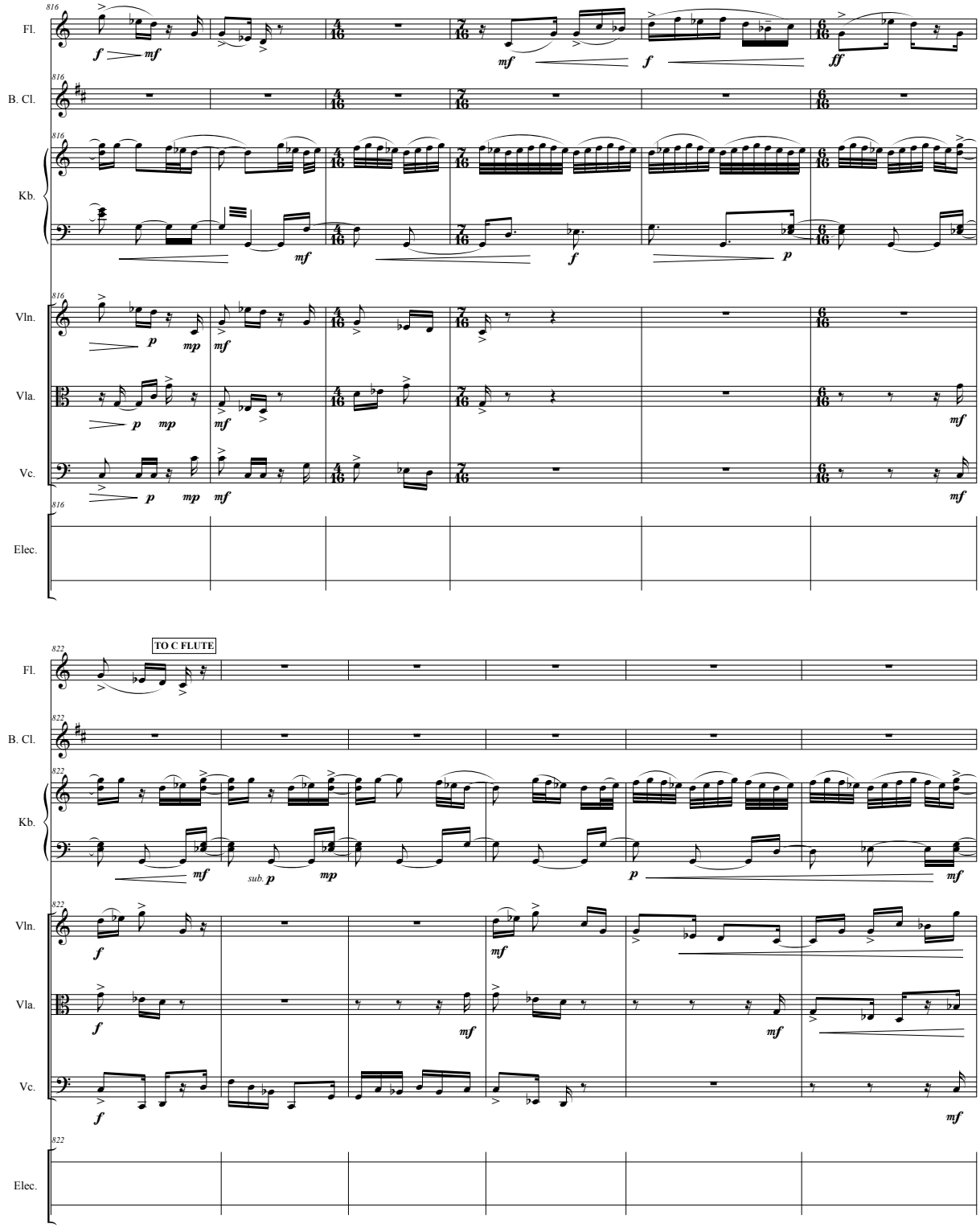

768
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
mf
f
ff
fff

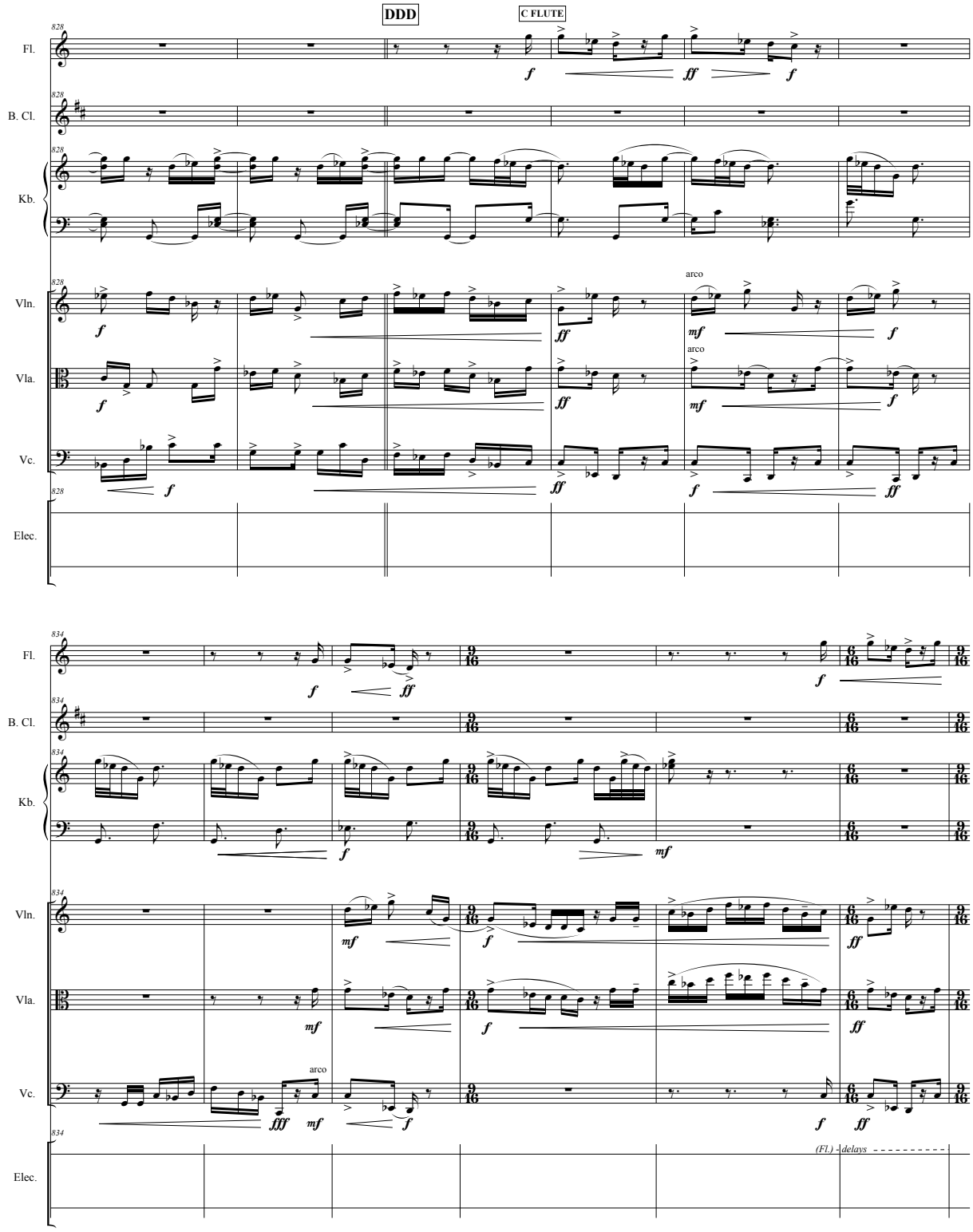

CCC
BASS FLUTE
774
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
mf
f
sub. p

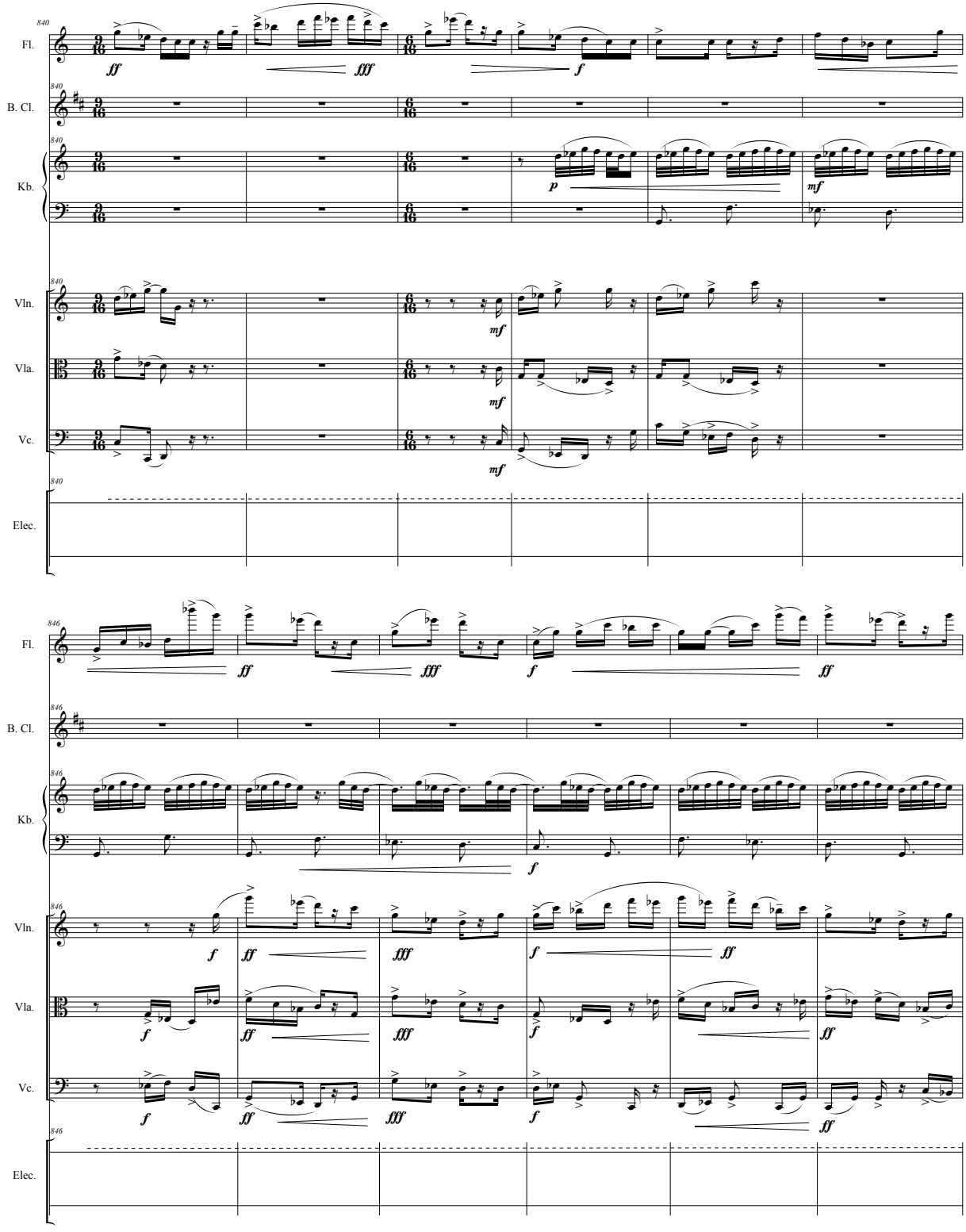

780
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
786
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.

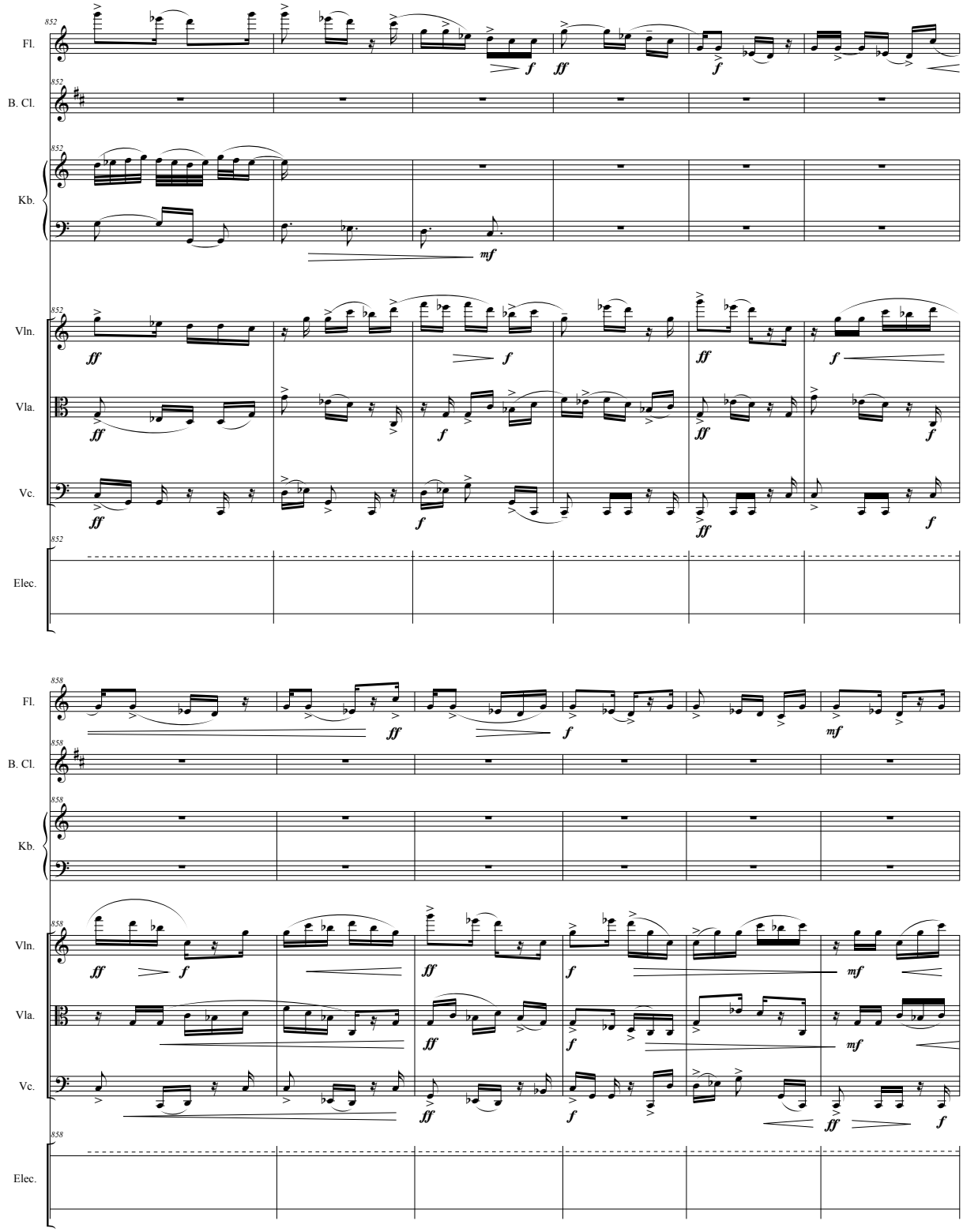

792
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
mf
f
mp
p
798
4/16
6/16

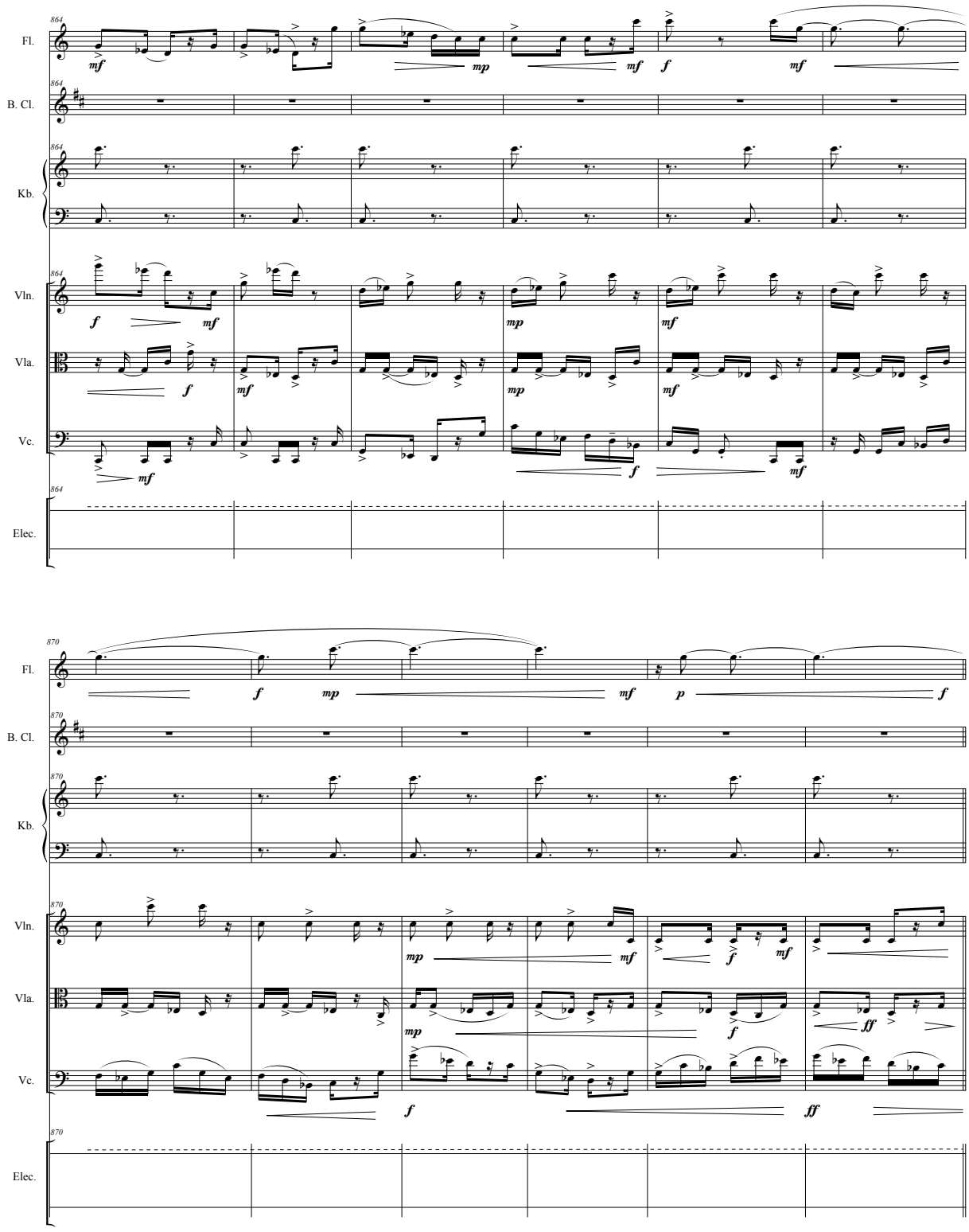

804
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
ff
f
mf
p
810

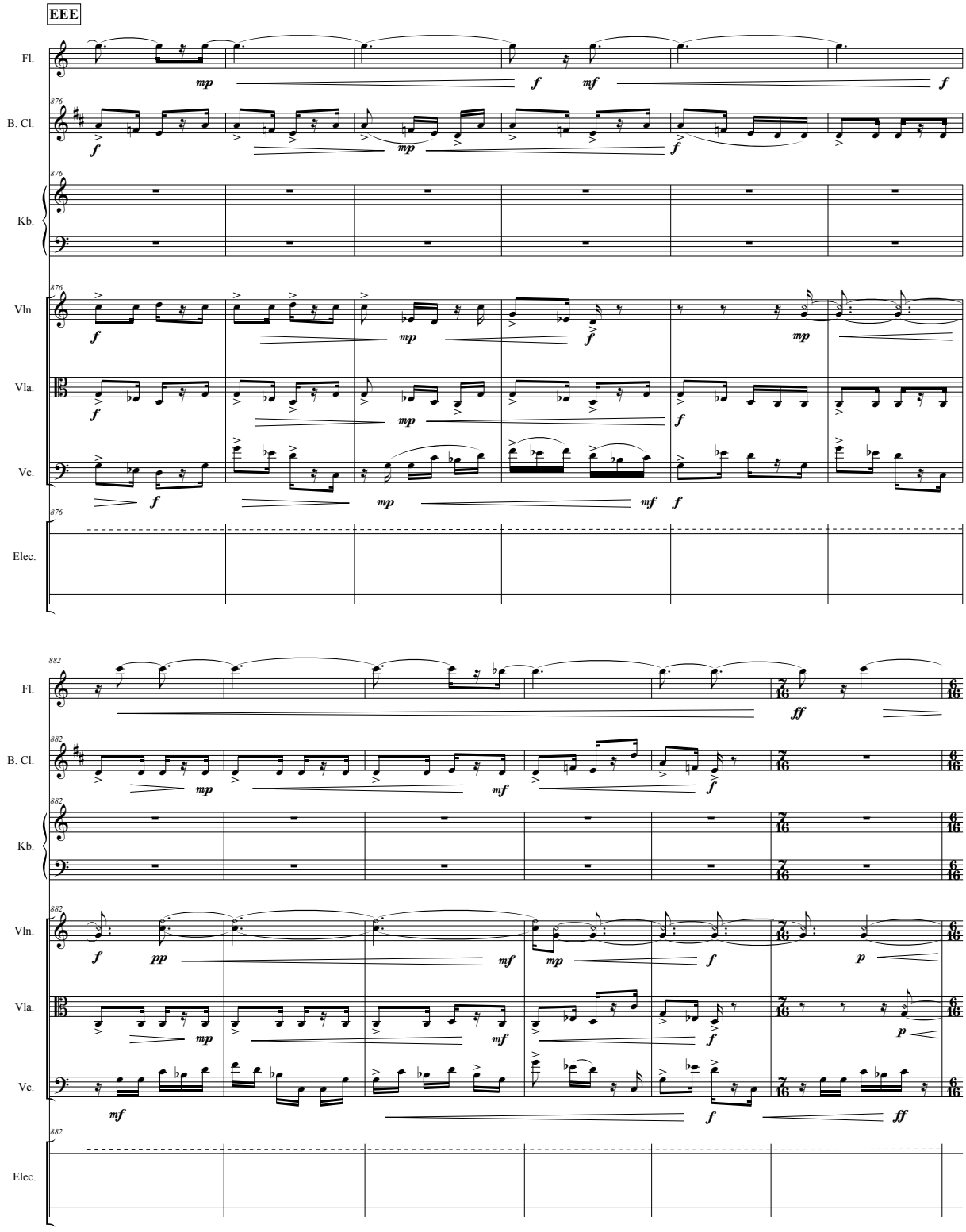

816
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
822
TO C FLUTE
sub. p

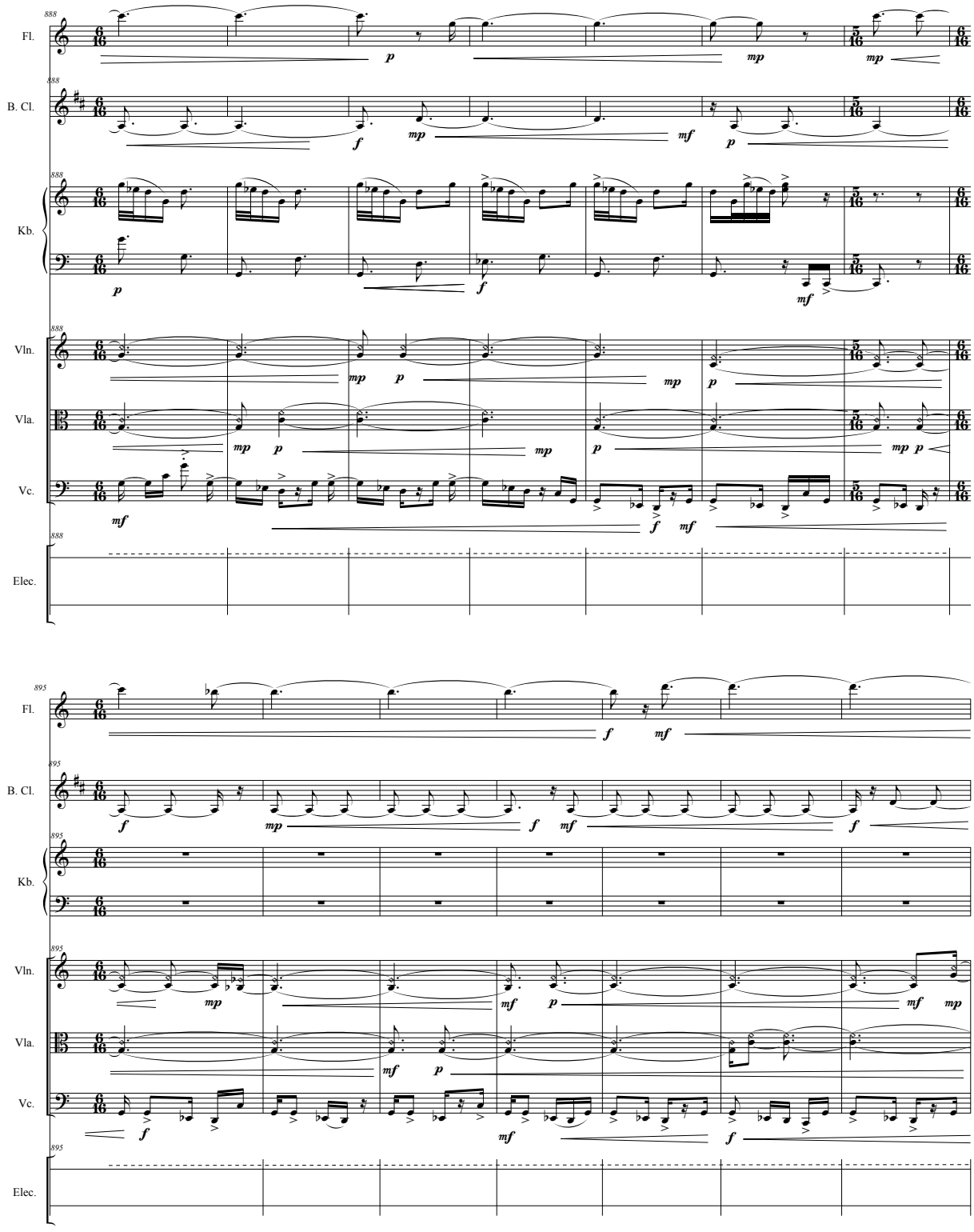

DDD
C FLUTE
828
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
arco
834
(Fl.) - delays

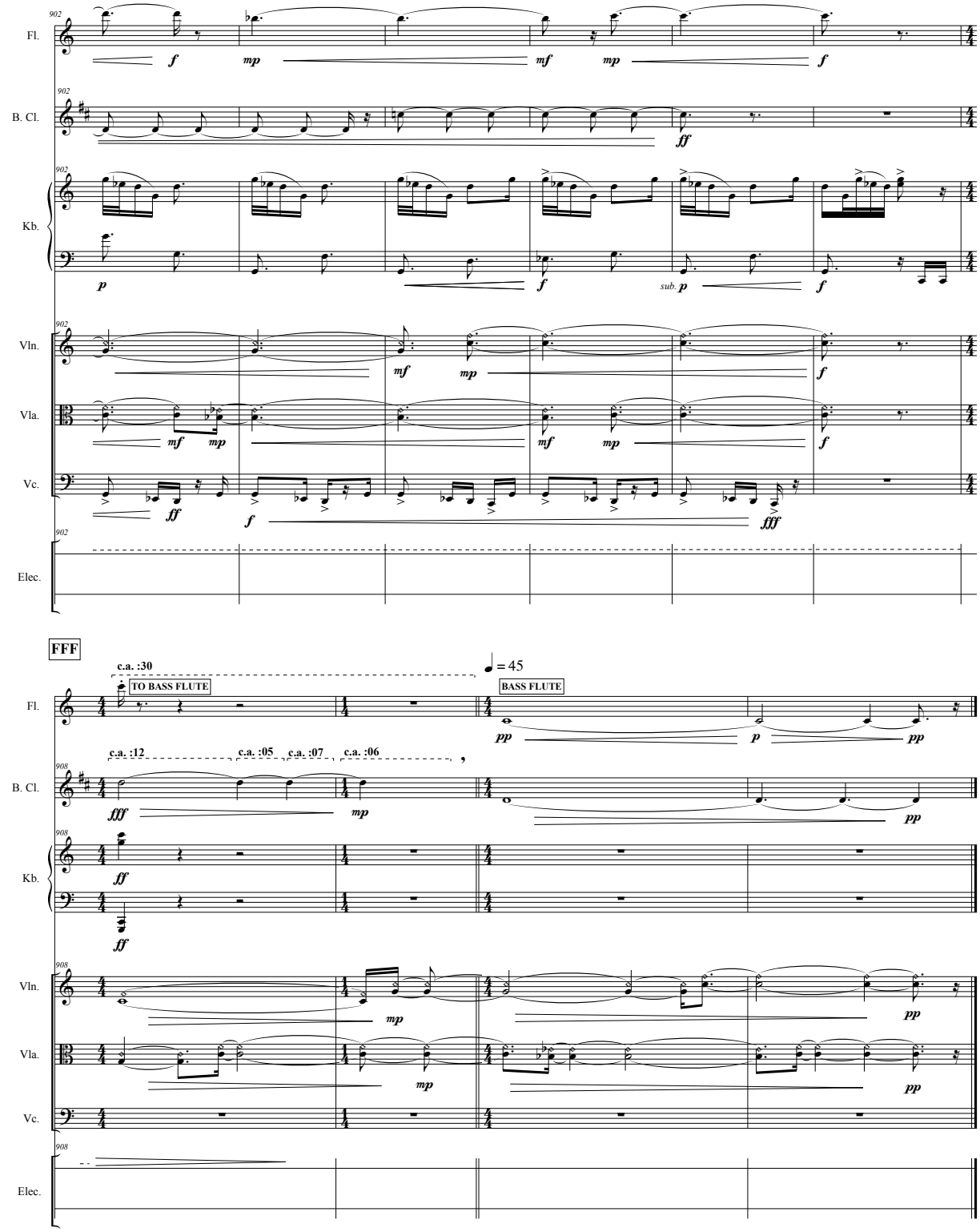

840
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
ff
fff
f
p
mf
846
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
ff
fff
f


852
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
858


Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
864
870


EEE
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
876
882
mp
f
mf
ff
pp
p


888
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
895
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.


902
Fl.
B. Cl.
Kb.
Vln.
Vla.
Vc.
Elec.
f
mp
mf
mp
f
ff
p
f
sub. p
f
mf
mp
f
mf
mp
mf
mp
f
ff
f
fff
FFF
c.a. :30
TO BASS FLUTE
♩ = 45
BASS FLUTE
pp
p
pp
c.a. :12
c.a. :05
c.a. :07
c.a. :06
908
fff
mp
pp
ff
ff
mp
pp
mp
pp
mp
pp

B. Software Contents

Software is included in the accompanying Media and Software Package (see Appendix C).

patternGen contains pre-compositional tools based on serial patterns, Markov chains, and probabilistic rhythms and dynamics. It was created to generate and develop primary musical materials for *Ceremony of Superheroes*. It is in a working state and is continuously in development.

The following Max/Msp/Jitter patches are provided for use in rehearsal, live performances, and recordings:

cosFlute.maxpat contains the electronics for the bass and C flutes.

cosClarinet.maxpat contains the electronics for the bass clarinet.

cosKeyboard.maxpat contains the electronics for the keyboard.

cosStrings.maxpat contains the electronics for the violin, viola, and cello.

cosMainMixPanel.maxpat mixes the output of other modules.

The following audio files are contained for use with the above listed patches. They must be in the Max search path: **ghostFlute.wav, deepWater.wav**

C. Software Documentation

The software for *Ceremony of* Superheroes was developed in Max/Msp/Jitter[1]. All patches are provided as editable patches rather than closed standalone applications. This allows users to make small adjustments and adaptations when creating personalized control strategies (and custom hardware integration) for live performance. Therefore, modules are also customizable for use in other musical projects, and as result are simultaneously released under creative commons.

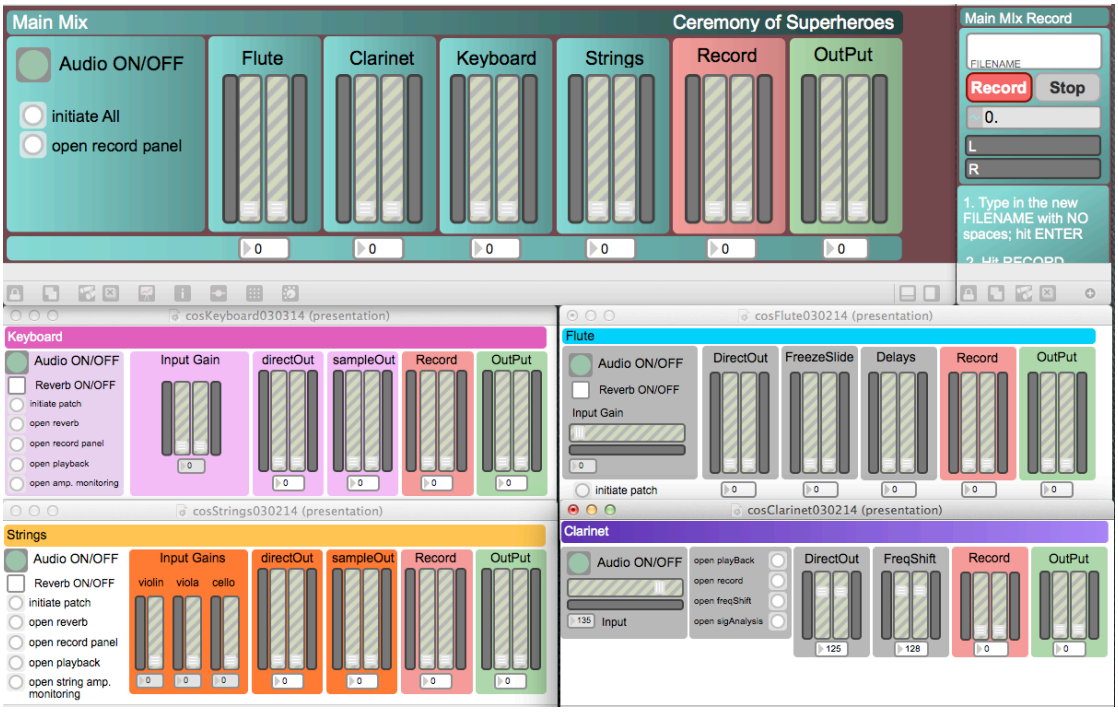


Figure 1. All modules: main panels.

1. Max/MSP/Jitter is an object-oriented graphical programming environment that integrates data flow (Max), signal processing (MSP), and matrix processing (Jitter). It is maintained and developed by Cycling '74. (cycling74.com)

The following documentation provides general instructions and outlines the operation of each individual module. The following five modules are discussed:

i. *cosFlute*

ii. *cosClarinet*

iii. *cosKeyboard*

iv. *cosStrings*

v. *cosMainMixPanel*

i. Generalized Functions

Four modular instrument patches function independently for calibration and rehearsal, and are used together during live performances and recordings. A fifth, main mix panel module (*cosMainMix*) mixes and outputs sound from all other modules. Each instrument module can function independently of each other, but they should always be used together with the main mix panel.

Each module has a green 'Audio ON/OFF' button. Press any one of them to turn the global Audio engine ON or OFF. The button will turn bright green to indicate that Audio output is 'ON'.

The *cosFlute* and *cosClarinet* patches have buttons labeled 'initiate'. These buttons reset important local settings. The *cosMainMixPanel* patch has a button labeled 'initiate all'. This button will reset global settings. Immediately at the beginning of a performance, it is important to initiate all settings on the main mix panel.

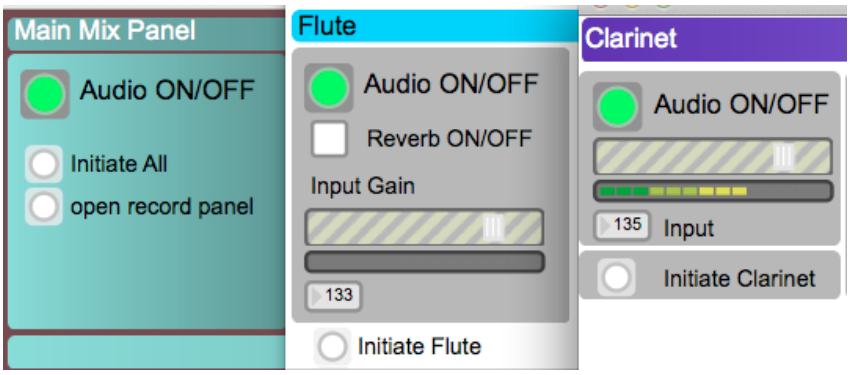


Figure 2. Initiating the software.

All four instrument modules have independent input gains and each should be adjusted to allow for the strongest input signal possible without distortion. Once set at the beginning of the piece, input gains should not be changed during performance (except to abate unanticipated input signal distortion).

Instrument modules are equipped with a basic reverb panel. A subtle amount of reverb may be used if needed. Reverb can be toggled ON/OFF. The reverb setting may be adjusted in the reverb control panel. If used, settings should be similar for all instruments.

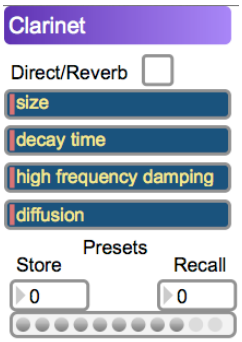


Figure 3. A reverb panel.

All four instrument patches have independent stereo output gains; outputting a stereo mix of direct amplified signal with their corresponding electronics, to the main mix panel. These independent output gains should be adjusted to allow for the strongest output signal possible without distortion. The main mix panel output gain, controls a stereo mix of all incoming signals from all four instrument patches.

Figure 4. A record panel.

Each instrument patch has a record panel used to name the output file, and to start and stop recording. The gain labeled 'Record' controls the level of the mix that will be recorded. It receives the same mix as the output, and should be adjusted to ensure the strongest output signal possible without distortion. Once set, the record output gain should not be adjusted during performance.

All instrument modules have a 'playback panel' to play back an audio file when calibrating and rehearsing the electronics in the absence of live performers. Press the 'load file' button to load a new audio file. It will play back through the patch's input gain

with the same signal path used in live performance.

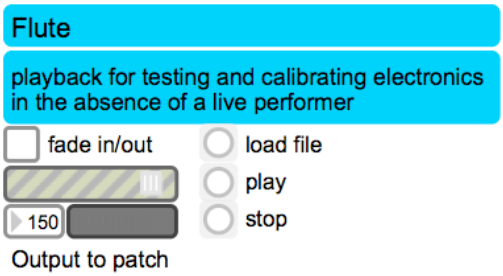


Figure 5. A playback panel.

ii. ***cosFlute***

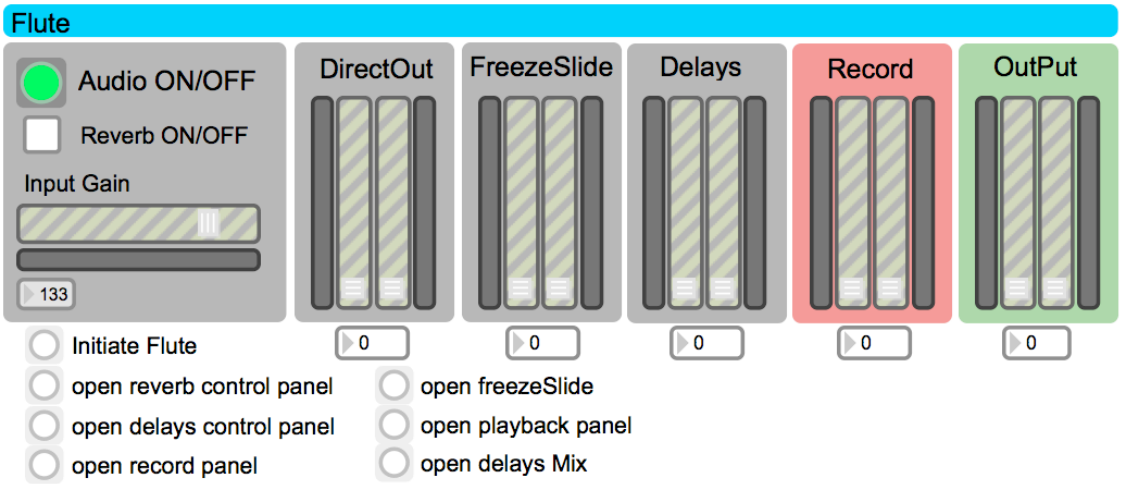


Figure 6. Flute module: main panel.

The patch, *cosFlute* contains the electronics for the bass and C flutes; and uses a spectral analysis and re-synthesis approach, and a series of delays. An FFT analysis is performed on an incoming signal with small slices of the resultant sonogram sustained through re-synthesis; this gives the illusion of several voices hanging in the air, building

and layering harmonies from the solo flute material. This is used in combination with a series of 8 delays programmed for a balance between pitches that are ‘frozen’ and layered to create harmony, with longer strings of musical material that would be delayed and layered to create multiple polyphonic melodic lines.

The acoustic and direct (slightly amplified) sound of the flute should be primary and present at all times, with the spectral effect and delays at approximately sixty-five to seventy-five percent of the (perceived) level of the direct signal. The gain labeled 'DirectOut' controls the amount of direct signal present in the output mix. The gain labeled 'FreezeSlide' controls the amount of spectral 'freeze' present in the output mix. The gain labeled 'Delays' controls the level for all delays in the mix. Adjust these gains to achieve the desired balance between all three signal groups. Once a balance is set correctly, only slight adjustments to the mix may be necessary during performance. These adjustments should be made as seamlessly as possible.

Press the 'initiate patch' button to reset the patch parameters and clear the memories of the spectral 'freeze' and delays. The patch must be initiated immediately beginning each performance. The 'Inititate All' button on the main mix panel may also be used to reset the patch.

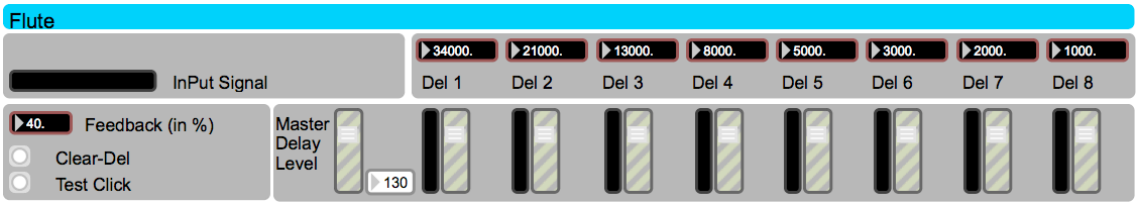


Figure 7. Flute delays.

The 'delays control panel' shows the timing, feedback level, and output levels of the delays. It is included for visual feedback for the user, and need not be adjusted. Opening the 'freezeSlide' abstraction reveals the internal function of the freezeSlide mechanism, and need not be adjusted. This effect is mapped to input amplitude and begins its spectral 'freezing' when enough amplitude is achieved; and it will fade out when the input stops or becomes very quiet. The 'delays mix' panel shows the delay gains as they are controlled by the input amplitude. In this panel only the panning of each delay may be adjusted. Panning should be set to spread out all delays in the stereo field. The amplitude of the delays is mapped to input amplitude and will fade out when the input stops or becomes very quiet.

iii. *cosClarinet*

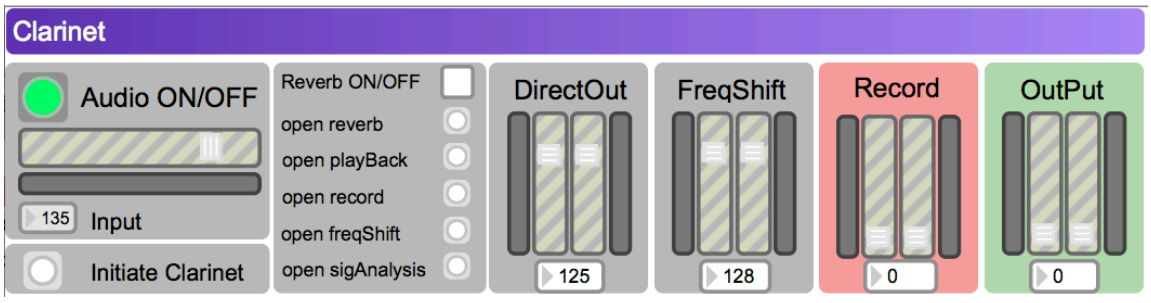


Figure 8. Clarinet main panel.

The patch c*osClarinet* contains the electronics for the bass clarinet; and uses a series of five instances of the native Max object, *freqshift~* (time-domain frequency

shifter). These are mapped to input amplitude so that at low amplitudes, no frequency shifting occurs; as the input amplitude increases, each frequency shifter is activated in gradual succession. Each successive frequency shifter, shifts the input frequency to a greater degree, so that as the input amplitude increases, the quantity and variety of frequency shifting is increased. The acoustic and direct (slightly amplified) sound of the clarinet should be primary and present at all times, with the frequency-shifted output at approximately eighty-five to ninety percent of the instrument's natural sound.

The gain labeled 'DirectOut' controls the amount of direct signal present in the output mix. The gain labeled 'FreqShift' controls the amount of frequency-shifted signal present in the output mix. Adjust these gains to achieve the desired balance between all three signal groups. Once a balance is set correctly, only slight adjustments to the mix may be necessary during performance. These adjustments should be made as seamlessly as possible. The acoustic and direct (slightly amplified) sound of the clarinet should be primary and present at all times, with the frequency-shifted output at approximately eighty-five to ninety percent of the instrument's natural sound.

The 'sigAnalysis' is included for visual feedback for the user, and need not be adjusted. Opening the 'freqShift' abstraction reveals the internal function of the frequency-shifting mechanism, and need not be adjusted. This effect is mapped to input amplitude and begins its shifting when enough amplitude is achieved; and it will fade out when the input stops or becomes very quiet.

iv. *cosKeyboard*

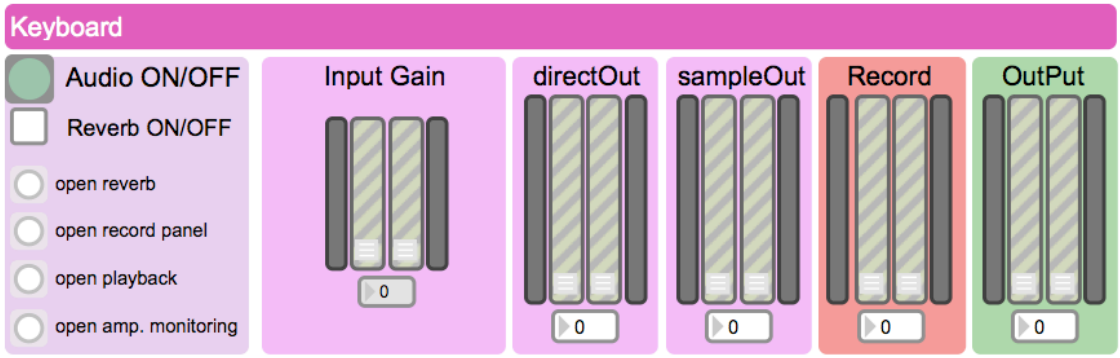


Figure 9. Keyboard Main Panel.

The patch, *cosKeyboard* contains the electronics for the keyboard; it uses envelope-following sample playback. During performance, the 'sampleOut' gain should be monitored according to score instructions. Where keyboard electronics are notated, the 'sampleOut' gain should be at approximately seventy-five to eighty percent of the 'directOut' level; and should otherwise be eliminated from the mix.

v. *cosStrings*

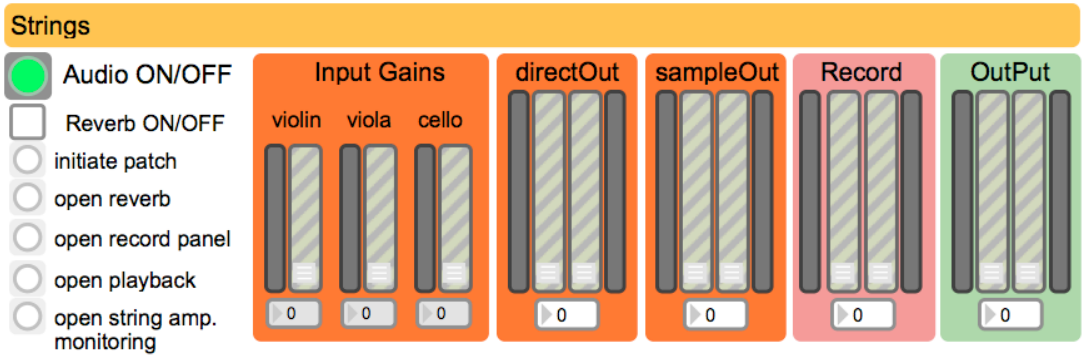


Figure 10. Strings main panel.

The patch, *cosStrings* contains the electronics modules for the violin, viola, and cello; and uses envelope-following sample playback. Where notated, the 'sampleOut' gain should be at approximately seventy-five to eighty percent of the 'directOut' level; and should otherwise be eliminated from the mix.

vi. *cosMainMixPanel*

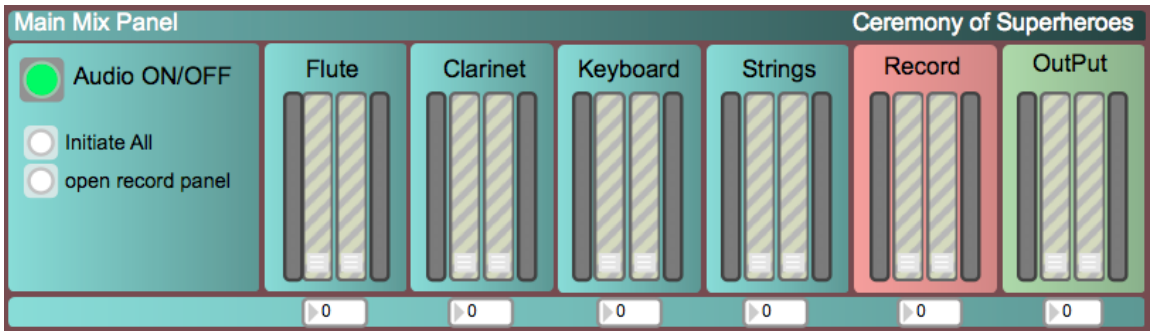


Figure 11. Main mix panel.

The main mix panel module has input gains for flute, clarinet, keyboard, and strings (stereo mix of violin, viola, and cello); and small seamless adjustments should be made throughout the performance to maintain balance.

vii. Input and Output Routing

Default Input Channels

1) Input 1, flutes
2) Input 2, bass clarinet
3) Inputs 3-4, keyboard Left and Right
4) Inputs 5-7, violin, viola, cello

Default Output Channels*

1) Outputs 1-2 (Main Output), Stereo Mix
2) Output 3, flutes
3) Output 4, bass clarinet
4) Outputs 5-6, keyboard
5) Outputs 7-8, strings

*For the setup shown in Staging Diagrams I and II, all output channels will be used. For the setup shown in Staging Diagram III, only main outputs 1 and 2 will be used.

2. *Ceremony of Superheroes*: Ambiguity and Metaphoric Narrativity in Compositional Process and Development.

When a composer creates a piece of music and it is played, what meaning, what message, what order is conceived, transmitted, and perceived? What is the possible fidelity of transmission from the poetic to the aesthetic? How clearly can music represent and communicate discreet ideas, emotions, interactions, stories and structures? To what extent is ambiguity inevitable, and what contributes to a listener's tendency to narratize (or not) a given composition?

Listeners hear and interpret music differently, and often in unpredictable ways. The listening experience consists of many correlated processes and there is great potential for individual variation in listeners' physical capacity for hearing, cognizing, and interpreting what they are hearing. Other considerations are the musical background of the listener, cultural contexts, mood, memory, and the listener's state of mind, environment, the qualities of the performance, as well as other volatile factors. Likewise, the same person may have very different perceptions of a piece of music throughout multiple listenings. For these reasons there is an inevitable ambiguity when it comes to interpreting, and listening to music.

These factors also affect the compositional process as the composer attempts to create meaningful relationships and developed ideas within a composition. For coherent compositional decisions to be meaningful, they need not rely on a listener's literal interpretation of underlying organizational principles (however they may be conceived); rather, they contribute towards a listener's ability to identify intentionality, and they

provide opportunities for the listener to generate a meaningful interpretation.

Vincent Meelberg cites an experiment conducted by Jean-Jacques Nattiez in which listeners were asked to describe the story they heard in Paul Dukas' *L'Apprenti Sorcier* (1896-97). As one might expect, each listener imagined different stories.[1] Perhaps more interesting and relevant here is not that each listener developed divergent stories, but that they imagined and described complete narratives as interpreted from the music. According to musicologist Lawrence Kramer, "Meaning is an irrepressibly volatile and abundant thing…"[2] This includes music's nonlinear web of potential meanings, that for Kramer were definitive enough to parallel to the rigor of interpretation employed in the field of literary theory and criticism. These new meanings are not seen as separate from the music itself. Rather Kramer notices that they are, "inextricably bound up with the formal processes and stylistic articulations of musical works;"[3] and that they are perpetually produced and re-produced as a mechanism of culture at large. Kramer suggests using an hermeneutical approach to musical meaning, beginning from the most explicit elements (text that accompanies a musical work) and moving to the less explicit materials, such as allusions to other musical, literary, or visual works. Lastly he suggests exploring the most implicit elements at play in a musical work, such as the performative, or expressive 'activities' that enact themselves within a social and cultural sphere. Kramer encourages working through these processes, examining and re-examining meaning that is coaxed out of the many 'discursive' interpretive processes, stating that the

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1 Vincent Meelberg, *New Sounds, New Stories : Narrativity in Contemporary Music* (Amsterdam: Leiden University Press, 2006).

2 Lawrence Kramer, *Music as Cultural Practice* (Berkeley, CA.: University of California Press, 1990), 2.

3 Kramer, *Music as Cultural Practice,* 1.

process of investigating and interpreting meaning in a musical work is chaotic and dynamic.

Nattiez is doubtful of music's ability to contain and transmit narrative, concluding that “music is not a narrative and that any description of its formal structures in terms of narrativity is nothing but superfluous metaphor.”[4] For Nattiez, musical gestures and their linear succession can contribute to a sense of literary narrative, in effect 'narrativizing' a system of musical symbols that is otherwise highly ambiguous in their ability to transmit discreet narrative principles. Citing music's ability to imitate narrative, he also touches upon a distinction between narrative and discourse:

> Since it (music) possesses a certain capacity for imitative evocation, it is possible for it to imitate the semblance of a narration without our ever knowing the content of the discourse, and this influence of narrative modes can contribute to the transformation of musical forms. But the composer is a being immersed in his or her culture. With the specific means of music and without necessarily trying to 'relate something', the composer can aim to present to us, in music, an attitude which it is then the responsibility of historical and cultural exegesis to interpret.[5]

This so-called 'superfluous metaphor' may not turn out to be at all superfluous when considering the listener's experience. The narrative metaphor allows listeners to interpret and describe what may otherwise be perceived as highly chaotic and ambiguous. Meelberg devotes a entire chapter to what he calls “grasp”, attempting to quantify features in a composition that contribute to a listener's engagement with, and understanding of a piece of music. He believes that taking a narrative listening stance contributes greatly to a listeners' ability to comprehend music; and by recognizing temporal developments that are represented by musical features. He concludes that, a

[4] Nattiez, Jean-Jacques and Katherine Ellis. “Can One Speak of Narrativity in Music?,” *Journal of the Royal Musical Association*, vol. 115, no. 2 (1990): 257.

[5] Nattiez, “Can One Speak of Narrativity in Music?,” 257.

narrativized comprehension of music confirms that idiosyncratic music (music that does not rely entirely on convention) can be grasped by the listener; but that ultimately in a narrative analysis, music is considered as something that it inherently is not, a narrative.

Fred Everett Maus asks, 'what is it about the music and the listener's perception of the music (especially of the classical and romantic periods) that encourages comparisons with literary or dramatic narrative?'[6] He discusses comparisons between traditional music theory and analysis, and theories of plot structure (or narrative syntax) of the Russian Formalists and later Structuralists.[7] He compares, for example, generalizations about narrative syntax outlined by Vladimir Propp in his 1928 text, *Morphology of the Folktale*, to the types of formal structures outlined in traditional music textbooks, such as rondo and Sonata forms: "So tonal music, as depicted by conventional analysis, resembles narrative, as depicted by Formalist and Structuralist writings, in that individual texts consist of identifiable kinds of object arranged in partially predictable patterns."[8] In making a case for 'music as narrative', some useful and problematic comparisons may be made between music theory and structuralist approaches to narrative; but for Maus, these connections do not explain the attraction listeners and critics have had for such an analogy. He suggests that listeners have a capacity to interpret musical 'events' anthropomorphically, hearing musical processes as narrative-like because they can resemble actions, thoughts, and characters. He speaks of instrumental music as consisting of a series of events, suggesting that the easiest anthropomorphic interpretation, is to hear musical events as intelligible actions; and that actions are distinguished from other events

6 Fred Everett Maus, "Music as Narrative," *Indiana Theory Review*, vol. 12 (1991): 1.
7 Maus, "Music as Narrative," 2.
8 Maus, "Music as Narrative," 3.

by their perceived intentionality, with the ascription of intention implying that such intention is coherent with and reinforced by the agent's other values. This in effect, creates a framework for interpreting an intelligible person, agent, or narrator, and is for Maus, "the relevant connection between action and narrative."[9] Additionally, the listener tends to interpret an action as situated within an extended sequence of events; and an explicit reading of these event-succesions, forms stories. Maus suggests a simple description of musical pieces that bypasses technical language and theory-based approaches in order to illuminate the "intuitions of listeners."[10] He uses a simple narratized description of the rondo (last movement) of Beethoven's Sonata, 14, no. 1. For example, he describes the movement's return to the tonic: "In returning to its overall key, the piece also recovers the clash between A and B, one aspect of its original problem. And so the piece returns, again, to its opening material."[11] Admittedly his description deals with the rondo as a series of repeated attempts to reach resolution whereby no further action is needed, extrapolating that these attempts at resolution are not necessarily ascribed to the composer or the performer, but instead are "best understood as behavior in a fictional world created through the music."[12] He continues to specify that the stories formed in this process are not necessarily programmatic, but rather that the actions and problems of the 'stories' themselves, are musical in nature. He allows that characters and emotions may be perceived but says that their qualities still remain interpretive, vague, and naturally ambiguous. Almén agrees that all narrative need not be exclusively literary

[9] Maus, "Music as Narrative," 7.
[10] Maus, "Music as Narrative," 8.
[11] Maus, "Music as Narrative," 11.
[12] Maus, "Music as Narrative," 13.

but that narrative is specific to its medium; and that music can display narrative-like qualities of its own.[13] He defines musical narrative as, "the process though which the listener perceives and tracks a culturally significant transvaluation of hierarchical relationships within a temporal span."[14]

In electroacoustic music, possibilities for representation through the use and manipulation of recorded sounds, and their sonic and narrative potentials have motivated attempts to theorize their poietic and aesthetic implications. Pierre Schaeffer sought to outline a syntax for musique concréte in his 1952 and 1966 treatises, *Esquisse d'un solfège concrète* and *Traité des objets musicaux.* In the latter he attempts to classify all potential sound-producing objects into seven characteristic parameters: mass, dynamic, melodic profile, grain, inflection, and harmonic timbre.[15] He also outlines four interrelated modes of listening especially pertaining to musique concrète: Mode 1 in which attention is directed to identifying the sound source; Mode 2, where sounds are heard without the attempt to interpret their meaning (passive listening); Mode 3, in which attention is directed towards spectra and the intrinsic qualities of the sound itself; and Mode 4, where musical meaning becomes encoded as a sort of 'musical language.'[16]

Building on Schaeffer's work, composer Dennis Smalley proposes an approach to understanding and analyzing (especially acousmatic) musics. He cites problems for composers and listeners that are unique to new musics, no longer limited to the sounds of instruments and voices: "how to cut an aesthetic path and discover a stability in a wide-

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13 Byron Almén, *A Theory of Musical Narrative* (Bloomington: Indiana University Press, 2008), 52.
14 Almén, *A Theory of Musical Narrative,* 12.
15 Natasha Barret, "Trends in Electroacoustic Music," in *The Cambridge Companion to Electronic Music*. Collins, Nick and Julio d'Escriván, eds. (New York: Cambridge University Press, 2007), 234.
16 Barret, "Trends in Electroacoustic Music."

open sound world, how to develop appropriate sound-making methods, how to select technologies and software. How are we to explain and understand electroacoustic music?"[17] *Spectromorphology* refers to the interaction between sound spectra and the ways in which they are shaped through time, and seeks to establish a framework for understanding sonic relationships and behaviors through time. He clarifies that this is not designed as prescriptive compositional theory, rather as a descriptive tool intended to aid listening and analyses. While it is not prescriptive in nature, he suggests composers may be influenced by a heightened consciousness of the perceptual implications of their compositional choices. Smalley is clear that the compositional methodologies, systems and structures conceived by the composer are different than what listeners will ultimately perceive in the same music; admitting that while program notes and other supplemental materials may help the listener's appreciation, such information is not always perceptually informative, or even relevant. He intends this spectromorphological approach to be applicable to a wide variety of electroacoustic musics, citing the need to interpret musics where the relationship is lacking between sounding bodies (acoustic instruments) and the source of heard sounds (including the absence of a physical, gestural cause). For Smalley, spectromorphology primarily deals with acousmatic music (including music that combines live performers and acousmatic elements) and is limited in its ability to deal with traditional instrumental music as well as electroacoustic music that is strongly anecdotal or programmatic; when meaning is closely connected to recognizing sounds, their contexts, and their intertextual meanings. Smalley also describes a *technological listening* mode, whereby the listener becomes focused on the

[17] Dennis Smalley, "Spectromorphology: explaining sound-shapes," *Organised Sound* 2 (1997): 107.

sound of the technology itself, limiting their ability to perceive musical meaning; and states that ideally, music should be composed that relies on the quality of invention, allowing the technology to be as transparent as possible.

Juan Chattah uses composer Mark Wingate's piece, "Klang, Kar, und Melodie" as a point of departure to discuss musical narrative, developing a model for evaluating musical parameters that contribute towards narrative interpretations. He states three main goals: 1) to reconsider and define linguistic terminology and methodologies while applying them to musical analysis; 2) to identify the features that contribute to the perception of narrativity in music; and 3) to establish an inter-disciplinary approach that may be applied to musique concrète.[18] He distinguishes three conditions on which musical narrativity are based: 1) the creation of a fictional space, 2) the elaboration of fictional characters and objects, and 3) music's depiction of events in time. Chattah allows for degrees of musical narrativity and degrees of fidelity of transmission of discreet meaning. For Chattah musical narratives exist on a continuum between representational specificity and abstraction, presenting his narrative cube of interrelationships between phonology, semantics, and syntax.

I accept that differing degrees of ambiguity are inevitable, and that music's lack of specificity is one of its most powerful resources. I also believe that it is my role as a composer to create opportunities for meaningful listenings through developing perceptible intentionality and compositional consistencies within the internal dynamics of

[18] Juan Chattah, "Klang, Kar, und Melodie: a Crash Course on Musical Narrative," *EMS07 - Electroacoustic Music Studies Conference Proceedings,* De Montfort University, Leicester, UK (June 2007).

a piece. While it is not necessary that listeners' interpretations are consistent with, or even similar to one another, it is important that they are able to sense an intentionality; that they have the opportunity to hear musical relationships, and experience the development of expectation, surprise, confirmation, and overall coherence. My interest in narrative metaphor is related to a common understanding of "storytelling" devices, character development, dramatic conflict and resolution, acting as organizing principles that inform my compositional activities.

Narrative thinking in my compositional process especially helps me to create and solve meaningful problems; as well as to develop strategies for musical and electronic interactions. I am interested in developing fertile ground for narrative interpretations, believing in many listeners' tendency to seek them out. While I am not necessarily concerned with any specific narrative transmission or interpretation of the musical results of my process, I believe that conceptual consistency in metaphor (regardless of its type) produces musical consistency and increases opportunities for meaningful listenings. This is a question of transformation. In John Cage's *Variations V* (1965) he mapped physical data derived from light sensors and capacitance antennas to musical parameters in an attempt to "transform our contemporary awareness of nature's manner of operation into art"[19] Rather than attempt to represent the data as music, he was interested in transformation through a consistency of mappings between two distinct systems of order to produce an artistic effect meaningful beyond the direct relationships. In *Pithoprakta (*1955/56) Iannis Xenakis' mapped data from the Brownian motion of gas particles to the

[19] John Cage, "Experimental Music," in *Silence. Lectures and Writings.* (Hanover, NH: Wesleyan University Press, 1961), 7-12.

speed of glissandi to create "one of those 'logical poems' which the human intelligence creates in order to trap the superficial incoherencies of physical phenomena, and which can serve, on the rebound, as a point of departure for building abstract entities, and then incarnations of these entities in sound or light."[20] My discussion of the narrative features that informed my compositional strategies for *Ceremony of Superheroes* is designed to illuminate the rationale behind mapping strategies as a feature of compositional thinking. This is to say that my approach is one in which narrative principles primarily become mapped to musical features rather than one in which musical features are employed to transmit narrative.

In developing *Ceremony of Superheroes*, I have adopted the narrative metaphor of the performer as superhero, and the musical performance as a mythological ceremony. I have developed a loosely archetypal set of characters that interact with each other in a series of dreamlike actions. The characters and their interactions become vessels for narrative interpretations. They are character archetypes with features and qualities that develop throughout the process of composing, informing models for idiosyncratic interactivity. Idiosyncratic interactivity implies that systems and strategies for interactivity are developed and employed in a way that is unique to a given situation, performer, or instrument; instead of maintaing an overall strategy applying to the ensemble. It implies that the types of interactions found, pertain to an identity, a character, or mode of behavior that is distinct from other identities occupying its context.

[20] Iannis Xenakis, "Formalized Music. Thought and Mathematics in Music," ed. S. Kanach. (Stuyvesant, NY: Pendragon, 1992), 3.

A. Coherence and Musical Language

Musical coherence might be described as a correspondence and confirmation of established expectations within a piece. Coherence can inform narrative and narrative metaphor can re-enforce coherence. In *Ceremony of Superheroes* I sought to develop coherence through the musical material, through the live electronic interactions, as well as through the narrative implications built into the design and potential perceptions of the piece.

The development of musical language for *Ceremony of Superheroes* began with flute material and corresponding electronics. All other material was developed in relationship to the original design decisions elaborated in the flute. All material was developed according to a method of iterative design, whereby pre-compositional systems and musical material; considerations of metaphoric narrativity; electronics systems design; and the uniqueness of the performers and their instruments would all empower and inform developments in all areas recursively.

I decided to begin working with flute, while developing electronics strategies that would relate to the particular instrument, the performer, and the potential roles of the character in a larger overall narrative. This decision was in part informed by the desire to begin with a monophonic instrument, therefore, forcing certain decisions about how I would generate and organize the general language of my pitch material. Many of these decisions informed the way I approached the other instruments and interactions throughout the piece. The superheroic power I conceived for the flutist was the power to

speak in many voices; the power of polyphony and harmony generated from a single monophonic instrument (when enhanced by her superpower).

Musical sketches were developed concurrently and in dialogue with early developments in electronics systems. I began by creating a multiple-voiced frequency-shifting system; a system for live sample recording and playback (which would ultimately be replaced by a series of 8 delays); and a system that uses a spectral analysis and re-synthesis approach outlined in Charles, Jean-Francois. "A Tutorial of Spectral Sound Processing Using Max/MSP and Jitter." In this spectral module, an FFT analysis is performed on an incoming signal with small slices of the resultant sonogram sustained through re-synthesis; this gives the illusion of several voices hanging in the air, and allowed me to build and layer harmonies from the solo flute material. Charles calls this technique *freeze*. I wrote initial flute material designed to work with the 3 different electronics systems I was developing; then tested the material with a variety of settings, combinations, and signal paths that integrated the 3 different approaches, yielding a wide variety of results; as well as ideas for evolving electronic techniques throughout the other movements, and across the ensemble. These tests were conducted before working with the flutist, using digital mockups of the material. Deciding to save the multiple-voiced frequency-shifter for a later potential application, I built a combination of an eight-voice delay system with Charles' spectral technique, *freeze*. This combination created the right balance between pitches that would be 'frozen' and layered to create harmony, with longer strings of musical material that would be delayed and layered to create multiple polyphonic melodic lines.

The initial flute sketches began with slowly evolving material, allowing space for gradual voice-layering; and were originally composed freely, informed by intuition related to my specific performer, the qualities of the instruments (bass flute and C flute), the character's role in the unfolding narrative, and according to how material would interact with the electronics. Then I analyzed my sketches, more clearly identifying essential seed motives, and deciding how I would formalize their relationships and developments. I identified motives and patterns that would become models for a system of material development, while discarding material that I deemed unnecessary to the formalization process.

B. *patternGen:* A Computer-Assisted Pre-composition System

I developed a patch called *patternGen*[21] as a pre-compositional tool to organize and develop initial material. It consists of two systems, one serial, and the other Markov chain.

For the serial pre-composition of *Ceremony of Superheroes*, I designed a system to associate a pattern of integers with note data to created ordered series. *PatternGen* takes a series of notes and indexes them with integers starting from 0. A user-entered pattern of integers is then associated with the indices from the original series to create the resultant ordered series.

Because the system is sufficiently general, it can also be used to generate and associate patterns related to form, dynamics, and other musical and/or poetic parameters.

[21] *patternGen* was developed using Cycling '74's Max/Msp/Jitter, http://cycling74.com, (April 17, 2014).

Entering the series shown below (**Figure 12.** *patternGen*: series and pattern), followed by the pattern of integers below that, the result is a larger series of pitches ordered according to the pattern specified.

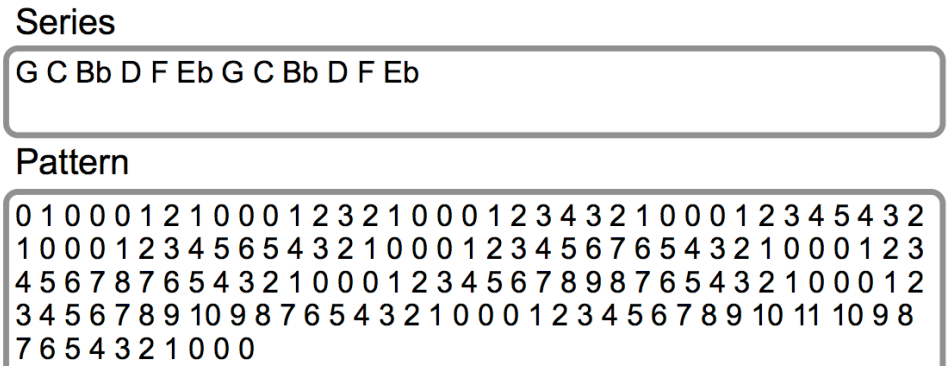

Figure 12. *patternGen*: series and pattern.

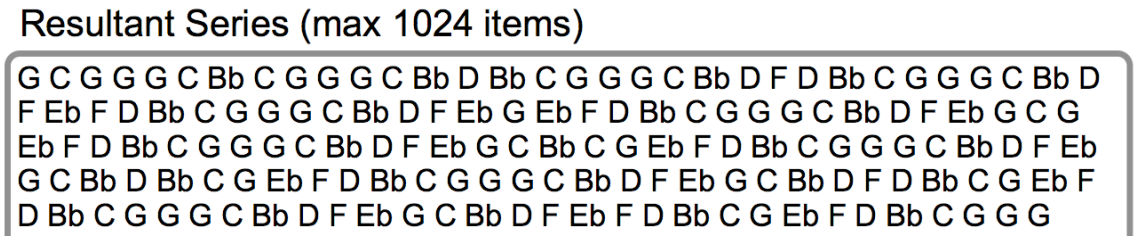

Figure 13. *patternGen*: resultant ordered series.

In *patternGen*, the ordered series created is also displayed in retrograde.

Pitches in retrograde

G G G C Bb D F Eb G C Bb D F Eb F D Bb C G Eb F D Bb C G G G C Bb D F Eb G C Bb D F D Bb C G Eb F D Bb C G G G C Bb D F Eb G C Bb D Bb C G Eb F D Bb C G G G C Bb D F Eb G C Bb C G Eb F D Bb C G G G C Bb D F Eb G C G Eb F D Bb C G G G C Bb D F Eb G Eb F D Bb C G G G C Bb D F Eb F D Bb C G G G C Bb D F D Bb C G G G C Bb D Bb C G G G C Bb C G G G C G

Figure 14 . *patternGen*: ordered pitches in retrograde.

I also designed a number of operations for varying and segmenting the resultant series; these include various serial rotations, retrograde, various sizes of groupings, a 2-pattern interleaver, and a preset system for moving between patterns. Figure 15 shows the series, pattern, and resultant ordered series for both flute and clarinet pre-compositional materials; while Figure 16 shows these two patterns interleaved. This represents a pre-compositional attempt to generate a hybrid of both ordered series and a transitional harmonic space.

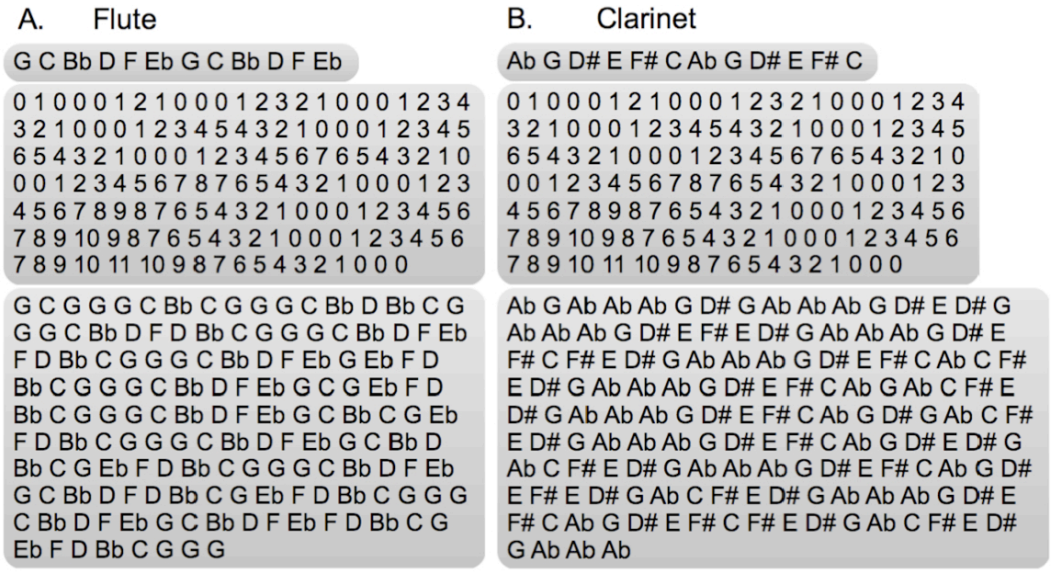

Figure 15. *patternGen*: flute and clarinet sequences.

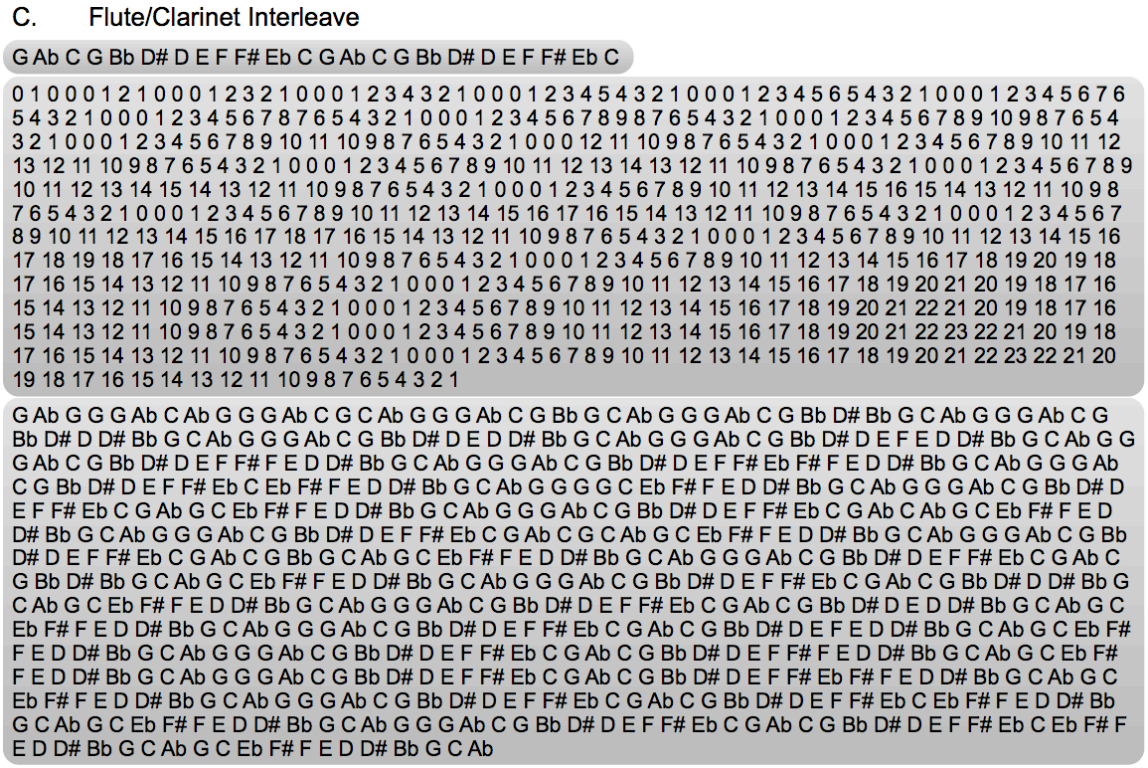

Figure 16. *patternGen*: two sequences interleaved.

Any resultant series may be auditioned through a plug-in virtual instrument of the user's choice. In this case I am primarily using a physically-modeled piano instrument (P*ianoteq* 4[22]) and a digital sample library (*Garritan Personal Orchestra*[23]) to audition my patterns. The user can select and change the octave transposition of the ongoing playback through the series. Initially for testing I used a metronome to signal the next note in the series to be played, giving me periodic steps forward through the pattern at a specified rate. I then added keyboard controls for more performative user input; including controls for moving forwards and backwards through the series, repeating the last note played, and stopping the sound of the current note. This keyboard-mapping allowed me to feel more performative and expressive and to consider phrasing and timing in a more musical manner. I recorded (through exporting MIDI data) various 'improvisational performances' by playing back and forth through the ordered series, allowing me to react sensitively and in real time, to the unfolding pattern of notes; and helping me to better envision the actual musical possibilities of an otherwise abstract and inactivated ordered series.

I also created a system for generating rhythms based on setting weighted probabilities for the selection of subsequent specified rhythmic values (represented and manipulated here as durations derived from their respective note values). It sets the likelihood that certain values will be selected, and parameters can be saved as presets,

[22] *Pianoteq* is a physically-modeled software instrument developed by *Modartt,* https://www.pianoteq.com, (April 17, 2014)

[23] *Garritan Personal Orchestra* is a sample-based software instrument developed by *MakeMusic*. (www.garritan.com)

facilitating the interpolation between them (manually, or using time ramps). This allows for gradual and seamless transformation between a variety of rhythmic behaviors.

The Markov-based component of *patternGen* analyzes a selected MIDI file, cataloging the order of its pitches into a collection of data. It catalogs the number of times certain pitches (represented here by MIDI numbers) follow other pitches, forming a transition matrix that describes the probabilities for resulting note choices. Each time the Markov-based system progresses forward, its current state is calculated and used to direct the next outcome. A first-order Markov chain takes as its current state, a single pitch, and the probabilities of other pitches to follow that single pitch. A second-order Markov chain takes as its current state, a specific order of two consecutive pitches and describes the weighted possibilities of certain pitches to follow these two pitches. A third-order Markov chain takes as its current state, a specific order of three consecutive pitches. The higher the order of Markov chain used, the more it will resemble the original material. In *Ceremony of Superheroes* I used second-order Markov chains. Below Figure 6. shows a selection from a second-order Markov chain data collection. (pitches are shown as MIDI data where 60 = middle C). The left column refers to an index number in the data collection. The four-digit number second from the left is actually a concatenation of two two-digit numbers, followed by a list of possible successive note values. MIDI note values with a greater probability of following a given two-note sequence will simply be listed multiple times to ensure their relative likelihood of selection. For example, entry number 12 below states “6258, 60 62 60 60;” (where 60 = middle C). This means that when this D (62) precedes Bb (58), then D (62) has a one in four chance of following,

while middle C (60) has a three in four chance.

```
5155, 60 60;
5560, 58 58 58 58;
6058, 60 50 62 62;
5860, 67 55 55 55 55;
6067, 63;
6763, 65 65 65;
6365, 62 62 62;
6562, 58 58 58 58;
6258, 60 62 60 60;
6055, 55 51 55 55;
5555, 55 60 55 60 55 74;
5850, 53;
5053, 51;
5351, 55;
5862, 70 63 65;
```

Figure 17. Sample data collection for second-order Markov chain.

In preparation for the larger piece, I first wrote a stand-alone piece for solo bass flute, C flute, and live electronics, entitled *Call of the Messenger*[24]. The vast majority of the flute material in *Ceremony of Superheroes* is derived from this early draft; and for this reason I include a draft of the score as an example[25]. I'll refer to this early score, then use finished score examples as well as selections from early sketches to demonstrate how musical language and material development were approached in *Ceremony of Superheroes*. All examples are provided from the score in C.

[24] This was originally intended to be the first movement of the larger piece, but this idea was abandoned for a more integrated ensemble approach.

[25] See Appendix B: *Call of the Messenger*-draft (05/31/12).

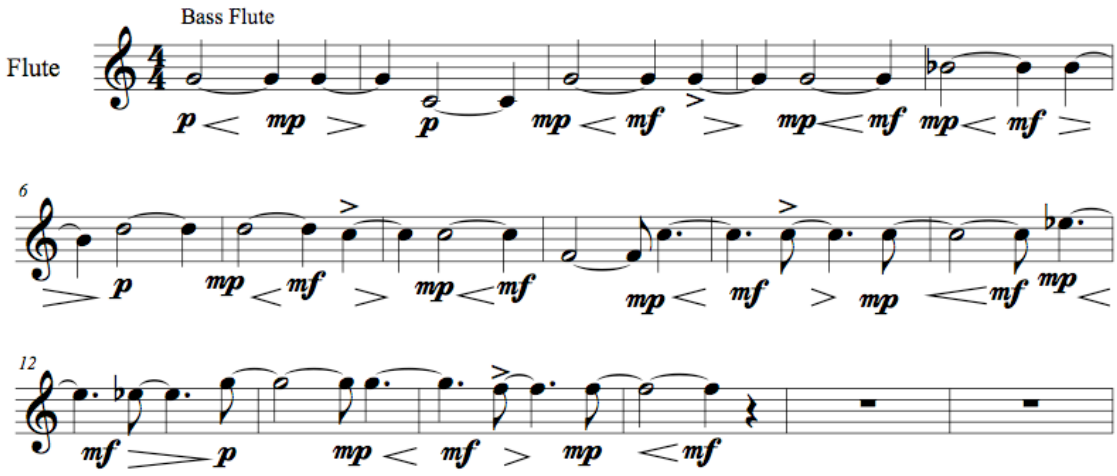

Figure 18. Early flute sketch (03/10/12).

In order to formalize my analysis of the first flute sketches, I chose an ordered series of six pitches: G C Bb D F Eb, and repeated it once to create the twelve-note ordered series: G C Bb D F Eb G C Bb D F Eb. I then mapped these pitches to the following sequence[26]:

> 0 1 0 0 0 1 2 1 0 0 0 1 2 3 2 1 0 0 0 1 2 3 4 3 2 1 0 0 0 1 2 3 4 5 4 3 2 1 0 0
> 0 1 2 3 4 5 6 5 4 3 2 1 0 0 0 1 2 3 4 5 6 7 6 5 4 3 2 1 0 0 0 1 2 3 4 5 6 7 8 7
> 6 5 4 3 2 1 0 0 0 1 2 3 4 5 6 7 8 9 8 7 6 5 4 3 2 1 0 0 0 1 2 3 4 5 6 7 8 9 10
> 9 8 7 6 5 4 3 2 1 0 0 0 1 2 3 4 5 6 7 8 9 10 11 10 9 8 7 6 5 4 3 2 1 0 0 0;
>
> to produce the resulting mapping:
>
> G C G G G C Bb C G G G C Bb D Bb C G G G C Bb D F D Bb C G G G
> C Bb D F Eb F D Bb C G G G C Bb D F Eb G Eb F D Bb C G G G C Bb
> D F Eb G C G Eb F D Bb C G G G C Bb D F Eb G C Bb C G Eb F D Bb
> C G G G C Bb D F Eb G C Bb D Bb C G Eb F D Bb C G G G C Bb D F
> Eb G C Bb D F D Bb C G Eb F D Bb C G G G C Bb D F Eb G C Bb D F
> Eb F D Bb C G Eb F D Bb C G G G.

The sequence was intuitively designed as a long, gradually unfolding revelation of

[26] (0 = G, 1 = C, 2 = Bb, 3 = D, etc.)

the initial ordered series. The first position, 0, is the focal point from which the sequence evolves and returns, expanding and contracting the distance from this initial position. It moves from 0 to 1, back to 0; then from 0, to 1, to 2, to 1, then back to 0, with each additional ascent reaching the next position in the sequence, and with repeated 0's emphasizing the return to the first position of the sequence. The sequence reaches completion shortly after all twelve pitches from the ordered series have been revealed, ending with one final return to the first pitch (from 11=Eb, back to 0=G).

In the first section of *Call of the Messenger* (mm. 1-85) the first forty pitches[27] are played with the bass flute, then they are played in retrograde with the C flute. In the faster, rhythmic section of the piece (mm. 86-239), the entire sequence is separated into thirty-one five-note sub-sequences and then elaborated in two ways.

In measures 86-100, vamp material (C D Eb G G) is introduced with slight variations.

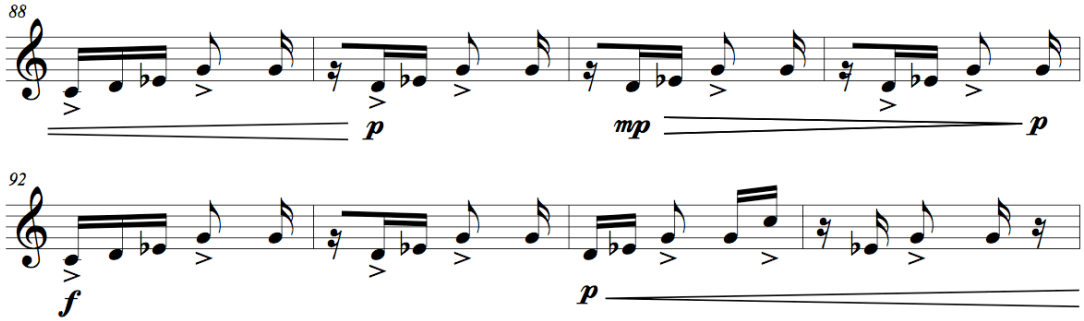

Figure 19. 'Messenger' vamp material.

Then in measures 101-182 it is used to separate ever-longer strings of five-note

[27] Measure 38 has a repeated Bb.

sub-sequences as they progress through the overall sequence.

(**1**) G C G G G **(2)** C Bb C G G **(3)** G C Bb D Bb **(4)** C G G G C **(5)** Bb D F D Bb **(6)** C G G G C **(7)** Bb D F Eb F **(8)** D Bb C G G **(9)** G C Bb D F **(10)** Eb G Eb F D **(11)** Bb C G G G **(12)** C Bb D F Eb **(13)** G C G Eb F **(14)** D Bb C G G (15) G C Bb D F **(16)** Eb G C Bb C **(17)** G Eb F D Bb **(18)** C G G G C **(19)** Bb D F Eb G **(20)** C Bb D Bb C **(21)** G Eb F D Bb **(22)** C G G G C **(23)** Bb D F Eb G **(24)** C Bb D F D **(25)** Bb C G Eb F **(26)** D Bb C G G **(27)** G C Bb D F **(28)** Eb G C Bb D **(29)** F Eb F D Bb **(30)** C G Eb F D **(31)** Bb C G G G.

Figure 20. Complete series separated into five-note sub-sequences.

Sub-sequence 1 begins in measure 101, followed by the vamp, then sub-sequence 2-3 in measures 106-107, vamp, sub-sequences 4-6 in measures 155-117, vamp, sub-sequences 7-10 in measures 126-129, and so on.

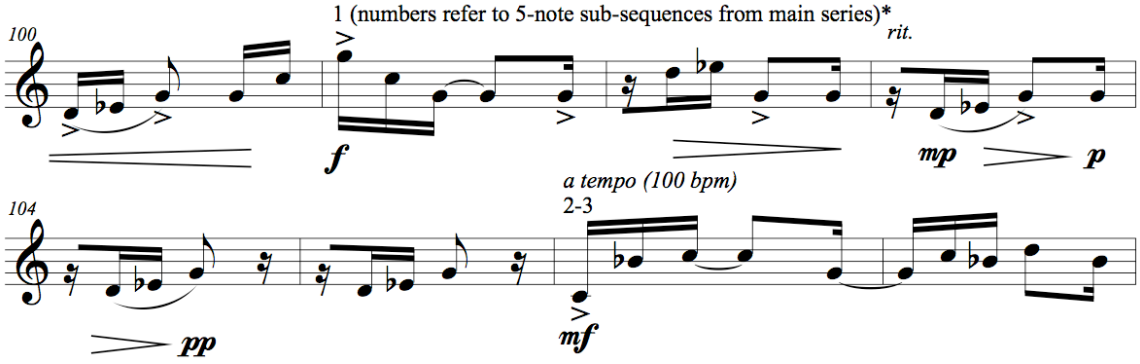

Figure 21. From *Call of the Messenger*: sub-sequences 1-3, with vamp material.

In measures 184-239 of *Call of the Messenger*, some vamp material is interjected, but the main material is unfolded more quickly. In the example below, the flute plays

groups 9-14, beginning with the G on the sixth sixteenth-note of measure 203. Group 13 ends on the F, on the second sixteenth-note of measure 209. The 14th group proceeds with the first three pitches starting on the third sixteenth-note of measure 209.

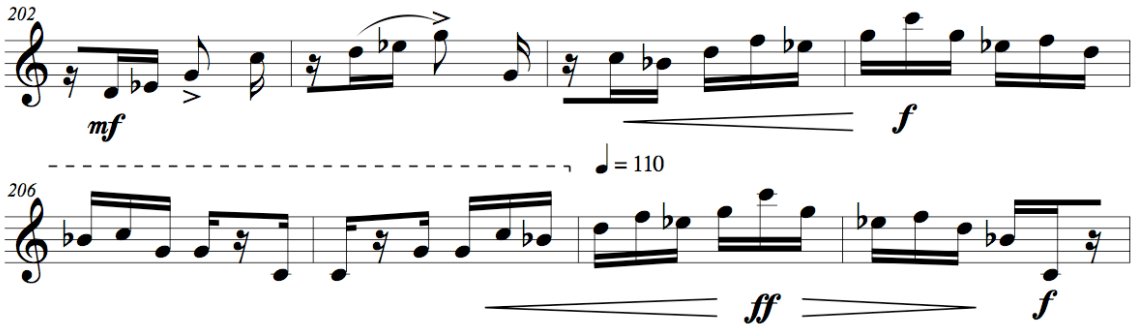

Figure 22. *Call of the Messenger*, sub-sequences 9-13.

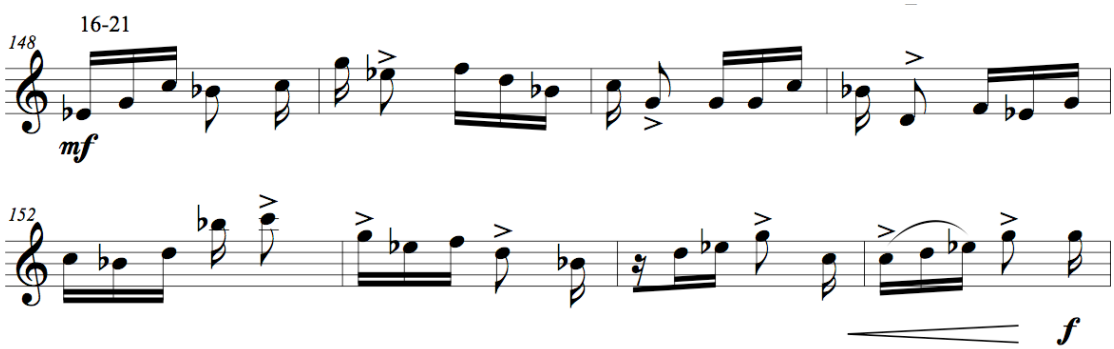

Figure 23. *Call of the Messenger*, measures 148-155.

The pattern of pitches from groups 16-31 were chosen (for their musical character) to be the central heroic 'messenger' material.

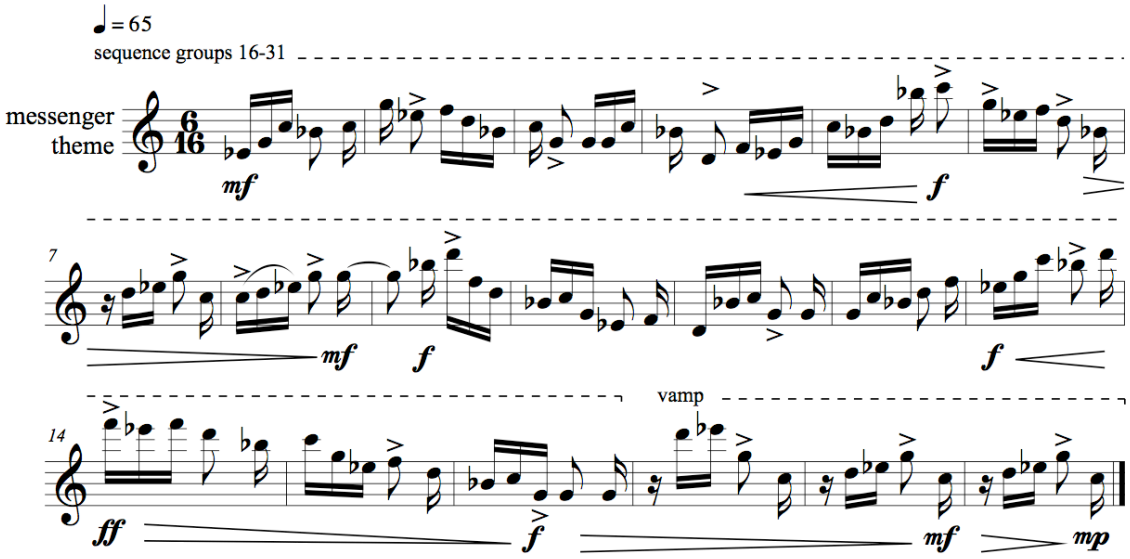

Figure 24. Early sketch of heroic 'messenger' material.

This appears in *Call of the* Messenger, measure 148, with some vamp interruption; and it appears continuously in the main body of *Ceremony of Superheroes* in measures 160-176, and 553-569. Measure 177 returns to the vamp. Here, it is re-metered and doubled in the strings. Below, only the violin line is shown.

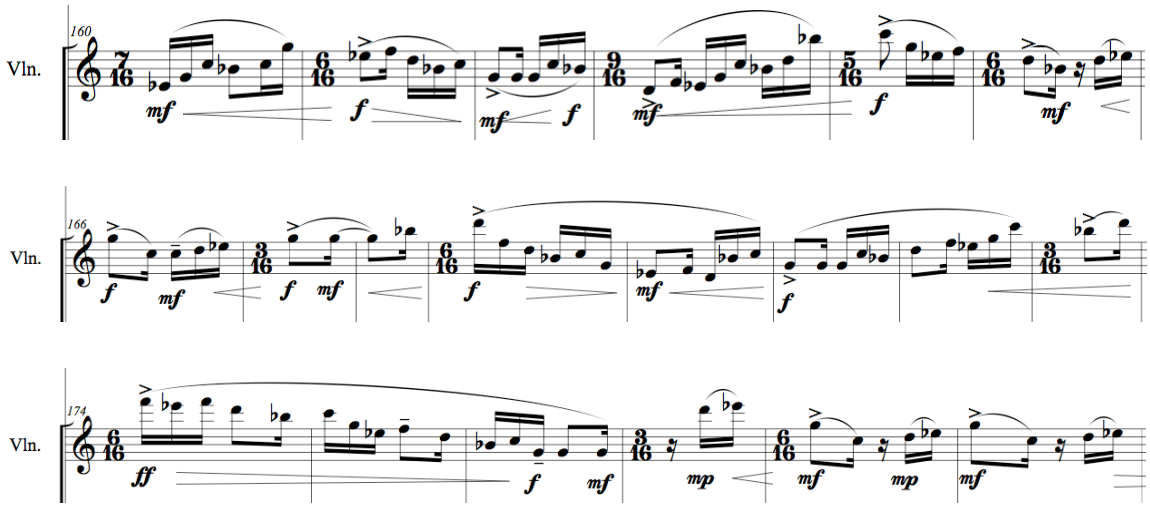

Figure 25. *Ceremony of Superheroes*, violin, measures 160-179.

The musical language of the 'messenger' reaches its full expressive and metaphoric potential when the complete ordered series has been gradually and systematically revealed. As the flute plays through her series in order, she metaphorically reveals a musical code representing the seat of her power, and the antidote for intoxication by 'shadow' forces. Her musical code's gradual but persistent revelation represents steadiness, balance, symmetry, and the inevitability of the hero's victory. Structurally, this drive to material saturation in the flute (and strings) produced many nested palindromic structures. Some are perfect palindromes, while others are slightly altered and asymmetrical. Palindromes, retrograde material and larger symmetries of form and repetition are all important to the structure of *Ceremony of Superheroes;* and they inspired the design of the original ordered series. In turn the series, by its own design, produces a richness of unexpected palindromes and altered palindromes[28]. The

[28] An 'altered palindrome' refers to a series of pitches that is nearly a perfect palindrome, except for slight deviations. I liken this to Morton Feldman's concept of 'crippled symmetry' especially as found in his

flute and its 'messenger' material, is especially informed by palindromes and retrograded ideas, expressing symmetry, return, and balance. These narrative metaphors are germane to the character played by the flute, expressing steadiness, serenity, and a confidence of identity. The flute knows where she must go and remembers from where she has come.

Figure 25 below, I show some of the nested palindromes that occur within the span of the first six of the five-note sub-sequences. There are many more nested palindromes within this section and throughout the entire ordered series. I have selected some that are illustrative of how palindromes are formed and unfolded throughout the piece.

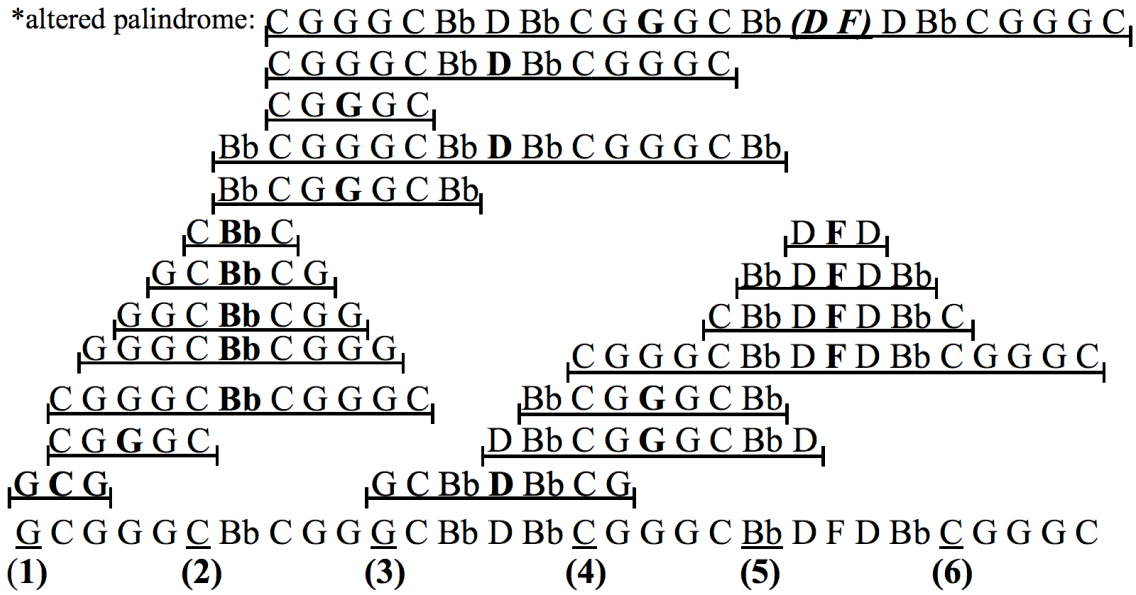

Figure 26. Selected nested palindromes.

later works such as *Piano and String Quartet* (1985). Similar structures can also be found in Ruth Crawford's String Quartet (1931), where certain palindromes are altered only slightly.

The last line of the above example (Figure 26) shows the first six sub-sequences with their corresponding pitches. Above them, selected palindromes found within the larger ordered series contain center pitches highlighted in bold. On the first line, an altered palindrome contains deviant pitches highlighted in bold and italics, with parentheses. Despite the 'D F' deviation, this sequence can still be heard as highly symmetrical. Palindromes and retrograde sequences of material were used throughout *Ceremony of Superheroes*.

The 'messenger' ordered series outlined in Figure 20, was an important source in developing the remainder of the musical language of the piece; including the selection and development of contrasting material. Pitch classes not used in the 'messenger' material were selected for the clarinet ('shadow') material, marking clear contrast between the two in terms of pitch class set. The keyboard material was then informed by a hybrid of both 'messenger' material and 'shadow' material, integrating both sides of their harmonic distinction and providing a transitory voice in the ensemble. The strings support the flute and 'messenger' material. The keyboard belongs to both creative (embodied by the flute and strings), and shadow (embodied by the clarinet) forces. I developed the clarinet material to be antithetical to the original flute material. This provided an opportunity to present a narrative distinction between the roles of the instrumentalists in terms of dramatic character and identity. If the character played by the flute reflects consonant intervals with steadiness and sustain, the clarinet exhibits dissonance and instability.

Early clarinet sketches contained a similar method and pattern as was used in the

flute material. I wrote an intuitive sketch that incorporated both: new pitches (i.e. F#, G#, A), and more aggressive and erratic activity ('shadow' material).

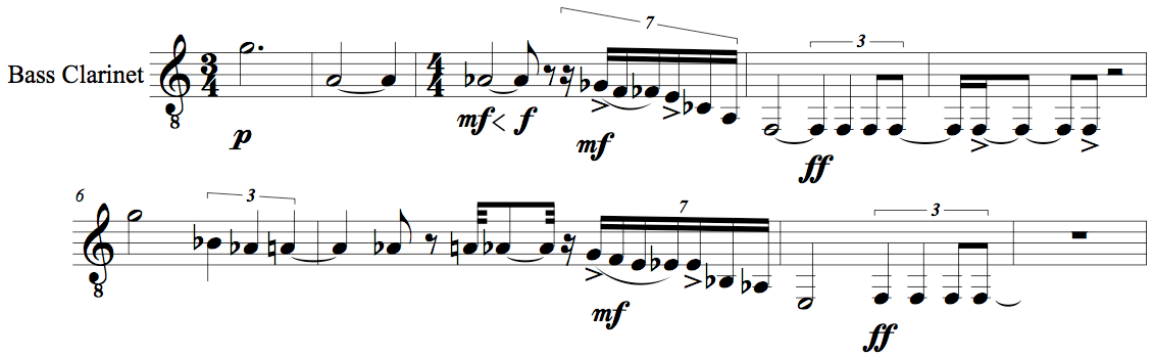

Figure 27. Early bass clarinet sketch (4/17/12).

I then selected another repeated ordered series of pitches (Ab G D# E F# C, Ab G D# E F# C), and used the same sequence as before:

0 1 0 0 0 1 2 1 0 0 0 1 2 3 2 1 0 0 0 1 2 3 4 3 2 1 0 0 0 1 2 3 4 5 4 3 2 1 0 0
0 1 2 3 4 5 6 5 4 3 2 1 0 0 0 1 2 3 4 5 6 7 6 5 4 3 2 1 0 0 0 1 2 3 4 5 6 7 8 7
6 5 4 3 2 1 0 0 0 1 2 3 4 5 6 7 8 9 8 7 6 5 4 3 2 1 0 0 0 1 2 3 4 5 6 7 8 9 10
9 8 7 6 5 4 3 2 1 0 0 0 1 2 3 4 5 6 7 8 9 10 11 10 9 8 7 6 5 4 3 2 1 0 0 0

to produce the resulting mapping:

Ab G Ab Ab Ab G D# G Ab Ab Ab G D# E D# G Ab Ab Ab G D# E F# E
D# G Ab Ab Ab G D# E F# C F# E D# G Ab Ab Ab G D# E F# C Ab C
F# E D# G Ab Ab Ab G D# E F# C Ab G Ab C F# E D# G Ab Ab Ab G
D# E F# C Ab G D# G Ab C F# E D# G Ab Ab Ab G D# E F# C Ab G D#
E D# G Ab C F# E D# G Ab Ab Ab G D# E F# C Ab G D# E F# E D# G
Ab C F# E D# G Ab Ab Ab G D# E F# C Ab G D# E F# C F# E D# G Ab
C F# E D# G Ab Ab Ab

These early clarinet sketches employ contrasting pitch material with the same rhythm as was used in the beginning of the flute material. I later discovered that this

approach did not produce the desired amount of difference.

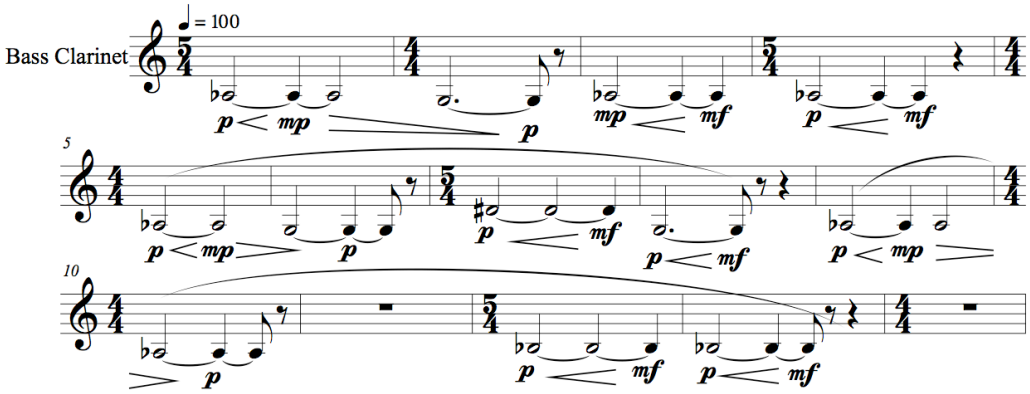

Figure 28. Early clarinet sketch 2 (10/09/12).

The faster, more rhythmic activity in the second section of *Call of the Messenger*, was exchanged here for more extreme, erratic, and unpredictable rhythmic activity:

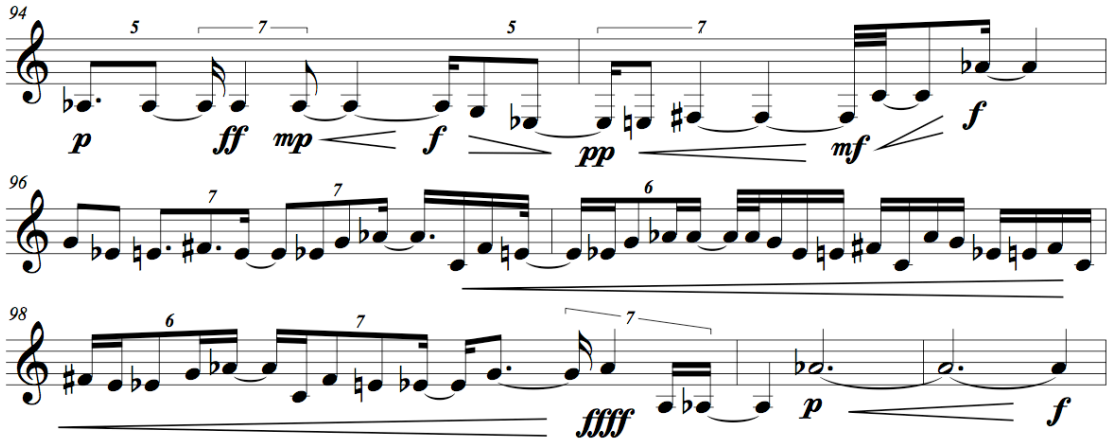

Figure 29. Early clarinet sketch 3 (1/15/13)

After an early reading session with the clarinetist, it became apparent that the electronics system would yield more expressive results with some specific adjustments in the clarinet material. I realized that material favoring some extreme long tones, mixed with erratic, quick rhythms, and extreme dynamics (approached both gradually and suddenly) would achieve a more effective result considering the role of the clarinet and the behavior of the electronics. I realized that an extremely gradual crescendo would allow the (amplitude-mapped frequency-shifting) electronics to slowly engage with a larger range of effect. I revised the clarinet material so that over the course of a complete outward breath (approximately twenty-five to thirty seconds) the clarinet crescendos from pianissimo to fortississimo, and as each successive frequency-shifter is engaged, the electronics create a slow vibrato-like beating that steadily increases in variety of difference tones and beating, rhythmic effects, and timbral shifts.

Additionally, I noticed that even when mapped to a different ordered series, using the same sequence produced material too reminiscent of the 'messenger' material.

In response to these discoveries I revisited the material, and selected a new, but related series of pitches, and a new pattern sequence. To create a faster unfolding of the material, I removed the repeated 0's in the sequence. I began with the same initial six pitches: Ab G D# E F# C; and their retrograde order: C F# E D# G Ab. I connected them with the Ab in the middle to create the eleven-note palindrome, with the ordered series of pitches: C F# E D# G Ab G D# E F# C, and the sequence:

0 1 0 1 2 1 0 1 2 3 2 1 0 1 2 3 4 3 2 1 0 1 2 3 4 5 4 3 2 1 0 1 2 3 4 5 6 5 4 3
2 1 0 1 2 3 4 5 6 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7
8 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 10 9 8 7 6 5 4 3 2 1 0;

to produce the resulting mapping:

C F# C F# E F# C F# E D# E F# C F# E D# G D# E F# C F# E D# G Ab G D# E F# C F# E D# G Ab G Ab G D# E F# C F# E D# G Ab G D# G Ab G D# E F# C F# E D# G Ab G D# E D# G Ab G D# E F# C F# E D# G Ab G D# E F# E D# G Ab G D# E F# C F# E D# G Ab G D# E F# C F# E D# G Ab G D# E F# C

This time, the sequence unfolds in a manner similar to the original sequence used for the 'messenger' material, but without repeating the first position upon return. It reaches completion when all eleven positions have been unfolded.

The core motive of the clarinet was derived from this sequence. The first twenty-eight pitches appear in sequence for the first time in *Ceremony of Superheroes*, measure 302. They follow the above mapping exactly, except for two deviations, at the thirteenth and eighteenth pitches. These pitches break up the systematic consistency of the clarinet material, while more specifically, adding an A# and a D. This newer sequence, combined with earlier pitch sequences (both sharing many common pitches) was used to derive hybrid material (a mix of 'messenger' and 'shadow' material) for the keyboard and clarinet parts.

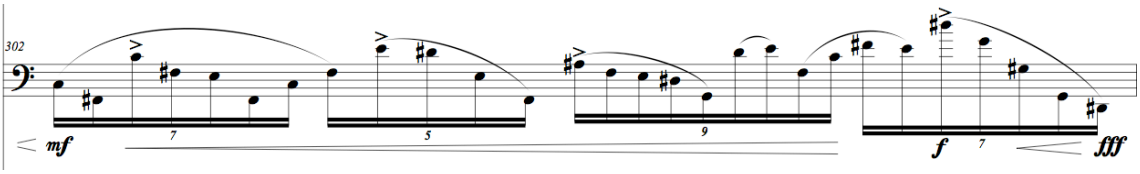

Figure 30. *Ceremony of Superheroes* principal clarinet material, measure 302.

Compare the original vs. resultant first twenty-eight pitches of the clarinet motive:

Original series:

C F# C F# E F# C F# E D# E F# C F# E D# G D# E F# C F# E D# G Ab G D#

Resultant series (with deviations underlined):

C F# C F# E F# C F# E D# E F# A# F# E D# G D E F# C F# E D# G G# G D#

This motive is imitated in the keyboard in mm. 352-354:

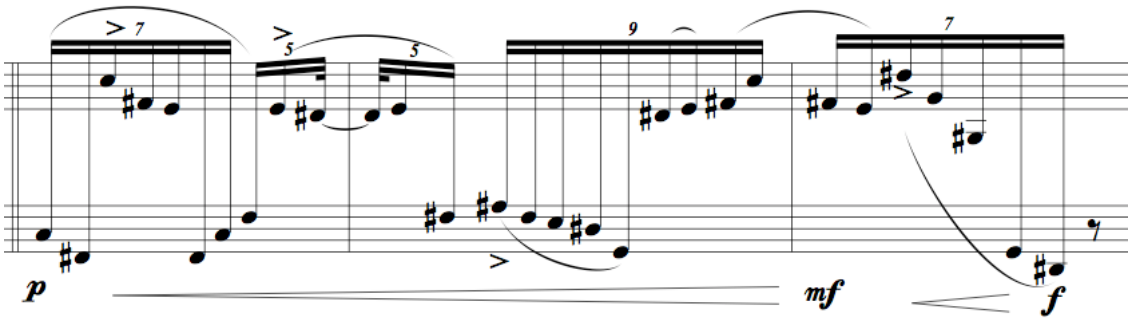

Figure 31. Keyboard, measures 352-354.

Early keyboard material was taken from second-order Markov chain improvisations that were based on analyses of both 'messenger' material and early 'shadow' material. Early 'shadow' material includes the original ordered series (Ab G D# E F# C, Ab G D# E F# C), as well as the newer revised palindrome (C F# E D# G Ab G D# E F# C). The keyboard material was developed to express 'messenger' and 'shadow' material, as well as to embody transitory instability between the two musical languages.

First, I analyzed the MIDI file exported from the *Call of the Messenger* score, and

recorded various improvisations. I chose seven segments (each from one to four measures in length) to develop for the early keyboard material. They are labeled A-G, and A(r)-G(r), for each of their retrogrades. I ordered the segments and their retrogrades into a loosely-structured larger pattern: A, B; A(r), B(r); C, B; D, C(r); D(r), E; C(r), E(r); F, G; F(r), C(r). Segments were sliced, manipulated, re-ordered, and discarded freely, as they were developed for *Ceremony of Superheroes*. Registers were adjusted and the material was edited for playability.

Selected segments and slices, can be charted throughout their evolution from primary material and sketches, to the final score. While additional material can also be traced through its evolution from early sketches to the final score, much has also been manipulated beyond clear recognition. While patterns, sequences, and systems have played an important role in the genesis of my raw materials, musical coherence and development; personal taste; and considerations of metaphoric narrativity, all outweighed loyalty to strict systematic consistency. Early segments are shown below as unedited MIDI output (from *patternGen*) and in order to show its eventual evolution, no attempt has been made to correct, develop, or manage raw material for playability:

C. Early Sketch Segments

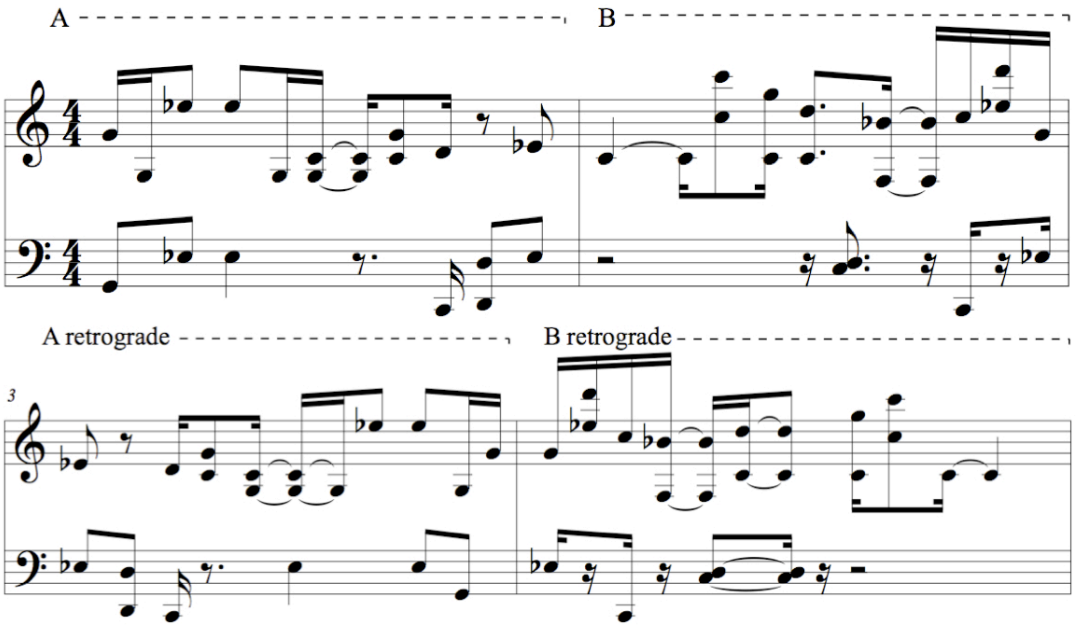

Figure 32. Segments A and B, and retrogrades (12/07/12).

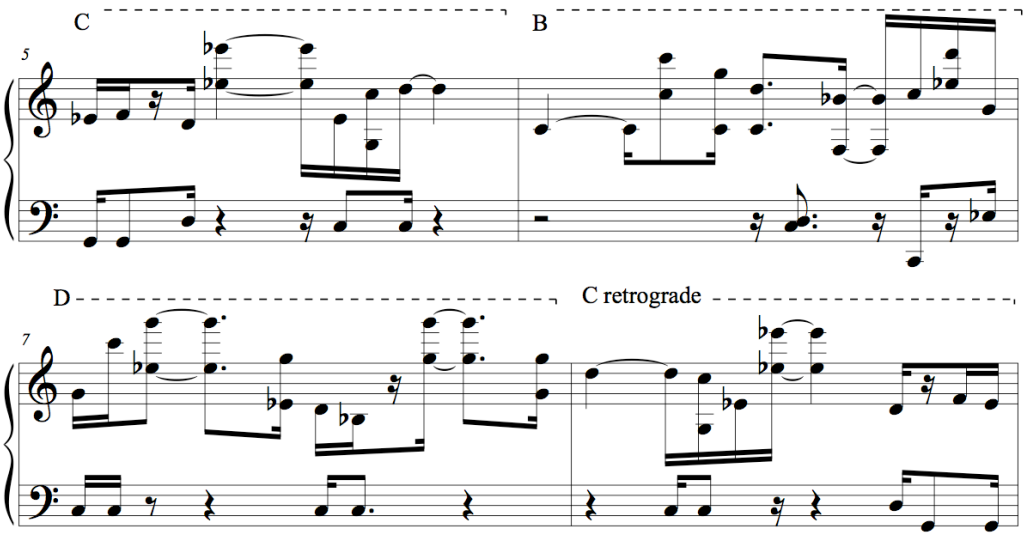

Figure 33. Segments C, B, D, and C retrograde (12/07/12).

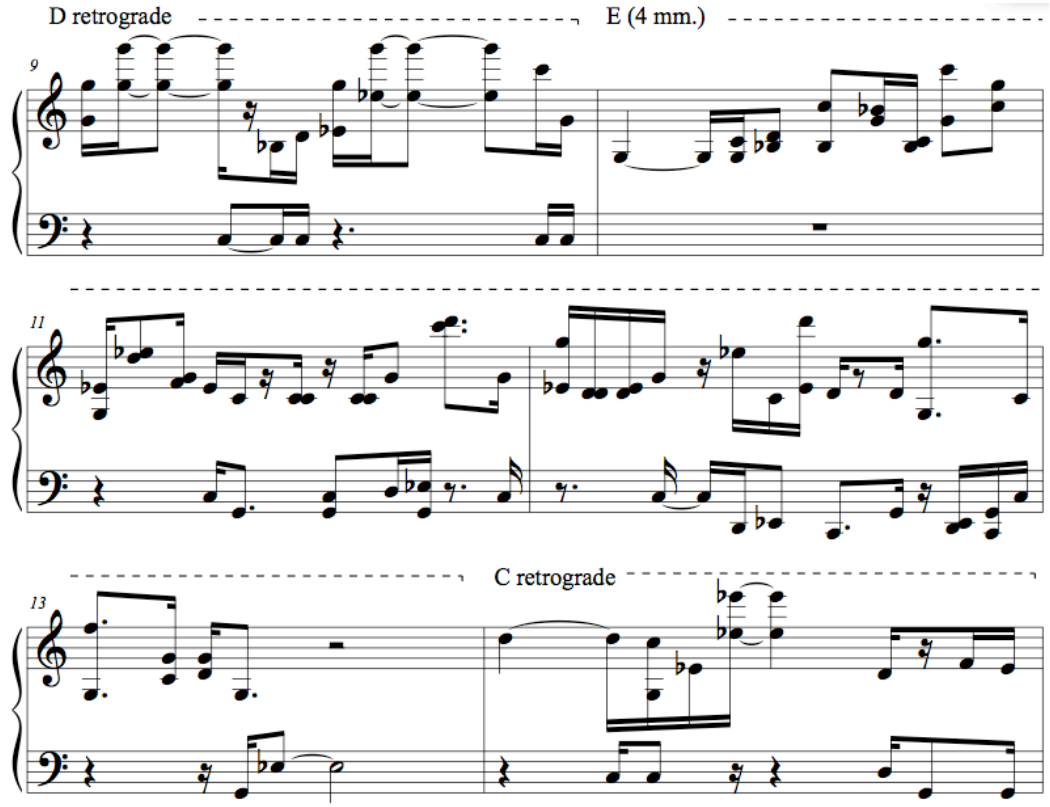

Figure 34. Segments D retrograde, E, and C retrograde (12/07/12).

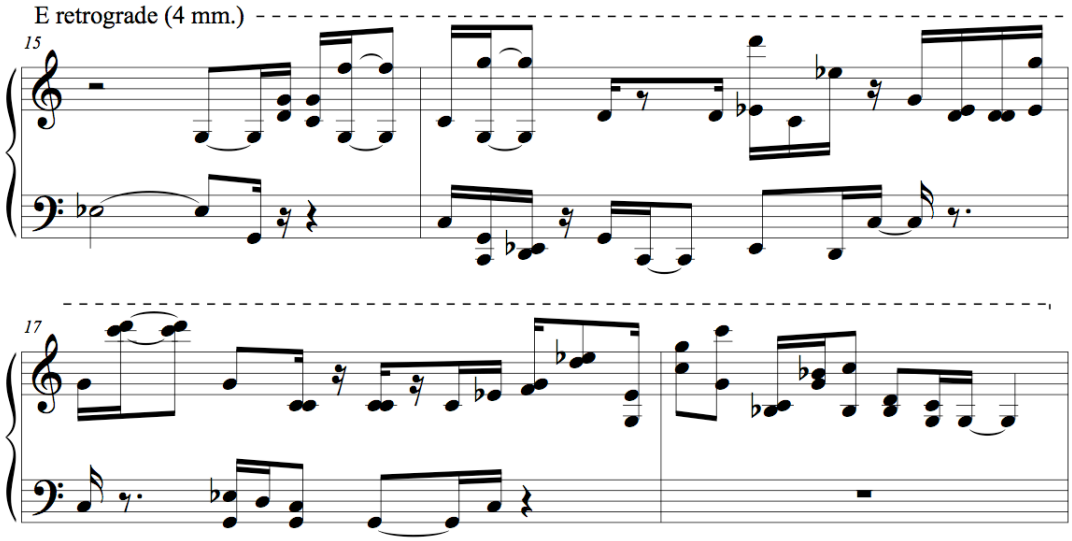

Figure 35. Segment E retrograde (12/07/12).

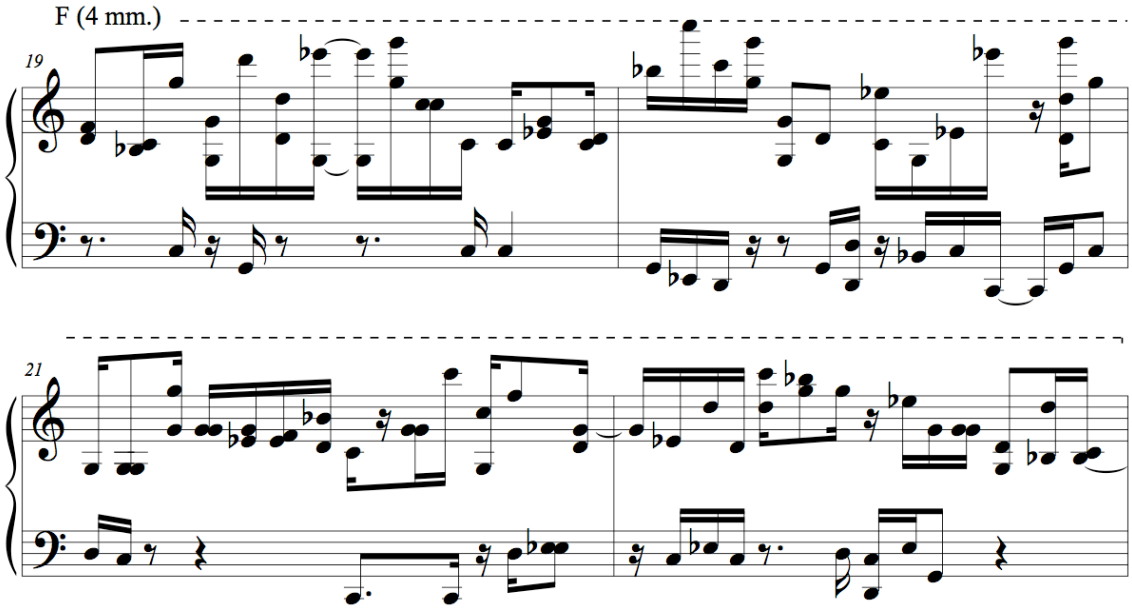

Figure 36. Segment F (12/07/12).

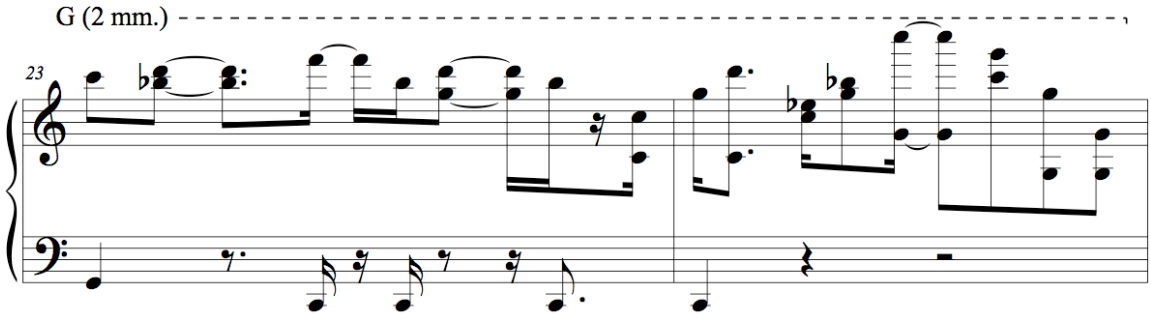

Figure 37. Segment G (12/07/12).

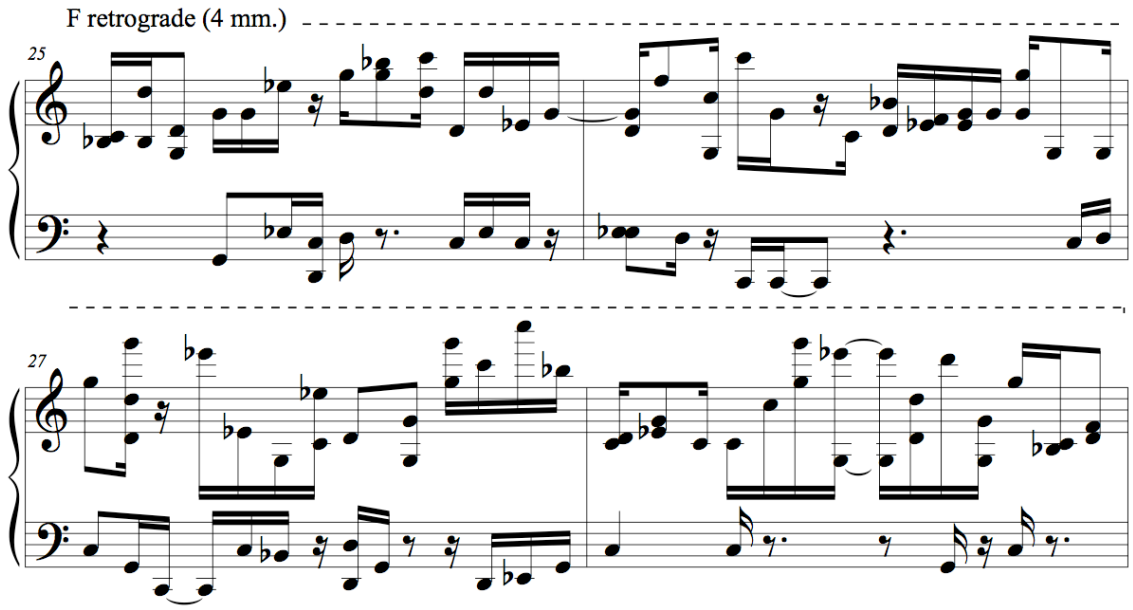

Figure 38. Segment F retrograde (12/07/12).

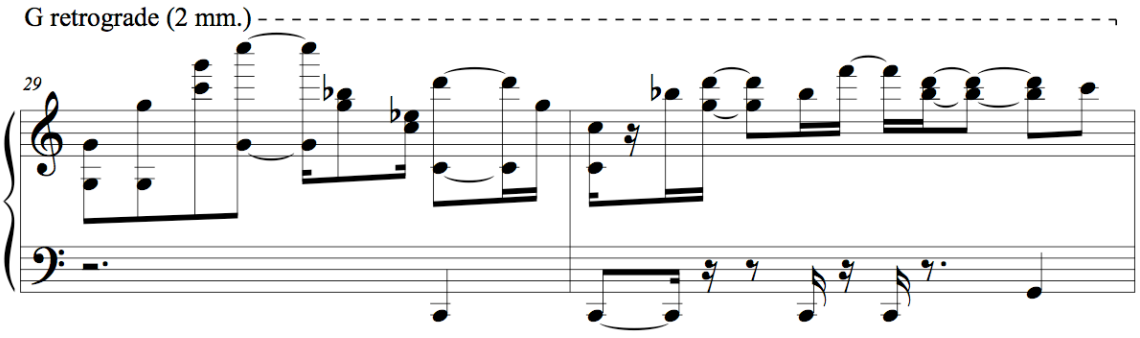

Figure 39. Segment G retrograde (12/07/12).

I generated Markov chain improvisations (A, B, C) from analyses of 'shadow' material to derive additional keyboard material. I also created improvisations based on simultaneous analyses of both 'messenger' and 'shadow' material to derive transitional material. Using my patch, *patternGen* I began by loading the analysis of *Call of the*

Messenger into the Markov system for improvisation. I would record material briefly (from thirty to sixty seconds) with only 'messenger' language. Then I would load the analysis of 'shadow' material during a continuous improvisation. When improvising, the system would arrive at pitches common to both 'messenger' and 'shadow' materials, creating a weighted possibility for transitions between 'messenger' and 'shadow' languages. In this paradigm, shared notes act as portals between 'messenger' and 'shadow' materials. This embedded narrative metaphor of the transition between states relates to the keyboard's metaphorical role in the composition, as the lonely force of transitory identity.

In preparation for the keyboard's role in the larger piece, and using the above material, I first wrote a draft stand-alone piece for solo re-tuned keyboard, entitled *Lullaby of the Lonely Gondolier*. The keyboard material in *Ceremony of Superheroes* is derived from this early piece; and for this reason I include a draft of the score as an example[29] Below I will discuss examples demonstrating the evolution of the keyboard language for *Ceremony of Superheroes*. The following selected segments were developed as the keyboard's 'messenger' material:

[29] See Appendix B: *Lullaby of the Lonely Gondolier.*

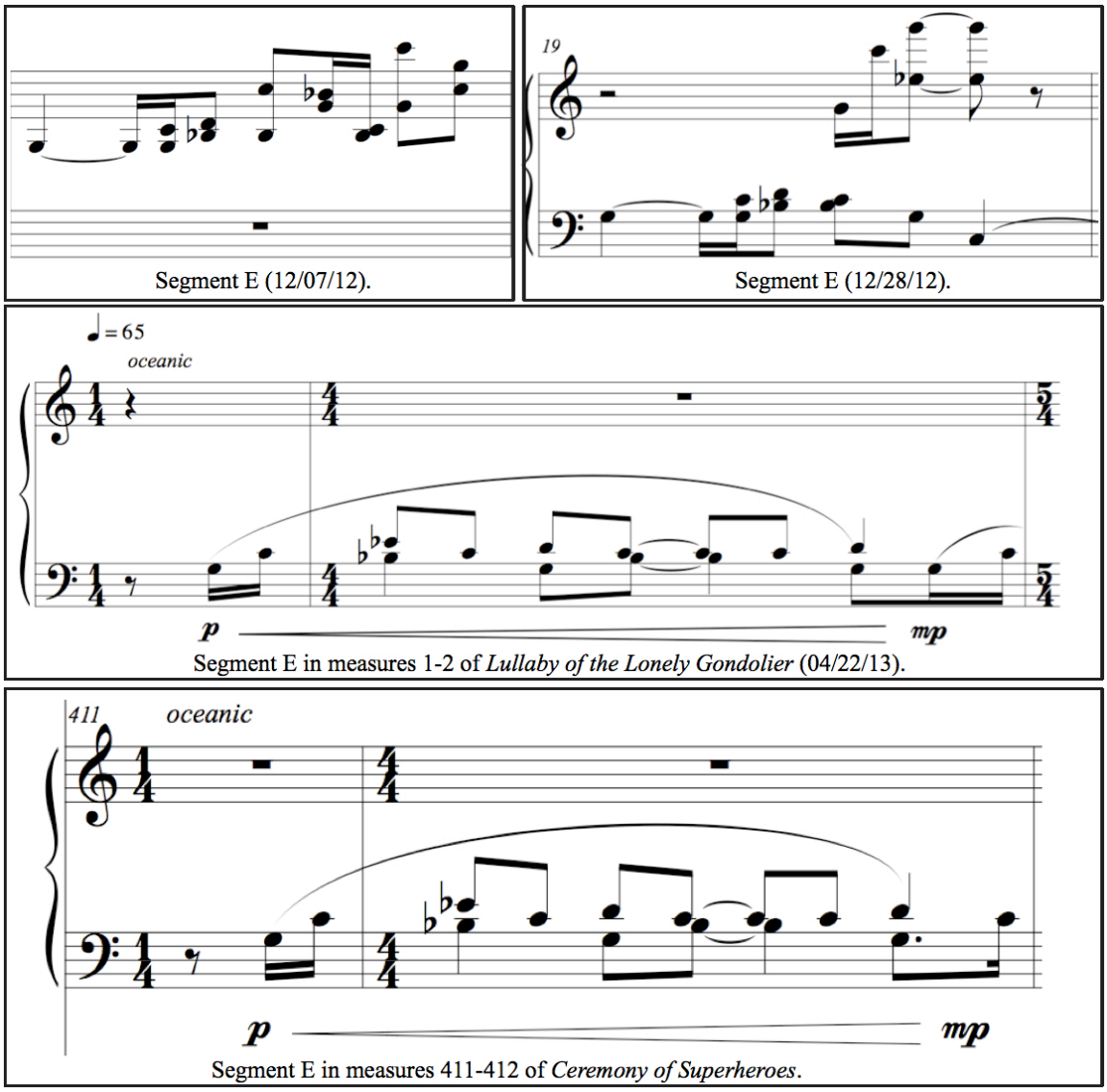

Figure 40. The Evolution of Segment E.

As seen above (Figure 40), segment E from early Markov chain improvisations evolved into introductory and vamp material for *Lullaby of the Lonely Gondolier* and *Ceremony of Superheroes*, measures 411-412.

Other important keyboard material is derived from superimposing a slice (and

eventually its retrograde) taken from the second half of segment G over the material developed from segment E. This became important motivic material for the keyboard when expressing 'messenger' material.

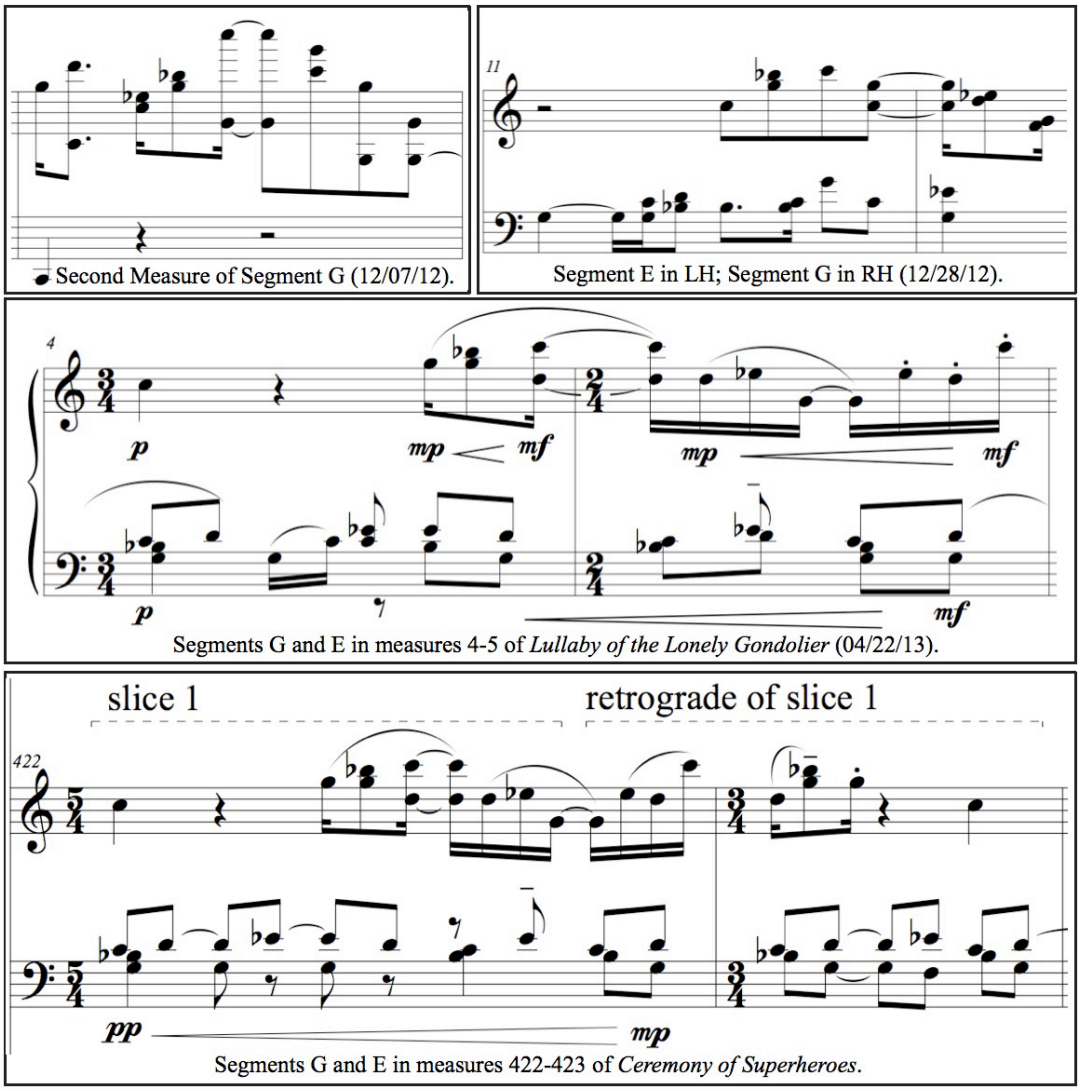

Figure 41. Evolution of Segments G and E.

This material and slight variations are found throughout the keyboard part of

Ceremony of Superheroes (i.e. measures 414-416, 418-419, 422-430).

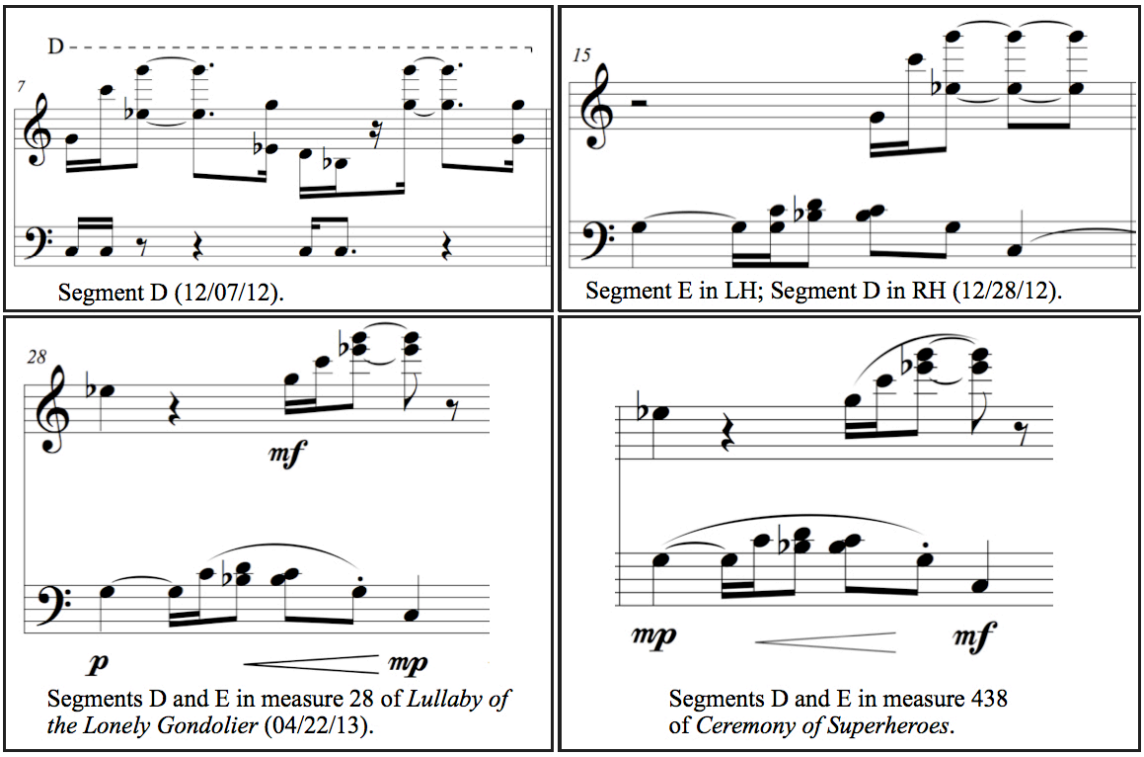

Figure 42. Evolution of Segment D.

This small motivic slice was superimposed over the left-hand vamp material. It also appears in *Ceremony of Superheroes*, measures 438-439.

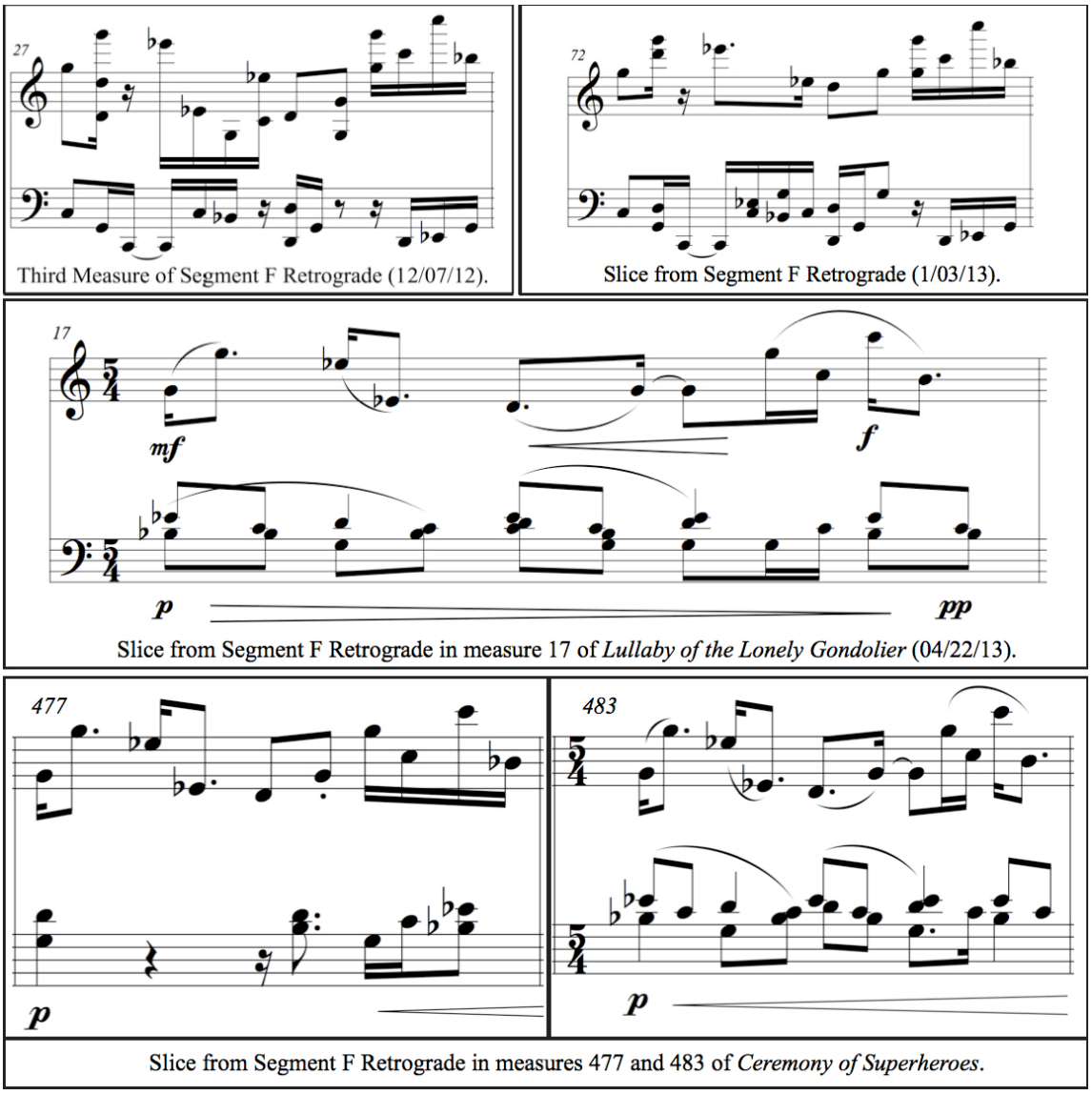

Figure 43. A slice from the third measure of Segment F retrograde.

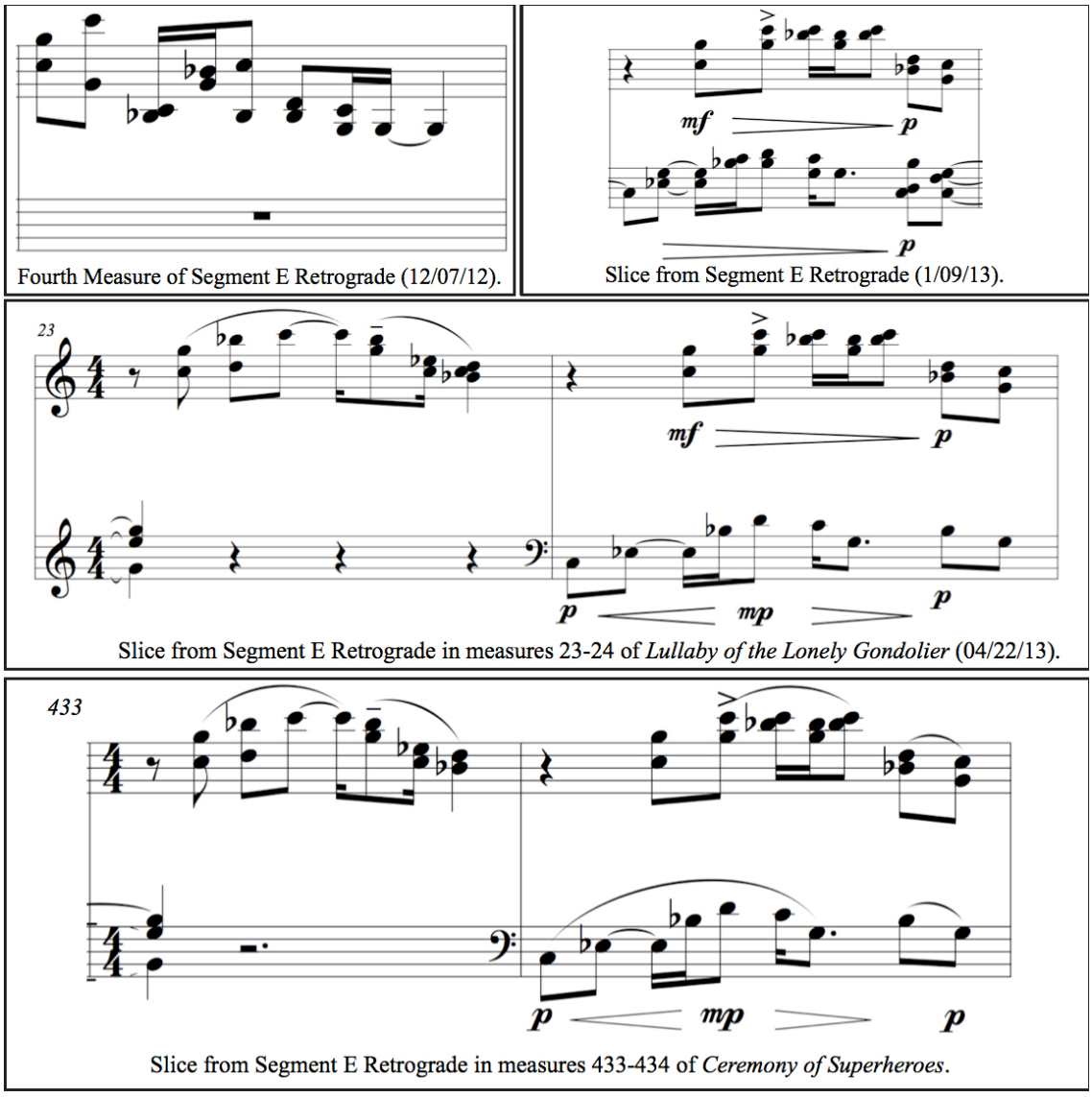

Figure 44. Evolution of Segment E retrograde.

'Shadow' material, in large part, was developed from two primary raw materials, Improvisation B and C, shown below.

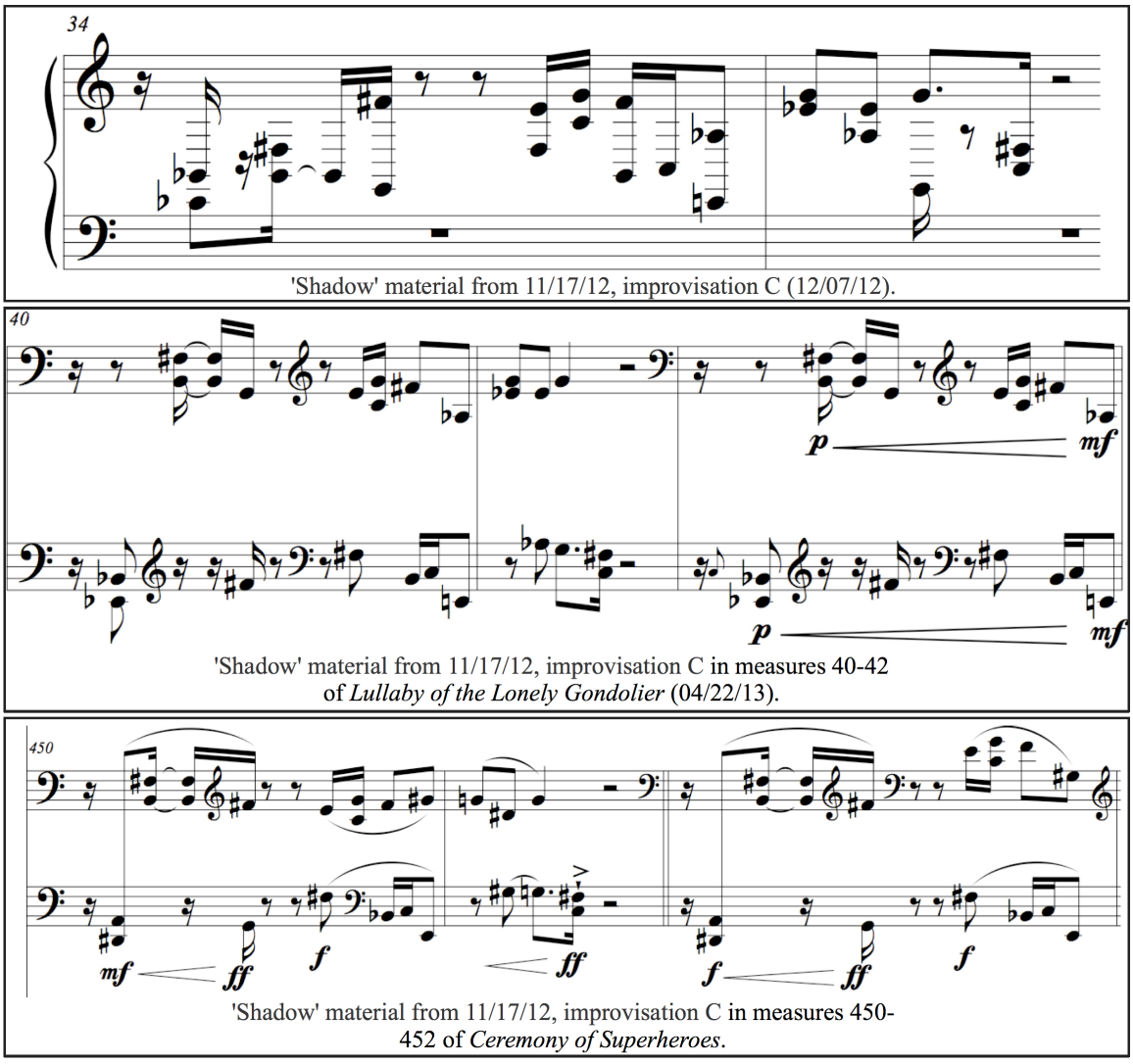

Figure 45. Evolution of 'shadow' material from 11/17/12, improvisation C.

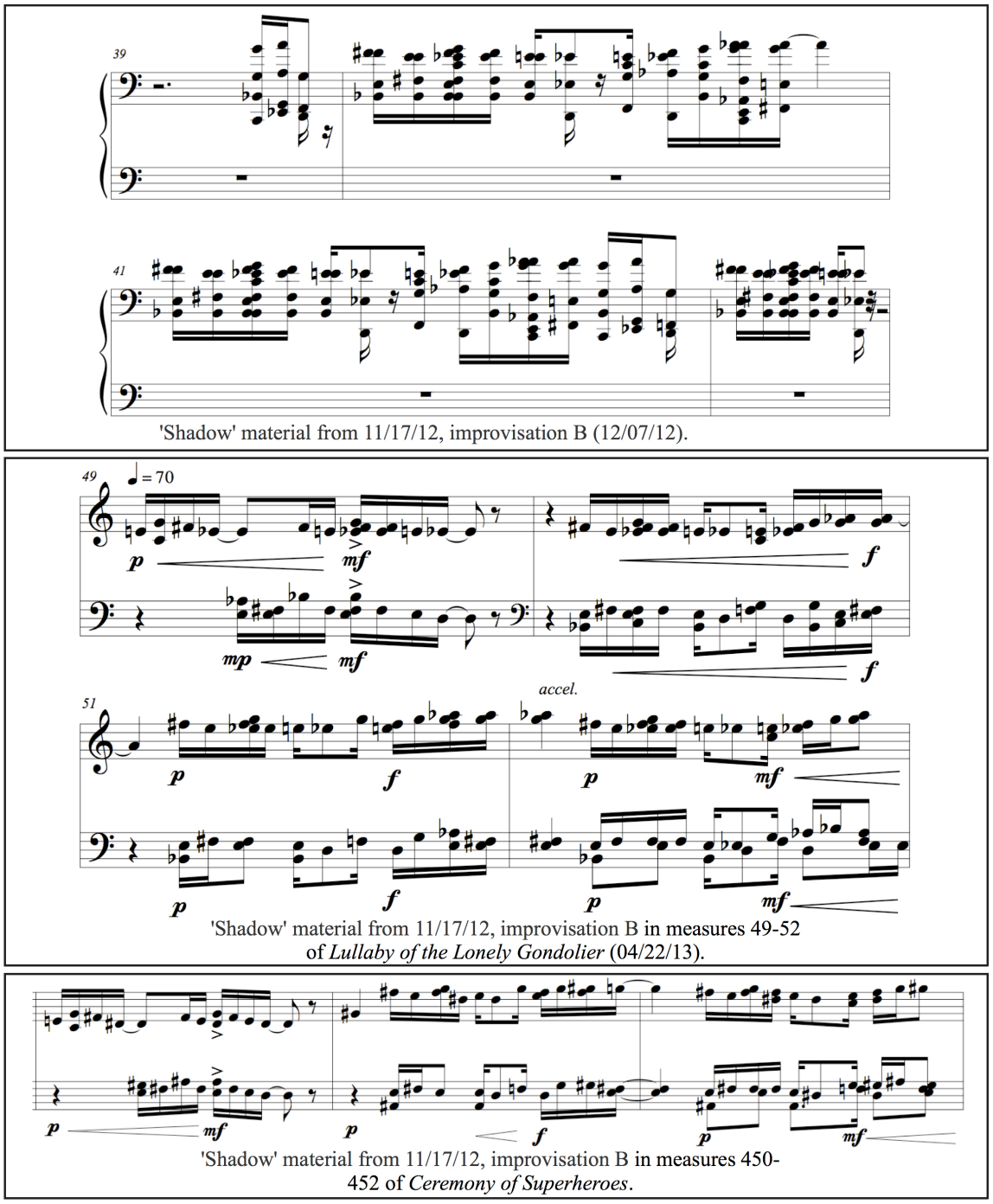

Figure 46. 'Shadow' material from 11/17/12, improvisation B.

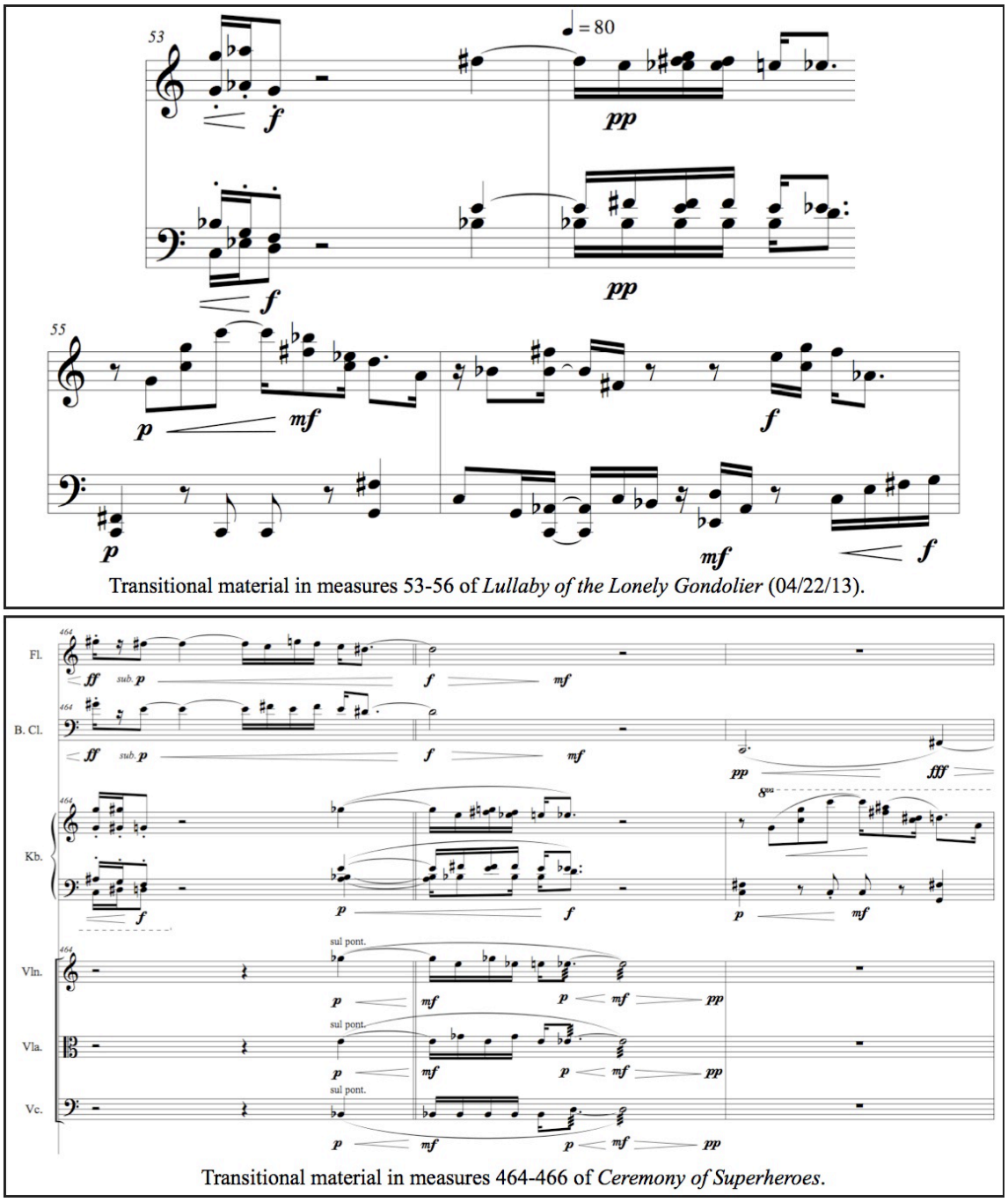

Figure 47. Transitional material.

Transitional material was created as a hybrid between the musical languages of

the 'messenger' and of the 'shadow'. In this case both 'messenger' and 'shadow' material were analyzed for Markov chain improvisations. Where they had common pitches and intervals, *patternGen* would improvise by moving between the two musical languages. Some transitional material is shown above as it appeared in the draft of *Lullaby of the Lonely Gondolier* and then as is became orchestrated for *Ceremony of Superheroes*.

D. *Shapeshifters*

The material for the strings (violin, viola, cello) was conceived as a mimetic orchestration of the combined effect of the acoustic 'messenger' material mixed with the resulting electronics. The strings especially mimic the delayed playback and the resulting overlapping motivic lines and harmonies that were originally generated by the flute. Their nature relates to their role as 'shapeshifters', taking on the musical qualities of others and supporting the 'messenger' by adding power, resonance, and new timbre to the 'messenger' material. The electronics for the strings also mimics whatever musical voice that they embody at a given time, as 'shapeshifters'. If their power is to assume other forms and adopt other voices, their weakness is susceptibility to domination by influential forces.

In preparation for the larger piece, I first wrote a stand-alone piece for solo bass flute, C flute, and string trio (violin, viola, cello), entitled *Shapeshifters*. The vast majority of the strings material in *Ceremony of Superheroes* is derived from this early

draft; and for this reason I include a draft of the score as an example[30]

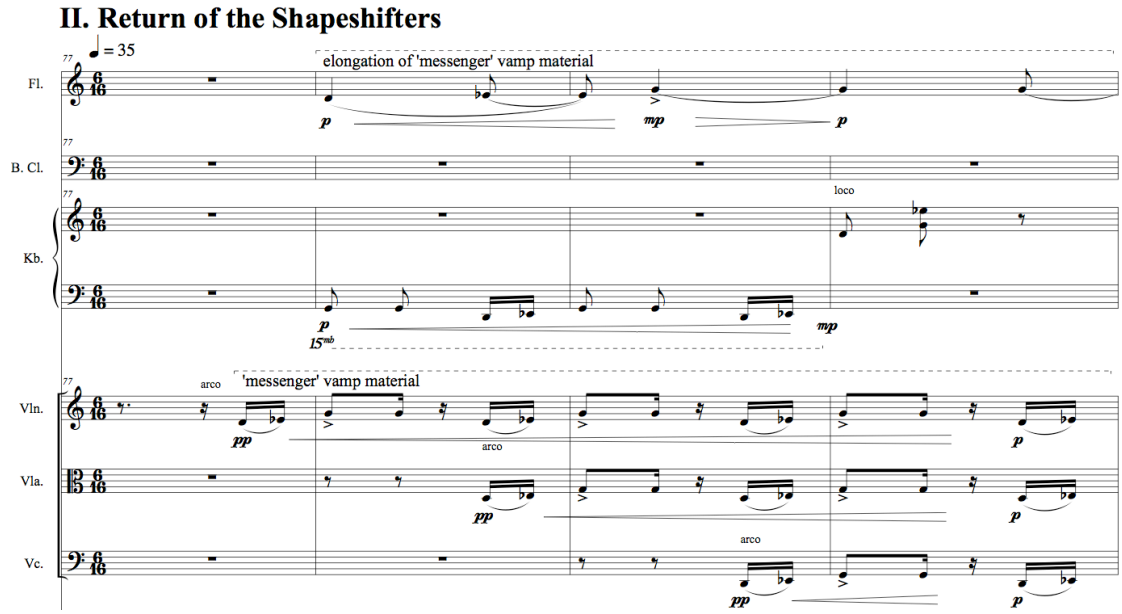

Figure 48. *Ceremony of Superheroes* measures 77-80.

This shows the 'messenger' vamp material[31] as it appears at the beginning of the second movement of *Ceremony of Superheroes, Return of the Shapeshifters*; with the flute playing a rhythmically elongated version of the vamp material. It is taken from the material at the beginning of *Shapeshifters*.

[30] See **Appendix B**: *Shapeshifters*-draft (04/07/13)
[31] See **Figure X.** 'Messenger' vamp material.

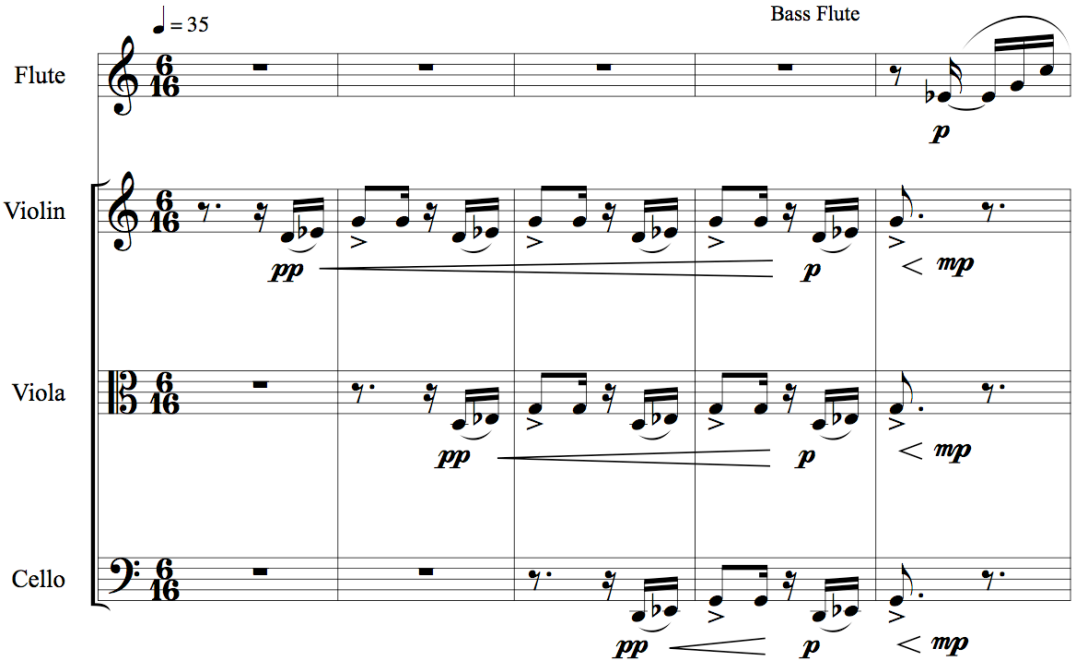

Figure 49. *Shapeshifters* measures 1-4.

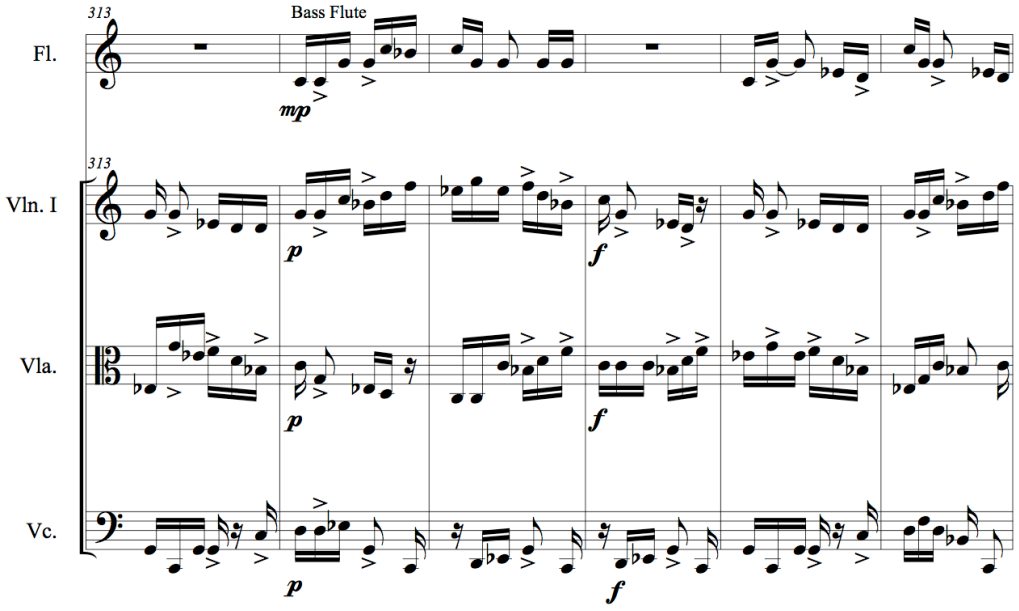

Figure 50. *Shapeshifters* measures 313-318.

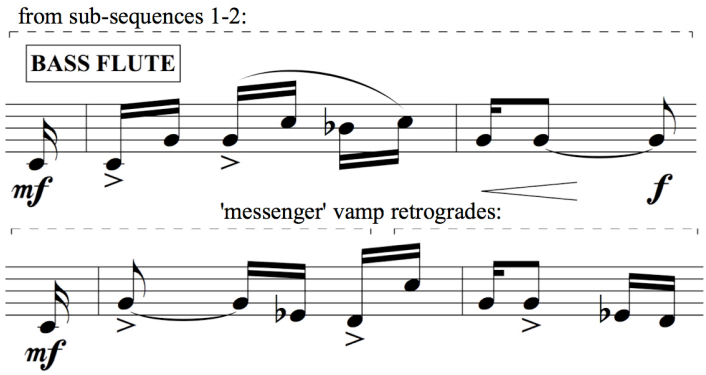

Figure 51. *Ceremony of Superheroes,* bass flute*,* measures 773-778.

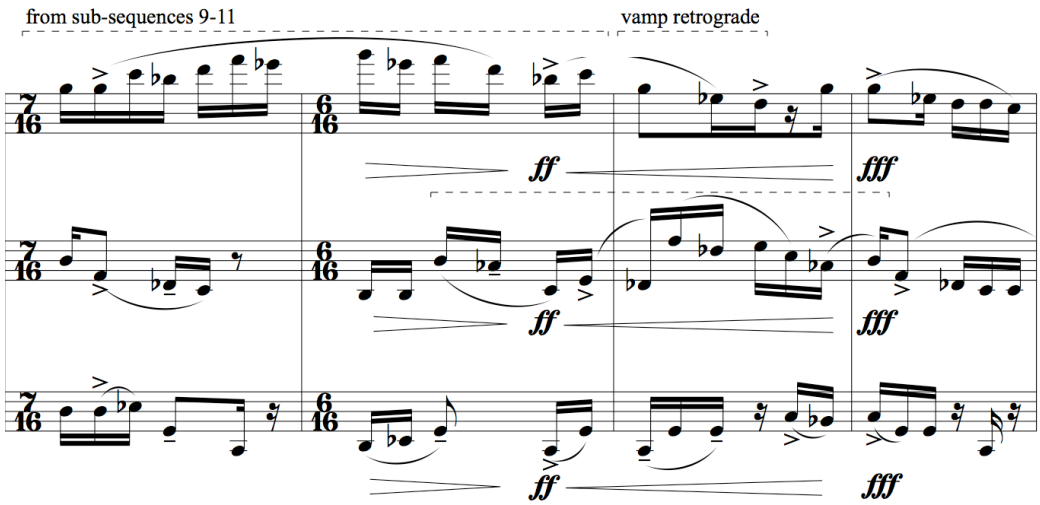

Figure 52. *Ceremony of Superheroes,* strings, measures 743-745.

The violin line above forms a palindrome with the high G (m. 744) as the pivot tone. The viola and cello play other sub-sequences and vamps that can be traced back to the original 'messenger' ordered series and it's sub-sequences.

Figure 42 shows some palindromes in the beginning of the fifth movement, *Run River*:

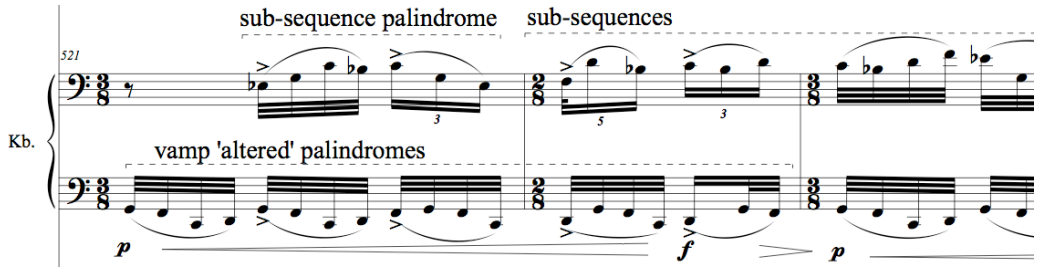

Figure 53. Vamps, sub-sequences, and palindromes in *Run River*.

E. Musical Material, Live Electronics, and Metaphor

Developmental decisions related to the relationships and interactions between instrumentalists, musical material, electronics, and larger-scale formal elements, were aided by iteratively-evolving character, and narrative metaphors. Narrative distinction between character archetypes was conceived to be played out in the realm of conflicting harmonic vocabularies; in which characters would seek to establish their musical language as dominant through insistence, repetition, and persuasion. This is especially true for interactions between the clarinet and the flute.

The character archetype that was developed as the 'messenger', attributes to the role of the flute, a series of mythological qualities and abilities such as transcendent communicative and leadership skills; the ability to communicate across worlds; the power to sustain her voice and to communicate in many voices simultaneously; the ability to call upon her sidekicks (strings) at great distance; and the power to persuade her enemies and control their communications. The 'messenger' also has a precise language, or code, that is embodied by the 'messenger' ordered series; the gradual and systematic

revealing of which relates to an inevitable persistence of the character's language. Her code/language relates to the seat of her power, and her hypnotic abilities; and implies that her message is ever-present, waiting to be un-coiled. Her sidekicks, the strings, assume her language and mimic her language in solidarity.

The flute's method of sound production is acoustically, relatively simple and direct. That the flutist breathes directly through her instrument to produce clear and steady sounds with her breath, influenced the development of the 'messenger' archetype. Meanwhile the bass clarinet, the more physically imposing instrument, is also more mechanical, requiring mediation through a reed (producing more complex spectra) for sound production. Additionally, the clarinet's ability to produce low frequencies with considerable power, contributed to its casting as the 'shadow', or oppositional character archetype in this case. This 'shadow' character metaphor was designed develop material that would balance and challenge the 'messenge' material. The electronics function to split and shift the frequencies of his instrument, forming the character's strength (the power to deteriorate stability in others) and weakness (the inability to sustain pitch-stability).

In *Ceremony of Superheroes* the electronically-produced sounds are meant to be identified as coming from each individual performer, from their instrument, from their super-personas. When the audience recognizes a sound source it is usually because of gestural, spatial, timbral, and causal connections perceived between the sound and its source. The electronics systems were developed for each performer to highlight specific qualities of each character archetype and to represent their unique superpowers. For

example, the flutist plays the 'messenger' character, and the electronics extend her expressive abilities, 'allowing her to speak in multiple voices'. The audience understands the source to be from the flute primarily because of the amplitude-to-playback mapping, pitch and timbre, and the delayed playback of the flute sounds. It speaks to her power of control over her electronically-produced (and re-produced) sounds.

In some cases it is very clear to the audience which sounds are coming from the acoustic instrument vs. the speakers; and in other cases this perception is confused. Conceiving of the electronics as an extension of the performers' expressive toolkit, it was meaningful to obfuscate the perceptual line between acoustic and synthetic sounds. For example, the bass clarinet's electronics system is a series of frequency-shifters that are activated and controlled by amplitude so that when the clarinet plays very quietly there is no electronic effect, and as it plays a gradual crescendo, the electronics come in very slowly. First we hear a clear, steady low tone, with no vibrato, then we begin to hear the effect of the first frequency-shifter, then the others gradually become active as he increases to maximum loudness. The listener at first perceives what sounds like an acoustic clarinet moving from no vibrato, to ever-increasing vibrato; and even at its extreme, is reminiscent of a dijeridoo, clarinet multiphonics, or the result of singing into the instrument while playing. At more intense dynamics and faster rhythms it sounds more synthetic.

When a recorded or delayed sound mimics an onstage live source it can have a variety of impacts on the audience. To mimic implies a temporal ordering as well as a distinction in originality or authenticity. Like traditional repetition, it can invoke memory

within the context of the piece, reinforcing the musical language developed. It may be heard as the voice of an overseeing narrator; sound from the environment in which the onstage actions take place; a transcendent force; or a an aspect of a character's psyche. It may be heard as an echo, or residual effect of an onstage action. If there is continued meaningful interactions between the two sound realms, then a dialogue may be perceived between an onstage actor and an unseen, or transcendent force. Because of its lack of an onstage source, it becomes dis-embodied from the immediate musical action; however, because it comments on material previously perceived, it can be understood to pertain to the same musical world.

In *Ceremony of* Superheroes, the strings mimic the material of the flute both acoustically and through their electronics. The strings, playing the archetypal characters of 'shapeshifters' take on the sounds of their environment and other characters. That they mimic (through their electronics) other sounds, helps to establish their identity in the mind of the listener. The strings' loyalty and affinity is indicated by the sounds mimic. The shapeshifters' ability to assume others forms and mimic other musical languages is both their power, as well as their greatest vulnerability. When the cello and the bass clarinet engage in a combative dialogue whereby they attempt to insist upon the other, their own musical language, the cello eventually gives way, taking on the musical material and electronic behavior of the bass clarinet. Just as the bass clarinet's pitch is unstable (through frequency-shifting), the cello becomes 'seduced' to join the clarinet, becoming unstable itself.

Ceremony of Superheroes attempted to establish an interactive relationship

between the acoustic instruments and their corresponding electronics by considering them to be mythological extensions of each performer's expressive toolkit. If sounds produced by the live electronics are the superheroic, or mythological aspect of each onstage performer, than the recorded synthetic sounds can be seen as the transcendent aspect of the recorded, natural sounds having no live source. In this case, natural sound (water) was used to recall aspects of a familiar natural environment in a dreamlike context.

To complete the analogous relationship between live sounds and electronically-produced sounds it was effective to have the acoustic instruments mimic electronic sounds. This speaks to an attempt to humanize the electronic elements by situating them as more closely connected to the expressive strategies already available to each instrument. Just as the electronically-produced effects are meant to be perceived as extending naturally from each performer, the line between the two could be further confused if the instrumental sounds were sometimes heard as 'electronic'. In *Ceremony of Superheroes* the bass clarinet begins by establishing a blurry line between natural and processed sounds, while later acoustically mimicking some of the same sound qualities. For example, extreme vibrato, multiphonics, and singing into the instrument all create acoustic sounds that may be perceived as electronic, especially in this context.

F. Audio Samples and Experimentation

In *Ceremony of Superheroes* audio samples consisted of three different types and sources: 1) mock-up samples; 2) instrumental samples; and 3) synthetically-generated

samples.

Mock-ups may be described as digitally-created synthetic realizations that approximate a musical performance. Mock-ups used in the creation of *Ceremony of Superheroes* were generated using notation software (*Finale*) to export sample-based audio files. These mock-ups at first consist of just enough musical material to begin testing how the material interacts with developing electronics strategies and systems. At the beginning of the process small musical sketch material is exported as audio, read, and played back within a *Max/Msp/Jitter* patch. While the sounds exported during the mock-up phase are ultimately a poor representation of the complexity of spectra and performative activity found in live instrument sounds, elements like pitch, harmony, rhythm, dynamics, formal structures and sometimes timbre can be decently represented in order to experiment and test developmental electronic systems. When a sound relies on extended techniques, or for any other reason cannot be satisfactorily represented in a mock-up, then imaginative calculations and working assumptions are made until rehearsal with live performers is possible. Mock-ups were especially helpful time-saving tools, as many drastic changes and small adjustments are often made to musical material as well as electronic systems prior to the first meeting with a performer.

Musical sketches and their mock-ups were developed concurrently and in dialogue with early developments in electronics systems. I wrote initial flute material designed to work with the three different electronics systems I was developing and exported them as initial mock-ups. I then tested the material with a series of different settings, combinations, and signal paths that integrated the three different approaches,

yielding a wide variety of results; as well as ideas for evolving electronic techniques throughout the other movements, and across the ensemble. The mock-ups especially allowed me to consider timing, pitch and harmonic construction, and led me to choose the most affective combination of systems, musical materials, and their narrative implications. and I decided on a combination of an 8-delay system, and Jean-Francois' spectral technique, *freeze*.[32] This combination allowed me the right balance between pitches that would be 'frozen' and layered to create harmony, with longer strings of musical material that would be delayed and layered to create multiple polyphonic melodic lines. The first-order discoveries and decisions were then applied to the first reading session; at which new, live samples were taken to test and further develop the system.

Instrumental samples were recorded at some rehearsals and used to further develop and calibrate their corresponding electronics. Discoveries made during initial experiments were used to adjust material (often during rehearsal), resulting in newly recorded live samples by the end of each rehearsal. Sketch materials and whole sections were played through the variety of systems developed for a given part, allowing the performer to experience the electronics' potential interactions; and during which time I calibrated and re-evaluated such systems' efficacy. These samples included verbatim readings as well as new techniques and experimental effects and interpretations that arose in dialogue with the performer. In the case of the bass Clarinet, initial sketch material was almost entirely abandoned after experimenting with the performer. Initial sketch material more resembled the flute's rhythms and contour, but with pitches from the clarinet's

[32]Documented and downloadable here: jeanfrancoischarles.com

language, meant to highlight pitches not found in the Flute and Strings. The activity was more steady and consistent in the initial sketches than in the final material. I realized there was great affective power and narrative clarity that could be derived from a very long sustained note with a very gradual crescendo; especially in the way it interacted with the amplitude-driven frequency-shifters. Thirty seconds of this gradual crescendo activated each level of frequency-shifting slowly enough to hear the compounding effect of layering multiple shifted frequencies; and creating a transition from a vibrato-like sound to a sound with strong beating, to one that has an altogether distinct timbral character. Naturally this gesture gave way to an extremely effective gesture in its palindrome: the loud attack followed by a very long decrescendo, in which the frequency-shifting gradually subsides, and the multiple frequencies seem to right themselves, the beating subsides, and we are left with a quiet and unaffected sustained pitch. As simple as it is, this has become a very powerful gesture in the clarinet's expressive toolkit. In this case clarinet samples (recorded at rehearsal) were very important in developing material while prototyping and calibrating the electronics. It gave me a sense of how long the clarinetist could sustain a steady pitch and how large of a dynamic range it was able to span in its crescendo. This simple sample sounding for thirty seconds allowed me to calibrate and experiment with the capabilities and results of this part of my system. The rhythm of the beating and the resultant timbral effect depended completely on the relationships between each of the frequency-shifters, and the range of shifting and the timing of their activation depended greatly on specific amplitude-mapping configurations. Using samples from rehearsals allowed me hours of calibration and

experimentation with these configurations in order to get a more effective result, without exhausting the clarinetist, and while freeing up rehearsal time for other concerns.

G. Musical Outline

Figure 54 shows an overall outline for *Ceremony of Superheroes*, highlighting selected material to illustrate its role in the larger form. The left side of the figure shows a timeline marking thirty-five, one-minute intervals, as well as the approximate timings of each movement. The movements are listed each with their name, approximate duration (in parentheses), measure numbers, and approximate start and end times.

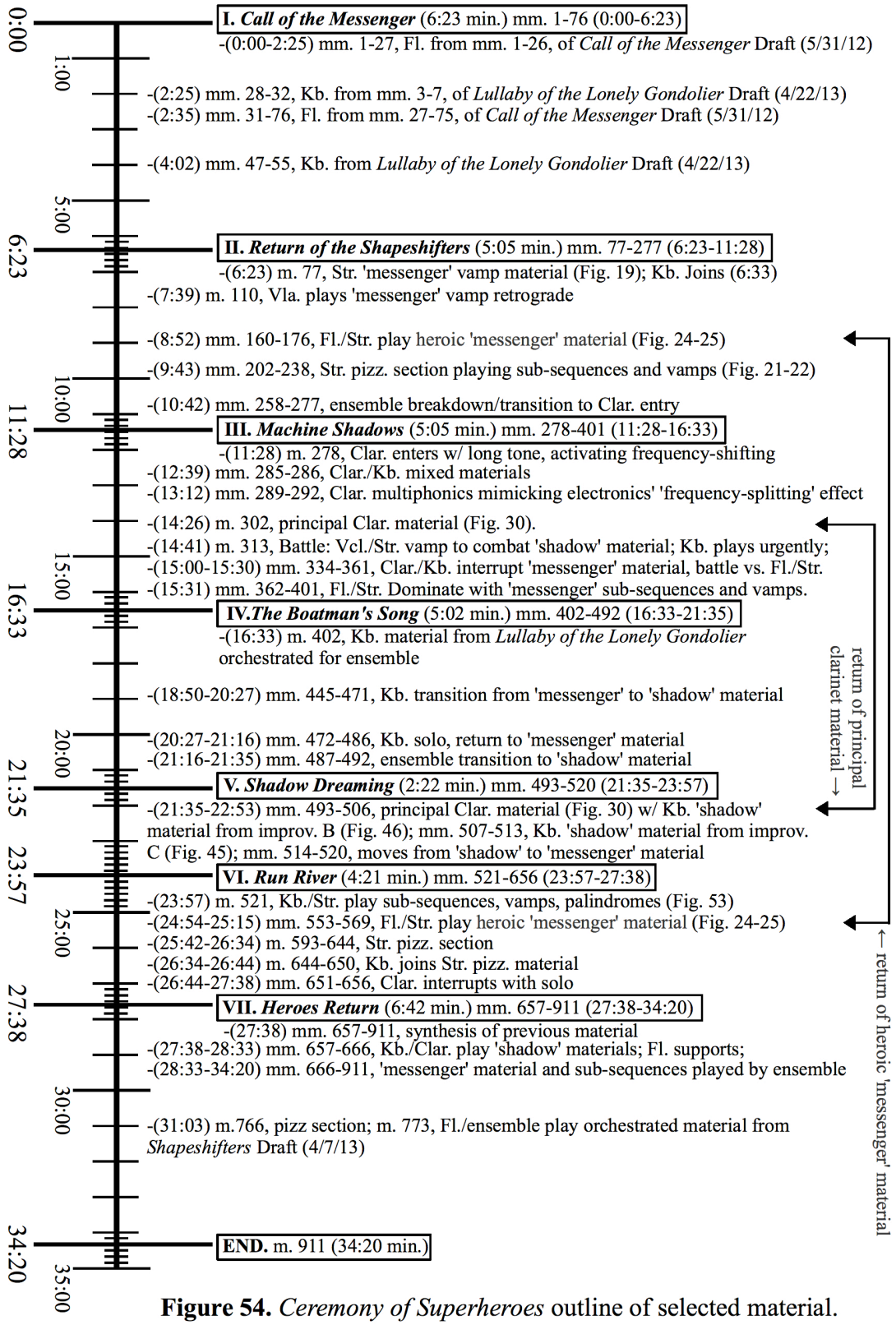

Figure 54. *Ceremony of Superheroes* outline of selected material.

Ceremony of Superheroes begins with the bass flute playing material directly from *Call of the Messenger*-draft (05/31/12). This introduces the character's musical language and electronics system. The keyboard enters quietly and in a low register with material from *Lullaby of the Lonely Gondolier*-draft (04/22/13), and so is only vaguely introduced here; foreshadowing contrasting material to come. The first movement establishes the direction of the 'messenger' material as well as upcoming contrasts. The strings' entry in the beginning of the second movement was designed to be in response and support of the flute's metaphoric call to action. Starting in measure 77, the strings plays 'messenger' vamp material, identifying them with the flute. In measures 160-176, the flute and strings play together, the main heroic 'messenger' material, representing the 'messenger' and 'shapeshifters' in their most unified, and therefore most powerful expression; and establishing their role as supportive characters. This heroic 'messenger' material is first played approximately nine minutes into the piece and is repeated approximately nine minutes before the end, forming a larger-scale palindrome. Following the heroic 'messenger' material, the strings enter a pizzicato section at measure 202 that develops a more percussive, dance-like activation of the 'messenger' sub-sequences and vamp material; and relates metaphorically to a celebration of solidarity with the flute, and freedom from danger. Transitional material at the end of the second movement (measures 258-277) prepares for the immanent arrival of the 'shadow' material and the clarinet language.

The third movement introduces the clarinet, interrupting the ensemble to demonstrate the brooding power of the deep sound of the instrument as it interacts with

the series of frequency-shifters. The keyboard eventually joins the clarinet with mixed 'shadow' material. In measure 302, the clarinet plays a distilled version of principal clarinet material; representing the clarinet at his most clear and powerful. This principal clarinet material also forms a palindromic formal structure shown bracketed in Figure 54. Approximately half-way through the third movement, from measures 313-361, a struggle between musical vocabularies ensues. The harmonic language of the clarinet material threatens to overtake the 'messenger' material and the keyboard supports the clarinet. In measure 353, the keyboard mimics the principal clarinet material. Starting at measure 362, the strings enter to support the flute, overtaking the destructive power of the clarinet.

The fourth movement explores and highlights the transitional nature of the keyboard's metaphoric character. Much of the material is derived from *Lullaby of the Lonely Gondolier*-draft (4/22/13), and is often orchestrated for the ensemble. As the character's loyalties are ambiguous, the keyboard seems to wander between harmonic languages. Belonging to neither musical vocabulary absolutely, the keyboard's affinity is constantly shifting. The choice to re-tune the keyboard to quarter-comma meantone metaphorically relates to the character's existential isolation. This means that the keyboard will ultimately never be in perfect tune, or resonance, with the other characters. He is forever floating in-between. The fifth movement begins with 'shadow' material played by the keyboard that provides an harmonic underpinning for the foregrounded clarinet. The clarinet states and then celebrates the principal clarinet material, before the keyboard transitions back towards 'messenger' material.

The sixth movement offers a more driving rhythmic side of the 'messenger' vamp

and sub-sequence materials. In measures 553-569, the flute and strings repeat the heroic 'messenger' material, re-establishing their dominance, before they repeat the celebratory dance-like pizzicato section. In measure 644, the keyboard joins the strings, punctuating their rhythmic drive and percussive force.

The seventh movement contains small parts from all previous movements (as well as materials from draft scores) and presents a heightened expression of the charster archetypes and their musical vocabularies. The 'messenger' material quickly overtakes the 'shadow' material and the clarinet eventually becomes seduced by the 'messenger' language, resulting in a unified ensemble by the end of the last movement. In finishing the piece, the clarinet plays a long, gradual decrescendo, which (in the electronics) moves gradually from an activated series of frequency-shifters producing many disparate and dissonant frequencies, to a steadiness of tone production that is ultimately in tune with the harmonic resonance of the ensemble.

H. Future Directions

The process developed and outlined throughout the creation of *Ceremony of Superheroes* has exciting potential implications for my future compositional activities. These include strategies related to algorithmic composition, the role of narrative metaphors as organizing principals in unifying musical material, custom software development, on-going collaborative relationships with instrumentalists as part of a generalized approach to collaborative cross-disciplinary creativity.

i. Algorithmic composition with *patternGen*.

The pre-compositional functions established within *patternGen* can be expanded to process additional serial and probability-based compositional techniques and utilized in future algorithmic approaches to musical performance and new media arts.

In developing materials for *Ceremony of Superheroes* I primarily used *patternGen* melodically, dealing with one voice at at time and one series of pitch classes at a time. Other possibilities could be explored to construct and manipulate harmonic and polyphonic patterns, rhythmic patterns, formal patterns, spectra, and patterns related to other media content such as text or image. Both *patternGen*'s serial and Markov chain components could be expanded to address these extended possibilities.

Multiple instantiations of the patch would allow the user to output multiple simultaneous ordered series. These multiple layers of pitch classes might consist of rotations or retrogrades of the original series; or other related and contrasting patterns and pitch class sets.

PatternGen could be used to order manipulations in spectra, synthesizing sounds to mimic or blend with existing sounds. It could be used to select granulations of a spectrum or to create an ordered shift towards greater inharmonicity, also to generate and manipulate synthesis related to speech formants. It might also be employed in developing and manipulating tuning systems with diverse harmonic implications.

The ordered series could also be grouped into sub-sequences (as in *Ceremony of*

Superheroes) and then selected sub-sequences could be stacked to create multiple voices and three-voice counterpoint. For example, stacking nine sub-sequences into three rows, forms chords from each horizontal groupings of three stacked pitch classes. Figure 55 shows sub-sequences 1-3 (from Figure 20) stacked above sub-sequences 3-5, stacked above sub-sequences 28-30. They are shown first in list form, and then in columns highlighting the triads that are formed as a result. In addition to the harmonic implications of stacking sub-sequences in this way, it also provides an opportunity to assess the vividness of the musical material as a result of memory.

(**1)** G C G G G **(2)** C Bb C G G **(3)** G C Bb D Bb;
(3) G C Bb D Bb **(4)** C G G G C **(5)** Bb D F D Bb;
(28) Eb G C Bb D **(29)** F Eb F D Bb **(30)** C G Eb F D;

(3)	G	C	Bb	D	Bb	**(4)**	C	G	G	G	C	**(5)**	Bb	D	F	D	Bb
(1)	G	C	G	G	G	**(2)**	C	Bb	C	G	G	**(3)**	G	C	Bb	D	Bb
(28)	Eb	G	C	Bb	D	**(29)**	F	Eb	F	D	Bb	**(30)**	C	G	Eb	F	D

Figure 55. Harmonically stacked sub-sequences.

Additionally, chords and voicings (instead of single pitch classes) could be mapped to selected (user-input) patterns to create ordered series of harmonic progressions.

Rhythmic patterns could be developed in *patternGen* by mapping pattern integers to a series of note onset and duration values. Formal patterns and relationships could also be developed and manipulated within the serial engine of *patternGen*. Formal events

could be identified (i.e., the instance and repetition of thematic motives; or marked sections exhibiting different degrees of dissonance), labeled, and mapped to selected patterns to create an ordered series of formal events. These formal patterns could be used to conceptualize and manipulate formal structures at any scale, from the phrase level, to the movement structure, to the overall form of an entire composition; and could also facilitate formal coherence across time scales, creating self-similarity and nested formal relationships between small and large structures.

Serial functions in *patternGen* could also be applied to composing in collaboration with other media. For example, a collaboration with a poet might suggest new strategies for manipulating text as well as for building connections between literary and musical materials. Letters, words, or sections of text could be mapped to a series of integers to create an ordered, or systematically disordered (and therefore distinct in meaning) pattern of text. Over the course of the composition, the text could gradually conform to its original order, decoding the poem's original context. The pitch content could be chosen from speech melodies of the poet's own reading of the text, and the melodies could likewise be serially coded and decoded throughout the piece. Audio samples of the poet's reading could also be cut and mapped to a pattern of integers, integrating all components through serial organization and manipulation within *patternGen*.

While the serial functions within *patternGen* deal with pitch classes, the Markov chain functions deal with (register-specific) MIDI note values, and in addition to expanding its serial functions, *patternGen*'s Markov chain subsystem could be expanded

to deal more complexly with harmony, rhythm, and pattern generation; and such functionality could be applied to live performance, improvisation, and installation art. In *Ceremony of Superheroes,* one instantiation of *patternGen*'s Markov chain subsystem was used to generate material (mostly melodic, with harmonic implications) for pre-composition. The Markov chain subsystem within *patternGen* currently takes an analysis of a selected MIDI file (used as source material) to a generate a single probabilistic improvisation; but multiple instantiations could also be employed to generate simultaneous, yet slightly varied improvisations based on common source (MIDI) material. Each additional Markov chain could also use variably related source materials. With more than one instantiation, the overall system could behave as an improvising ensemble to generate a more complex harmonic, polyphonic, and rhythmic texture.

Currently *patternGen* does not take into account the rhythm of an analyzed MIDI file, and it could also be expanded to analyze for note onset and duration values, as well as for dynamics. In this case, the subsystem could generate rhythms, taking into account, or not, the original succession of pitches. Another potential application that would unite the serial and Markov subsystems in such a way that the Markov subsystem feeds material to the serial component. The user-input series of pitch classes would be mapped to a Markov chain-generated pattern of integers to generate an original ordered series. MIDI note values generated from an analyzed MIDI source file would be translated to integers (for example: 60 = 1; 61 = 2; 62 = 3; etc.) to form a probabilistically-generated pattern that could be mapped to series of selected pitch classes.

During the development of pre-compositional materials for *Ceremony of*

Superheroes, *patternGen* used a rhythm generator based on weighted probabilities (determining successive note onset times) to trigger the Markov chain to output each successive MIDI note. In the future, other triggers could be used to progress through Markov chain-generated series of MIDI note values. For example, control output from a MIDI drum pad could trigger the system so that the percussionist performs improvised, or composed rhythms while the Markov chain generates pitch selections. This would offer performative control over phrasing, dynamics, and gestures.

Currently *patternGen* is capable of analyzing existing MIDI files. By expanding the analysis functionality of the Markov chain subsystem to include real time analysis of a live MIDI performance (including onset, velocity, and duration values), *patternGen* could be used as a computer improvisation system to interact (generating MIDI note value data) in real time with an improvising performer, by probabilistically responding to her note choices, dynamics, and phrasing. A real time interactive improvisation system could also be interesting in compositional contexts involving aleatoric processes and improvised materials; as well as applied to new media installations. Using Markov chains in these ways is a re-discovery of techniques developed by earlier algorithmic composers and music technologists. Algorithmic composers Lejaren Hiller and Leonard Isaacson used probabilistically generated music to develop some material for *Illiac Suite* (1956), and in *Drift* (1970) Joel Chadabe programmed pseudo-random processes automating musical sequences that would develop into a composition: "It was the real time equivalent of algorithmic composition."[33] I am using similar techniques developing

[33] Joel Chadabe, *Electric Sound: the past and promise of electronic music* (Upper Saddle River, N.J.: Prentice Hall, 1997), 286.

connections between metaphoric narrative and character development on the one hand, and electronics systems behavior, on the other; and I am using an iterative design approach that takes into account the varying results of collaborative experiments on the resulting processing strategies.

Markov chain improvisations were used in *Ceremony of Superheroes* to generate abstract pre-compositional materials; however, with their ability to send MIDI data to software instruments, synthesizers, or to send messages that would trigger the playback of pre-programmed audio samples, they can also be used to generate audible musical performances in real time scenarios. Systems involving Markov chain improvisations could be mapped to receive control input from a variety of incoming sensor data. For example, a standard webcam could be used to track the degree of motion within its field of capture, with the frequency of note onsets increasing as overall motion increases. As another example, increasing levels of loudness measured could be mapped to an increasing likelihood of harmonic dissonance in the resulting material.

ii. Custom Software

Ceremony of Superheroes integrates custom software that was developed in conjunction with its corresponding musical material. The original software patches (especially those developed for the flute and the clarinet) have additional potential applications; especially when considering their variable parameters, routing and mixing scenarios, and potential musical mappings and their resultant effects. By changing certain

parameters and adjusting the mappings within the patches, it is possible to generate a variety of new and distinct processing scenarios; as well as to apply these processes to different instruments, voices, and other sound sources.

Currently, the patches for *Ceremony of Superheroes* monitor input amplitude and use data from a real time envelope-following analysis to control processing parameters. I chose to use an envelope-following technique in this capacity because it provides a reliable and consistent data stream; and because when mapped effectively to processing parameters, it can enhance a performer's sensation of expressive relationship with such parameters and their musical results, especially when the performer can alter their distance to the mic. This strategy also signals to the audience, a meaningful connection between the acoustic sounds produced by the instrumentalist, and their concomitant digitally-produced sounds. Within the patch *cosFlute*, envelope-following is employed to determine whether or not spectral samples are captured, as well as to control the output gain of the delay system and that of the re-synthesized spectra (from an FFT analysis of the flute). These mappings are calibrated to respond effectively to the particular instrument (it's attack and sustain especially) and the particular composition. The envelope-following is mapped to the output of the processed sounds so that they fade in and out gradually, according to the input amplitude of the the flute. In the future they could be re-calibrated to respond to different instrumental and compositional situations, creating new and distinct musical results. The rate at which spectra is captured and analyzed, the timing of the delays, and the rate at which the processed sounds fade in and out could all be re-calibrated to achieve different results or for use with another

instrument in a future composition. The parameters of *cosFlute* and *cosClarinet* are currently calibrated for instruments capable of relatively long sustain, and able to produce a soft, gradual attack; but they could be adjusted to interact with more percussive instruments and musical material with more attack and less sustain.

Within *cosClarinet*, envelope-following data is mapped to a series of Max objects, set to perform frequency-shifting with different ranges. As the input amplitude increases, so does the quantity of active frequency-shifters, as well as the degree of shifting. These objects are currently calibrated to engage and disengage gradually, but could also be adjusted to respond more rapidly; and their ranges could be adjusted to lessen or increase the severity of the effect. This patch could be calibrated to respond to quicker attacks, and used with pitched (or non-pitched) percussion, guitar, piano, and in many other applications.

Currently, common audio sample rates used for live electronics are 44.1, 48, and 96 khz, with higher sample rates requiring more computer processing power; but much higher sample rates are possible in recording applications, where sampling at 192 khz is common and exponentially higher rates are possible. With increased processing power we will be able to take advantage of these increasingly higher sample rates for use in real time applications; and this implies systems that not only sound better, but also 'listen' better. The ability to perform faster and more accurate FFT analysis would provide systems with richer data and therefore more accurate processing algorithms. Tracking pitch would become a more reliable indicator for interactive mappings, and frequency-shifting algorithms would more accurately represent original spectra.

Another approach to varying the functionality of these patches for future applications would be to alter the mappings between the input amplitude and certain parameters affecting the functionality of the electronic processes. For example, the mapping of input amplitude to the output gain of both the spectral freeze effect and the flute delays, could also be reversed so that when the flute decrescendos, the processed sounds would crescendo. This would imply a very different relationship between the instrumentalist and the electronics. Instead of an expressive extension of the instrument, the processed sounds might seem to struggle against the performer, creating the impression of two antiphonal forces vying for the musical foreground.

Altering the signal flow within, and between patches, could also yield new resources. Adding other modular processing functions (such as a envelope-controlled filters) to the signal path could also increase the potential diversity of applications and results. For example, the signal flow within *cosFlute* could be altered so that the direct input signal would first be sent to the delays, with the spectral freeze effect re-synthesizing the delayed signals. Musically this would mean that the harmonic language expressed by the spectral freeze effect at any given moment, would be generated not from the live signal in real time, but would come from previously played material. This would allow for greater diversity between the real time musical content and the previously established (delayed) harmonic content. Alternatively, the signal path could be altered so that instead of the direct signal, the spectral freeze effect would be sent to the delays. In this scenario the direct signal would be re-synthesized and the spectral freeze would be delayed. Depending on different delay settings, this re-routing could be used to create a

variety of rhythms and pulses in the harmonic texture. For further development, an envelope-controlled filter could be added to dynamically shape the timbre of the harmonic content created by the spectral freeze effect. The inability to produce predictive materials (with the electronics) can potentially create a balance issue in systems consisting of serial structures and nested formal schemes. For example, a sound cannot be electronically played backwards in real time, before it has first been played once in. This means that an electronic system could never effectively perform a real time retrograde before the musician. Future solutions to this challenge might involve musical illusions that use a combination of fixed and live media. For example, a pre-recorded theme could be first played backwards by the computer before the performer responds with the original theme.

Different mixing scenarios can also alter the final musical results. Currently, these are designed to blend the acoustic instrument sounds with their concomitant electronic processes. In the future, a basic adjustment in the balance between the wet and dry signals could offer drastically different sonic applications. For example, by removing the direct signal from the output mix, the patch could be used to process an electric guitar, effectively replacing the instrument's attack and direct sound, with an harmonic tapestry of spectrally 'frozen', slowly decaying layers. Additionally, the mix could be scheduled to change throughout the course of a composition, or be mapped to real time indicators such as amplitude envelope or pitch-tracking data.

As integrated modular components, the patches for *Ceremony of Superheroes* can easily be re-configured, re-routed, re-mixed, and re-purposed for use in a variety of future

compositions, castings, and venues. That the patches were originally developed in conjunction with this particular musical material, suggests that future re-configurations may also benefit from an iterative design approach. Functionality could be added to measure the impulse responses of a given space, creating realtime adjustments to reverb settings and manipulate or synthesizing the sound of a particular environment. Character-specific reverb settings could influence staging decisions and create the effect that performers are occupying distinct spaces from each other, or could also create different acoustic environments for each movement.

iii. Collaboration and Community

I consider composition a necessarily collaborative art; and while I remain the unique author of *Ceremony of Superheroes*, the collaborative process greatly informed the final results. For me, participating in a successful collaboration means that artists with distinct skills, experiences, and points of view can challenge and incite each other to be more creative and expressive. This implies a balance between individual approaches and expertise on one hand, and a fluid ability to allow collaborative input to affect personal ideas, on the other.

Working closely with performers allowed me to better understand the strengths and limitations of each instrument (and instrumentalist); and allowed me to experiment more freely with my early materials, testing and changing musical material and software setups iteratively. In addition to rehearsals and meetings, I was in close contact with the

performers in order to discuss issues of playability and notation. Ultimately this contributed towards a greater mutual investment (between myself and the performers) in the piece's development and realization, while we developed trust and tested our artistic expectations of each other. Because of this, I was also able to incubate relationships with instrumentalists that in the future would no longer require the same degree of personal contact for the project to be successful. Additionally, these methodologies could be applicable to new collaborative relationships developed at a distance.

The iterative design approach I took here could also benefit projects involving other types of artists. In an upcoming collaboration I plan to record a poet performing a reading and to use the unique qualities of her voice (including inflection, melodic contour, rhythm, timing, timbre, and dynamics) to develop musical material and an electronics system. The process will be informed by ongoing discussions about the possible relationships between the words and the music.

As another important aspect of my compositional activities, I am also involved in community building and audience development through concert and event curation, community outreach, venue development, and the creation of platforms for cross-disciplinary projects. My investment in these community-related and cross-disciplinary activities, and the relationships I have built through these efforts, ultimately played a large role in my ability to produce the concert for *Ceremony of Superheroes;* and it has helped me to establish effective collaborative methodologies for future projects.

iv. Narrative Metaphors and Musical Coherence

Treating narrative metaphors and the idiosyncrasies of individual instruments and performers as organizing principles allowed for consistency and coherence in developmental strategies for incorporating live instruments and real time electronics. Throughout the development of *Ceremony of Superheroes* I considered my character archetypes and overall narrative metaphors when making important decisions affecting the musical development of the composition.

The overall narrative metaphor of *Ceremony of Superheroes* deals with the coexistence and harmony between opposing cosmic forces. The ceremony/'ceremony' takes place in a sound world where opposing forces vie for the power of musical dominance by asserting themselves through incantations made up of their unique musical languages. For example, the 'messenger' is the main heroic character and her power derived from reciting (playing) her unique incantation (ordered series of pitch classes) and this is used to call upon, persuade and develop affinities and allies, as well as to pacify and neutralize enemies. If she is the hero, the 'shapeshifters' are her cohorts responding to her call and reinforcing the power of her 'incantation'. These kind of dynamics served as a unified field for making meaningful and consistent connections between music and software development.

The metaphoric theme of integration and harmony between opposing cosmic forces is also reflected in the relationships between instrumentalists and their respective electronic processes. Just as the flute and clarinet are ultimately revealed as, or

transformed into co-existing, even complimentary forces, the electronics are presented as integrated extensions of the expressive powers of each instrumentalist.

I have confidence in the musical coherence established by the consistencies in mappings between narrative metaphors (and character archetypes) and musical material, rather than a precise, or literal representation of these underlying metaphors. Developing related and contrasting musical languages for the different character archetypes can also contribute to perceptions of intentionality by presenting interactions (conflicting and harmonious) between separate established identities. The gender casting of the piece is also a future direction. The 'messenger', for example, might have different compositional qualities ensemble roles with a male player.

I trust that the combination of the consistency of mappings and the capability of musical language to be somewhat abstract make the piece robust to changes in casting and venue and can contribute to the listeners' perception of design intentionality and lead to various potential meaningful (although unpredictable) interpretations.

I. Sources

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III. Appendices

A) Project Logs

i. Description and Documentation Methodology

ii. Log of Asset Prototypes

B) Draft Scores

i. *Call of the Messenger*-draft score

ii. *Lullaby of the Lonely Gondolier*-draft score

iii. *Shapeshifters*-draft score

C) Accompanying DVD

i. Score and Parts

- Transposed Score
- Score In C
- Parts

ii. Software

- Max Patches
- Software Documentation

iii. Video of a Performance

A. Project Logs

i. Description and Documentation Methodology

A log book served as a central repository for all project asset prototypes, including media and documents produced in the development of *Ceremony of Superheroes*. Although these materials are not included in the dissertation, this spreadsheet documents the order of their evolution throughout the iterative development process.

It is presented in the form of a spreadsheet with the following headings: Date, Type, Filename, and Description. The filetypes include *Audacity*[1] sessions (consisting of recording sessions, and mixing and editing sound files and sound recordings), Audio (Wav format), *Logic*[2] sessions, *Finale*[3] documents (sketches, scores, and parts), *json* (*JavaScript Object Notation* files that store data and presets for specific patches in *Max/Msp/Jitter*), *Logic* sessions, *Max/Msp/Jitter* patches, MIDI, PDF, Text, and Video.

Audio files primarily consisted of mock-ups, samples, Max patch outputs, and recordings. In most cases it was necessary to play back musical material through a Max patch during all stages of musical development; including the iterative processes of developing electronic strategies and composing musical material. The mock-ups were designed to simulate the sounds of the performers' parts. They were exported from *Finale* and used in developing, calibrating, and mapping the electronic elements before rehearsal with a live performer, or in their absence. Some samples were taken during rehearsal with

1 *Audacity* is an open source audio editor: http://audacity.sourceforge.net, (April 16, 2014).
2 *Logic* is a digital audio workstation software developed by *Apple*: https://www.apple.com/logic-pro, (April 16, 2014).
3 *Finale* is music notation software developed by *MakeMusic*: http://www.finalemusic.com, (April 16, 2014)

live performers to be used recursively in developing the score and electronics. Other audio files were either exported from Max patches to test the results of the interactions between the performative and electronic elements, or were recorded as output from Markov chains. The recordings mostly documented rehearsals and concerts, sometimes were sync-ed to video.

Recording video during rehearsals proved important for retaining and reviewing discussions and performances/reading sessions. For recording video I used a Nikkon D5100 digital camera capable of taking 20 min. of HD video at a time. It was placed on a tripod and set to frame just the performer(s). Video files documented reading sessions and rehearsals, including discussions between myself and the performers, as well as pre-concert run-throughs and concert performances.Video capture was especially useful in reflecting on the results of experimental materials and impromptu cues and adjustments that arose in the moment; as well as in reviewing and evaluating the effectiveness of electronic interactions. Video recordings also assisted in the development of staging and mic-ing strategies, and allowed me to consider the gestural and visual components that would be perceived by audiences.

I first asked performers if they were comfortable being video-recorded during discussions, rehearsals, and run-throughs. I explained that any video taken, was for my documentary and developmental purposes only, and that they would not be made public without their future permission. I found that because I had hand-selected each performer based on personal and professional relationships with each of them, in addition to the fact that they were all themselves consummate professionals (accustomed to performing and

recording under a variety of conditions and expectations), they were all quite comfortable being recorded. I noticed no adverse or distracted affect on their ability to perform during instances when video was recorded vs. audio alone, vs. instances where we did not record.

The *Finale* files consisted of sketches, scores, and parts, and were saved and catalogued in their many versions and updates throughout the process. As the compositional process was iterative, it was often helpful to re-visit and re-use musical material found in earlier versions of a score. It also benefited my analysis and reflection on the growth of the piece.

The *Max/Msp/Jitter* files were saved, and catalogued in their many versions and updates. Some were merely early experiments in electronics strategies that were ultimately abandoned or set aside; some were small modular patches that lend some specific functionality towards a larger patch; others were more polished patches used in live performance.

Many of the MIDI files were exported from *Finale* to be used in the analysis phase of the Markov chains. They were often serial iterations of sequences used throughout the piece, as well as MIDI exports of entire sections or modular pieces. Others were exported as MIDI from Max as MIDI results of a Markov chain 'improvised performance.'

The PDF files were generally scores, parts, or PDF versions of other writings and materials.

The text files consisted of informal notes (often taken during advisory meetings or

rehearsals), program notes, reflective analyses, and any other writings.

The log book, with its included descriptions, has allowed me to clearly recall, re-visit, and re-use any necessary materials and media generated throughout the piece's developments; while also serving as a document of the progression of my iterative compositional process.

Date	Type	Filename	Description
03/07/2012	MaxMsp	freqShiftMultiVoice030712.maxpat	multiple-voice frequency shifting; with freq calculation errors
03/09/2012	MaxMsp	octaLoop030912.maxpat	8-channel live sampler w/ dynamics and speed control during playback
03/10/2012	Audio-WAV	fluteFreez2.wav	2:41; mock test (w/ electronics); MIDI-Audio output from Finale used (early sonofreeze testing)
03/10/2012	Audio-WAV	freezeFlute3.wav	2:59; mock test (w/ electronics); MIDI-Audio output from Finale used (early sonofreeze testing)
03/10/2012	Finale	fluteSketch031012.mus	early flute sketch
03/10/2012	MaxMsp	3-freeze-slide-cycle-sketch031012.maxpat	experiment to add pitch-following synth tone to spectral 'freeze'
03/11/2012	MaxMsp	freezeSlideMultiSketch031112.maxpat	from Charles, Jean-Francois' 'freeze' mapped to envelope-following; now contained within 'Messenger' patch
03/12/2012	MaxMsp	drumSeq031212.maxpat	timing sequencer used w/ 'freeze' to time spectral 'snapshots'
03/13/2012	Audio-WAV	fluteSample10.wav	3:58; mock test (w/ electronics); MIDI-Audio output from Finale used
03/13/2012	Audio-WAV	fluteSample8.wav	3:59; mock test (w/ electronics); MIDI-Audio output from Finale used (early sonofreeze testing)
03/13/2012	Text	NOTES-8-channel-buffer-grab031312.rtf	to do' notes for 8-channel record/playback machine
03/13/2012	Text	Notes-Labor031312.rtf	some notes related to flute material, and clarinet early electronics (frequency-shifting)
03/14/2012	Finale	fluteSketch2-031412.mus	early flute sketch
03/14/2012	Finale	fluteSketchMidC-031412.mus	early flute sketch
03/14/2012	MaxMsp (json)	chords.json	(JavaScript Object Notation): chord presets for ClarShifter
03/19/2012	MaxMsp	freqShiftMultiVoice2-031912.maxpat	multiple-voice frequency shifting; w/ corrected freq. Values
03/20/2012	Text	freqShiftMultiVoice-chords032012.rtf	chords noted for "freqShiftMultiVoice" patch
03/22/2012	MaxMsp	octaLoopShare3-22-12.maxpat	8-channel live sampler w/ dynamics and speed control during playback
03/23/2012	MaxMsp	octaLoopShare3-23-12.maxpat	8-channel live sampler w/ dynamics and speed control during playback
03/25/2012	MaxMsp	00.octaLoopShare3-25-12.maxpat	8-channel live sampler w/ dynamics and speed control during playback
03/26/2012	MaxMsp	00.octaLoopShare3-26-12B.maxpat	8-channel live sampler w/ dynamics and speed control during playback
03/29/2012	MaxMsp	auto-record-sketch032912.maxpat	early sketch to automate record on/off controls
03/31/2012	MaxMsp	00.octaLoop3-31-12.maxpat	8-channel live sampler w/ dynamics and speed control during playback
04/06/2012	Audio-WAV	fluteTrial-4-6-12.wav	4:01; mock test (w/ electronics); MIDI-Audio output from Finale used
04/06/2012	Finale	fluteSketch3-040612.mus	early flute sketch
04/06/2012	Finale	fluteSketch4-040612.mus	early flute sketch
04/06/2012	MaxMsp	ranges040612.maxpat	experiment to determine and separate ranges of pitches played; w/ pitch tracking (CNMAT's "analyzer~")
04/07/2012	Finale	fluteSketch5-040712.mus	early flute sketch
04/07/2012	Finale	fluteSketch6-040712.mus	early flute sketch
04/09/2012	Finale	fluteSketch7-040912.mus	early flute sketch
04/12/2012	Audio-WAV	flutesketches2.wav	5:28; finale mock-up (flute only)
04/12/2012	Audio-WAV	flutesketches3.wav	5:27; finale mock-up (flute only)
04/12/2012	Audio-WAV	flutesketches4.wav	6:24; finale mock-up (flute only)
04/12/2012	Audio-WAV	flutesketchestrial1.wav	1:33; finale mock-up (flute only)
04/12/2012	Audio-WAV	flutesketchesY.wav	6:22; finale mock-up (flute only)
04/12/2012	Finale	fluteSketches-4-12-12.mus	early flute sketch
04/12/2012	Finale	fluteSketches-4-12-12B.mus	early flute sketch
04/12/2012	Text	notes-4-12-12.rtf	some ideas for 'Messenger'
04/14/2012	Finale	fluteSketches-4-14-12.mus	early flute sketch
04/15/2012	Finale	fluteSketches-4-15-12.mus	early flute sketch
04/15/2012	Finale	fluteSketches-4-15-12B.mus	early flute sketch
04/16/2012	Finale	fluteSketches-4-16-12.mus	early flute sketch
04/17/2012	Finale	fluteSketches-4-17-12.mus	early flute sketch
04/17/2012	Finale	fluteSketches-4-17-12B.mus	early flute sketch
04/17/2012	Finale	reedSketch4-17-12.mus	initial clarinet sketch free-composed
04/18/2012	Audio-WAV	fluteSketch4-18-12.wav	7:07; finale mock-up (flute only)
04/18/2012	Finale	fluteSketches-4-18-12.mus	early flute sketch
04/18/2012	MaxMsp	stereo-to-mono041812.maxpat	mixes stereo file for mono output
04/27/2012	Finale	fluteSketches-4-27-12.mus	early flute sketch
05/02/2012	Finale	fluteSketches-5-2-12.mus	early flute sketch
05/02/2012	Finale	fluteSketches-5-2-12B.mus	early flute sketch
05/02/2012	Finale	fluteSketches-5-2-12mm1-39.mus	early flute sketch
05/03/2012	Audio-WAV	fluteSketchTrial-5-3-12.wav	1:36; mock test (w/ electronics) in preparation for rehearsal. MIDI-Audio output from Finale used
05/03/2012	Finale	fluteSketches-5-3-12.mus	early flute sketch
05/03/2012	MaxMsp	patternGen050312.maxpat	first instance of patternGen
05/05/2012	Audacity	andonDirectRoom4ch5-5-12.aup	audacity file used to mix room w/ direct audio from rehearsal
05/05/2012	Audio-WAV	andonDirectRec2-050512.wav	8:56; first full run-through of first half of piece (direct)
05/05/2012	Audio-WAV	andonDirectRun1-050512.wav	1:43; beginning material interrupted (direct)
05/05/2012	Audio-WAV	andonRead1-050512.wav	2:31; first read of beginning flute material
05/05/2012	Audio-WAV	andonRoom4-050512.wav	00:21; flute tone w/ 'sonofreeze' resonance

05/05/2012	Audio-WAV	andonRoomRec2-050512.wav	9:05; first full run-through of first half of piece (room)
05/05/2012	Audio-WAV	AndonroomRec5-050512.wav	6:50; beginning material interrupted (room)
05/05/2012	Audio-WAV	andonRoomRun1-050512.wav	00:37; beginning material interrupted (room)
05/05/2012	Audio-WAV	andonRoomRun1B-050512.wav	1:20; beginning material interrupted (room)
05/05/2012	Audio-WAV	andonRun4Tracks5-5-12.wav	8:21; first full run-through of first half of piece MIXED (room+direct)
05/05/2012	MaxMsp	roomRecStereo050512.maxpat	simple stereo record patch for stereo room audio during rehearsals
05/05/2012	Video	AndonRehearsal1A-050512.MOV	19:04; bass flute discussion; unique techniques
05/05/2012	Video	AndonRehearsal1B-050512.MOV	3:17; begininng test; mic-ing
05/05/2012	Video	AndonRehearsal1C-050512.MOV	5:24; beginning read w/ electronics
05/05/2012	Video	AndonRehearsal1E-050512.MOV	20:00; run-through first half w/ bass + C Flutes and electronics; discussion and reflection
05/05/2012	Video	AndonRehearsal1F-050512.MOV	3:40; C flute improv w/ frequency shifting electronics to test
05/05/2012	Video	AndonRehearsal1G-050512.MOV	00:38; C flute improv w/ frequency shifting electronics to test (singing while playing)
05/07/2012	Audio-WAV	fluteSketches-5-7-12.wav	11:10; finale mock-up (flute only)
05/07/2012	Finale	fluteSketches-5-7-12.mus	early flute sketch
05/08/2012	Audio-WAV	andonDirect5-8-12.wav	12:39; direct audio feed from Max at rehearsal
05/08/2012	Audio-WAV	andonDirect5-8-12A.wav	5:01; direct audio feed from Max at rehearsal
05/08/2012	Audio-WAV	andonDirect5-8-12B.wav	13:51; direct audio feed from Max at rehearsal
05/08/2012	Audio-WAV	andonRoom5-8-12A.wav	5:07; audio from stereo room mic at rehearsal
05/08/2012	Audio-WAV	fluteSketches-5-8-12.wav	11:43; finale mock-up (flute only)
05/08/2012	Audio-WAV	fluteSketches-5-8-12B.wav	11:41; finale mock-up (flute only)
05/08/2012	Audio-WAV	machtest050812.wav	15:34; mock test in preparation for rehearsal. MIDI-Audio output from Finale used
05/08/2012	Audio-WAV	machTest1-5-8-12.wav	12:05; mock test (w/ electronics) in preparation for rehearsal. MIDI-Audio output from Finale used
05/08/2012	Finale	fluteSketches-5-8-12.mus	early flute sketch
05/08/2012	Finale	fluteSketches-5-8-12B-portion.mus	early flute sketch
05/08/2012	MaxMsp	fluteSketches050812.maxpat	original concept for flute electronics w/ multiple loop record/playback w/ discreet speed + dynamics controls
05/08/2012	Video	AndonFluteRunThrough1-050812.mov	13:31; first full run-through (pre return to bass flute)
05/08/2012	Video	AndonFluteRunThrough2-050812.mov	12:40; full run-through (pre return to bass flute)
05/08/2012	Video	AndonRehearsal3-052512.MOV	18:21; run-through w/ discussion (pre return to bass flute)
05/09/2012	Finale	fluteSketches-5-9-12.mus	early flute sketch
05/21/2012	Text	CallOfTheMessengerProgramNotes052112.rtf	Call of the Messenger Program Notes
05/23/2012	Finale	PatGenTest1-052312.mus	from rawPatternGenSketches transcribed into Finale
05/23/2012	Finale	PatGenTest2-052312.mus	from rawPatternGenSketches transcribed into Finale
05/23/2012	Finale	PatGenTest3-052312.mus	from rawPatternGenSketches transcribed into Finale
05/23/2012	Finale	PatGenTest5-052312.mus	from rawPatternGenSketches transcribed into Finale
05/23/2012	Finale	PatGenTest6-052312.mus	from rawPatternGenSketches transcribed into Finale
05/23/2012	MIDI	trial1.midi	early tests with patternGen using hybrid flute/clarinet series
05/23/2012	MIDI	trial2.midi	early tests with patternGen using hybrid flute/clarinet series
05/23/2012	MIDI	trial3.midi	early tests with patternGen using hybrid flute/clarinet series
05/23/2012	MIDI	trial4.midi	early tests with patternGen using hybrid flute/clarinet series
05/23/2012	MIDI	trial5.midi	early tests with patternGen using hybrid flute/clarinet series
05/23/2012	MIDI	trial6.midi	early tests with patternGen using hybrid flute/clarinet series
05/24/2012	MIDI	test8.midi	early tests with patternGen using hybrid flute/clarinet series
05/24/2012	MIDI	trial7.midi	early tests with patternGen using hybrid flute/clarinet series
05/25/2012	Audio-WAV	andondirect52512.wav	13:08; direct audio feed from Max at rehearsal
05/25/2012	Audio-WAV	andonroom52512.wav	13:07; audio from stereo room mic at rehearsal
05/25/2012	Audio-WAV	messengerDelaysTest1-052512.wav	12:24; Messenger run-through with Andon to test delay settings and timings (1st)
05/25/2012	Audio-WAV	messengerDelaysTest2-052512.wav	11:44; Messenger run-through with Andon to test delay settings and timings (2cnd)
05/25/2012	MaxMsp	CallOfTheMessenger5-25-12.maxpat	current performance patch (used for 5/30/12 concert @UCR)
05/25/2012	MaxMsp (json)	mypresets.json	(JavaScript Object Notation): general 'Messenger' preset settings
05/26/2012	MaxMsp (json)	mypatch.json	(JavaScript Object Notation): general 'Messenger' patch settings (pattrstorage)
05/27/2012	Audio-WAV	CallMessengerFInalMockUp5-27-12.wav	11:45; Mockup (Finale Output)
05/27/2012	Audio-WAV	CallOfTHeMessenger-5-27-12C.wav	11:27; mockup from Finale
05/27/2012	Finale	CallOfTHeMessenger-5-27-12.mus	final draft edits (in preparation for 5/30/12 concert)
05/27/2012	Finale	CallOfTHeMessenger-5-27-12B.mus	final draft edits (in preparation for 5/30/12 concert)
05/27/2012	Finale	CallOfTHeMessenger-5-27-12C.mus	final draft edits (in preparation for 5/30/12 concert)
05/27/2012	Finale	CallOfTHeMessenger-5-27-12F.mus	final draft edits (in preparation for 5/30/12 concert)
05/30/2012	Audio-WAV	callMessengerConcertDirectAudio053012.wav	14:27; direct audio feed from Max at live concert
05/30/2012	Audio-WAV	callmessrun_direct-5-30-12.wav	12:44; direct audio feed from Max during run-through
05/30/2012	Audio-WAV	callmessrun-thru-Room-5-30-12.wav	12:44; audio from room mics during run-through
05/30/2012	Audio-WAV	CallofTheMessengerLiveMixed053012.wav	11:40; final mix (room+direct) of audio from concert (5/30/12)
05/30/2012	Audio-WAV	CallOfTheMessengerRoom-5-30-12	11:56; audio from room mics from concert

05/30/2012	Video	CallofTheMessengerRun-5-30-12.MOV	12:58; pre-concert run-through footage
05/31/2012	Audacity	CallMessengerConcert5-30-12.aup	audacity file used to mix concert recording
05/31/2012	Audio-WAV	CallMessengerConcert5-30-12.wav	11:41; mix from concert audio from Audacity
05/31/2012	Finale	CallOfTHeMessenger-5-31-12.mus	current score (used for 5/30/12 concert @UCR)
05/31/2012	PDF	01.CallOfTHeMessenger-5-31-12.pdf	Stand-alone score for flute and electronics
05/31/2012	PDF	CallOfTHeMessenger-5-31-12.pdf	printable score for first concert
06/02/2012	Audio-WAV	callconcertDIrect-out060212.wav	11:21; direct audio from Max, output from Audacity
06/02/2012	Audio-WAV	callconcertMixed-out11.wav	11:40; concert audio output from Audacity
06/02/2012	Audio-WAV	callconcertMixed-outgain4.wav	11:40; concert audio output from Audacity
06/02/2012	Audio-WAV	callconcertMixed-outgaincurve.wav	11:40; concert audio output from Audacity
06/02/2012	Audio-WAV	callconcertMixed-outnorm.wav	11:40; concert audio output from Audacity
06/02/2012	Audio-WAV	callconcertMixed-outnorm2.wav	11:40; concert audio output from Audacity
06/02/2012	MaxMsp	jitterPlayer060212.maxpat	simple utilitarian video player/recorder
06/02/2012	Video	00.CallOfTheMessengerConcert-5-30-12.mov	11:52; video of sonogram and audio from live concert at UCR;w/ Titles
06/02/2012	Video	w/spectrogram060212.mov	11:40; video of sonogram and audio from live concert at UCR w/o Titles
06/02/2012	Video	callofMessengerSpectrogram060212.mov	11:44; video of scrolling sonogram from AudioSculpt; no audio
06/04/2012	MaxMsp	patternGen-6-4-12.maxpat	patternGen w/ added instruments for output
06/05/2012	MIDI	test10.midi	early tests with patternGen using hybrid flute/clarinet series
06/05/2012	MIDI	test9.midi	early tests with patternGen using hybrid flute/clarinet series
06/06/2012	MaxMsp	Timing4PatternGen060612.maxpat	beginning functionality for prabalistic rhythm controls for use within patternGen
06/06/2012	MIDI	testNewRhythmGen1.midi	improv experimenting with rhythmic settings, using clarinet material/series as source for patternGen
06/06/2012	MIDI	testNewRhythmGen2.midi	improv experimenting with rhythmic settings, using clarinet material/series as source for patternGen
06/06/2012	MIDI	testNewRhythmGen6.midi	improv experimenting with rhythmic settings, using clarinet material/series as source for patternGen
06/06/2012	MIDI	testNewRhythmGen8.midi	improv experimenting with rhythmic settings, using clarinet material/series as source for patternGen
06/06/2012	MIDI	testNewRhythmGen9.midi	improv experimenting with rhythmic settings, using clarinet material/series as source for patternGen
06/07/2012	MIDI	testNewRhythmGen10.midi	improv experimenting with rhythmic settings, using tonal material as source for patternGen
06/10/2012	MaxMsp	patternGen-6-10-12.maxpat	patternGen w/ minor advancements/edits
06/10/2012	MIDI	testNewRhythmGen11.midi	improv experimenting with rhythmic settings, using clarinet material/series as source for patternGen
06/10/2012	MIDI	testNewRhythmGen12.midi	improv experimenting with rhythmic settings, using clarinet material/series as source for patternGen
06/10/2012	MIDI	testNewRhythmGen13.midi	improv experimenting with rhythmic settings, using clarinet material/series as source for patternGen
06/10/2012	MIDI	testNewRhythmGen15.midi	improv experimenting with rhythmic settings, using clarinet material/series as source for patternGen
06/10/2012	MIDI	testNewRhythmGen16.midi	improv experimenting with rhythmic settings, using clarinet material/series as source for patternGen
06/10/2012	MIDI	testNewRhythmGen17.midi	improv experimenting with rhythmic settings, using clarinet material/series as source for patternGen
06/10/2012	MIDI	testNewRhythmGen18.midi	improv experimenting with rhythmic settings, using clarinet material/series as source for patternGen
06/11/2012	MaxMsp	patternGen-6-11-12.maxpat	patternGen w/ minor advancements/edits
06/11/2012	Text (doc)	dissertationUpdate061112	dissertation update (mainly related to patternGen, 'Messenger' material)
06/12/2012	PDF	HeathDissUpdate061112.pdf	dissertation update (mainly related to 'Messenger')
06/14/2012	MaxMsp	patternGen-6-14-12.maxpat	patternGen w/ minor advancements/edits
06/21/2012	MaxMsp	patternGen-6-21-12.maxpat	patternGen w/ minor advancements/edits
06/30/2012	MaxMsp	patternGen-6-30-12.maxpat	patternGen w/ added rhythmGen controls (w/ groups + single notes)
06/30/2012	MIDI	patternGenMIDI-TEST.midi	constant rhythm experiment with basic series in patternGen
06/30/2012	MIDI	patternGenMIDI-TEST2.midi	constant rhythm experiment with basic series in patternGen
07/01/2012	MIDI	patternGenMIDI-TEST3.midi	varied rhythmic values w/ clarinet series
07/01/2012	MIDI	patternGenMIDI-TEST4.midi	varied rhythmic values w/ clarinet series
07/06/2012	Finale	clar-070612.mus	patternGen improv: MIDI to finale (early clar. Sketch)
07/06/2012	MIDI	patternGenMIDI-TEST5.midi	varied rhythmic values w/ clarinet series
07/06/2012	MIDI	patternGenMIDI-TEST6-improv.midi	varied rhythmic values improvised w/ keyboard controls, w/ clarinet series
07/16/2012	MaxMsp	patternGen-7-16-12.maxpat	patternGen w/ added rhythmGen controls (w/ groups + single notes)
07/16/2012	MIDI	patternGenMIDI-TESTvoice1.midi	varied rhythmic values w/ flute series (experiment for use as individeual voice)
07/16/2012	MIDI	patternGenMIDI-TESTvoice2.midi	varied rhythmic values w/ 1st iteration of flute series (experiment for use as individeual voice)
07/16/2012	MIDI	patternGenMIDI-TESTvoice3.midi	varied rhythmic values w/ 2cnd iteration of flute series (experiment for use as individeual voice)
07/16/2012	MIDI	patternGenMIDI-TESTvoice4.midi	varied rhythmic values w/ 3rd iteration of flute series (experiment for use as individeual voice)
07/24/2012	Finale	MVMNT-II-7-24-12.mus	new and aborted material (pre-shapeShifters)
07/24/2012	MIDI	patternGenMIDI-str1-slow.midi	1st rotation of flute series elaborated w/ original pattern; rhythm experiment; slower rhythms
07/24/2012	MIDI	patternGenMIDI-str1.midi	1st rotation of flute series elaborated w/ original pattern; rhythm experiment
07/24/2012	MIDI	patternGenMIDI-str2-slow.midi	2cnd rotation of flute series elaborated w/ original pattern; rhythm experiment; slower rhythms
07/24/2012	MIDI	patternGenMIDI-str2.midi	2cnd rotation of flute series elaborated w/ original pattern; rhythm experiment
07/24/2012	MIDI	patternGenMIDI-str3-slow.midi	3rd rotation of flute series elaborated w/ original pattern; rhythm experiment; slower rhythms
07/24/2012	MIDI	patternGenMIDI-str3.midi	3rd rotation of flute series elaborated w/ original pattern; rhythm experiment
07/24/2012	MIDI	patternGenMIDIcello.midi	3rd rotation of flute series elaborated w/ original pattern; rhythm experiment
07/24/2012	MIDI	patternGenMIDIStrings-Prog.midi	original flute series, rhythm experiment

07/24/2012	MIDI	patternGenMIDIviola.midi	2cnd rotation of flute series elaborated w/ original pattern; rhythm experiment
07/24/2012	MIDI	patternGenMIDIviolin.midi	1st rotation of flute series elaborated w/ original pattern; rhythm experiment
08/18/2012	Finale	MVMNT-II-8-18-12.mus	new and aborted material (pre-shapeShifters)
08/30/2012	Finale	Shapeshifters083012.mus	early sketches
09/01/2012	Finale	Shapeshifters-Sketches090112.mus	early sketches
09/01/2012	Finale	theme16-21-090112.mus	from mm. 16-21 - "CallOfTHeMessenger-5-31-12.mus"
09/04/2012	Finale	Shapeshifters-Sketches2-090412.mus	early sketches
09/05/2012	MaxMsp	shapeShifters090512.maxpat	experiment for electronics for string trio from 'messenger' patch, w/ panning and gain mapped to amplitude
09/06/2012	MaxMsp	sShifters-pm-slider090612.maxhelp	physically-modelled data spring to control panning/gain mapped to amp. (from Ali Momeni's "pm-slider")
09/08/2012	Finale	Shapeshifters-Sketches090812.mus	early sketches
09/08/2012	MaxMsp	shapeShifters090812.maxpat	slightly newer version of early experiment with shapeShifter patch
09/10/2012	Finale	Shapeshifters-Sketches091012.mus	early sketches
09/11/2012	Finale	Shapeshifters-Sketches091112.mus	early sketches
09/11/2012	Finale	Shapeshifters-Sketches091112B.mus	early sketches
09/16/2012	Finale	Shapeshifters-Sketches091612.mus	early sketches
09/18/2012	Finale	Shapeshifters-Sketches091812.mus	early development (flute melodies added)
09/19/2012	Finale	Shapeshifters-Sketches091912.mus	early development
09/20/2012	Finale	Shapeshifters-Sketches092012.mus	early development
09/21/2012	Finale	Shapeshifters-Sketches092112.mus	early development
09/22/2012	Finale	Shapeshifters-Sketches092212.mus	early development
09/24/2012	Finale	Shapeshifters-Sketches092412.mus	early development
10/01/2012	Audio-WAV	clar-10-1-12.wav	5:55; finale mock-up (clar. only)
10/01/2012	Finale	clar-10-1-12.mus	early clar. sketch
10/01/2012	MaxMsp	ClarShifter100112.maxpat	4 frequency-shifters progressively mapped to amp. (More amp.= more active/severe shifters)
10/04/2012	Audio-WAV	clar-10-4-12.wav	7:13; finale mock-up (clar. only)
10/04/2012	Finale	clar-10-4-12.mus	early clar. sketch
10/05/2012	Finale	clar-10-5-12.mus	early clar. sketch
10/05/2012	MaxMsp	patternGen-10-5-12.maxpat	patternGen w/ added rhythmGen controls (w/ groups + single notes) + minor advancements
10/06/2012	Audio-WAV	clartest10612.wav	5:22; mock test (w/ electronics); MIDI-Audio output from Finale used
10/06/2012	Finale	clar-10-6-12.mus	early clar. sketch
10/06/2012	Text	series100612.rtf	clar. Series and pattern from patternGen
10/09/2012	Audio-WAV	clar-10-9-12.wav	5:15; finale mock-up (clar. only)
10/09/2012	Finale	clar-10-9-12.mus	early clar. sketch
10/09/2012	Finale	clar-10-9-12B-Series.mus	early clar. sketch
10/09/2012	Text	dynamicseries100912.rtf	serial dynamics from patternGen
10/10/2012	Finale	Shapeshifters-Sketches101012.mus	early development
10/10/2012	Text	Notes-10-10-12.rtf	to do' notes for patternGen, Clarinet, and shapeShifters
10/11/2012	MaxMsp	amp-gain(inverse)101112.maxpat	inverse mapping of input signal amplitude (using CNMAT's 'analyzer~') to signal output gain
10/12/2012	Audio-WAV	clartest101012B.wav	5:29; mock test (w/ electronics); MIDI-Audio output from Finale used
10/12/2012	MaxMsp	biquadFilter101212.maxpat	basic filter (considered for use with string trio)
10/14/2012	Finale	Shapeshifters-Sketches101412.mus	early development
10/14/2012	MaxMsp	resBandPassFilter101412.maxpat	basic filter (considered for use with string trio)
10/16/2012	Finale	Shapeshifters-Sketches101612-Cuts.mus	later development (begun to cut material and shape texture)
10/16/2012	Finale	Shapeshifters-Sketches101612.mus	early development
10/16/2012	MaxMsp	ClarShifter10-16-12.maxpat	4 frequency-shifters progressively mapped to amp. More amp.= more active/severe shifters.
10/18/2012	Text	CharacterSketches101812.rtf	character outline notes for the messenger and 3 shapeShifters
10/18/2012	Text	Notes-10-18-12.rtf	some general ideas for shapeShifters and for strings + electronics
10/21/2012	Finale	Shapeshifters-Sketches102112-Cuts.mus	later development (begun to cut material and shape texture)
10/24/2012	MaxMsp	1stOrderMarkovMIDI102412.maxpat	first order markov chain from analysis of MIDI (now contained within patternGen)
10/24/2012	MaxMsp	2cndOrderMarkovMIDI102412.maxpat	second order markov chain from analysis of MIDI (now contained within patternGen)
10/24/2012	MaxMsp (json)	mypatch.json	(JavaScript Object Notation): general patternGen patch settings (pattrstorage)
10/25/2012	Finale	clar-10-25-12.mus	early clar. sketch
10/25/2012	Finale	Shapeshifters-Sketches102512-Cuts.mus	later development (begun to cut material and shape texture)
10/27/2012	Finale	pianoSketchesMarkovTest102712.mus	from rawPatternGenSketches (markov) transcribed into Finale
10/27/2012	Finale	Shapeshifters-Sketches102712-Cuts.mus	later development (continued to cut material and shape texture)
10/27/2012	MIDI	CallOfTHeMessenger-5-30-12.mid	messenger' output as MIDI to load into patternGen's Markov system
10/27/2012	MIDI	messengerMarkov-102712.midi	improv experimenting with rhythmic settings, using 'messenger' as source for markov chains
10/27/2012	MIDI	messengerMarkov3-102712.midi	improv experimenting with rhythmic settings, using 'messenger' as source for markov chains
10/27/2012	MIDI	messengerMarkov4-102712.midi	improv experimenting with rhythmic settings, using 'messenger' as source for markov chains
10/27/2012	MIDI	messengerMarkov5-102712.midi	improv experimenting with rhythmic settings, using 'messenger' as source for markov chains
10/27/2012	MIDI	messengerMarkov7-102712.midi	improv experimenting with rhythmic settings, using 'messenger' as source for markov chains

10/27/2012	MIDI	Shapeshifters-Sketches102712-Cuts.mid	draft of "shapeshifters" output as MIDI to load into patternGen's Markov system
10/27/2012	MIDI	shapeshiftersMarkovTest1-MIDI102712.midi	improv experimenting with rhythmic settings, using "shapeshifters" draft as source for markov chains
10/30/2012	Audio-WAV	Shapeshifters-Sketches103012-Cuts.wav	8:16; finale mock-up
10/30/2012	Finale	markovMIDIClarSketch1-103012.mus	from rawPatternGenSketches (markov) transcribed into Finale
10/30/2012	Finale	markovMIDISketch7-103012.mus	from rawPatternGenSketches (markov) transcribed into Finale
10/30/2012	Finale	pizzTest.mus	section used to experiment with pizz section
10/30/2012	Finale	Shapeshifters-Sketches103012-Cuts.mus	later development (continued to cut material and shape texture)
10/30/2012	MIDI	clarMarkov103012.midi	improv experimenting with rhythmic settings, using clarinet material/series as source for markov chains
10/30/2012	MIDI	markovMIDIClarSketch1.midi	improv experimenting with rhythmic settings, using clarinet material/series as source for markov chains
10/31/2012	Finale	Shapeshifters-Sketches103112-Cuts.mus	later development (continued to grow material and shape texture); added 1 pizz section
10/31/2012	Text	Notes103112.rtf	misc. notes related to shapeShifters
11/01/2012	Audio-WAV	Shapeshifters-Sketches110112.wav	9:32; finale mock-up
11/01/2012	Finale	Shapeshifters-Sketches110112.mus	nearing final draft; added 2cnd pizz section
11/01/2012	MIDI	theme16-21.mid	mm. 16-21 of 'messenger'(also used in "shapeShifters") as MIDI to load into patternGen's Markov system
11/05/2012	MaxMsp	patternGen-11-5-12.maxpat	patternGen w/ added 1st and 2cnd order Markov systems
11/06/2012	Audio-WAV	Shapeshifters110612.wav	9:44; finale mock-up
11/06/2012	Finale	Shapeshifters110612.mus	more editing/formatting
11/06/2012	Finale	Shapeshifters110612B.mus	more editing/formatting
11/07/2012	Audio-WAV	Shapeshifters110712.wav	9:48; finale mock-up
11/07/2012	Finale	Keyboard1stMarkov11-7-12.mus	from rawPatternGenSketches (markov) transcribed into Finale
11/07/2012	Finale	Shapeshifters110712.mus	more editing/formatting
11/07/2012	MIDI	2cnd-Iter-KeyBoard110712.midi	using 8ths and 16ths w/ 2cnd iteration of flute series
11/07/2012	MIDI	clar-10-25-12.mid	clarinet draft output as MIDI to load into patternGen's Markov system
11/07/2012	MIDI	KeyBoard110712.midi	16th-notes, using "shapeshifters" as source for markov chains
11/08/2012	Audio-WAV	Shapeshifters110812.wav	9:48; finale mock-up
11/08/2012	Finale	Shapeshifters110812.mus	more editing/formatting
11/10/2012	Finale	clar-111012.mus	clar. sketch
11/10/2012	Finale	Keyboard2cndOMarkov11-10-12.mus	from rawPatternGenSketches (markov) transcribed into Finale
11/10/2012	MIDI	clarMarkov.midi	using clarinet material/series as source for 1st order markov chains
11/10/2012	MIDI	hybrid1stOMarkov3.midi	using hybrid clarinet/flute material/series as source for 1st order markov chains
11/10/2012	MIDI	hybridMarkov.midi	using hybrid clarinet/flute material/series as source for 1st order markov chains
11/10/2012	MIDI	hybridMarkov2.midi	using hybrid clarinet/flute material/series as source for 1st order markov chains
11/10/2012	MIDI	hybridMarkovwRhythm.midi	using hybrid clarinet/flute material/series as source for 1st order markov chains
11/10/2012	MIDI	Shapeshifters110812.mid	draft of "shapeshifters" output as MIDI to load into patternGen's Markov system
11/11/2012	Finale	clar-111112.mus	clar. sketch
11/12/2012	MaxMsp	patternGen-11-12-12.maxpat	patternGen w/ added 1st and 2cnd order Markov systems + minor advancements
11/12/2012	MIDI	KeyBoard111212.midi	16th-notes, using "shapeshifters" as source for markov chains
11/13/2012	MaxMsp	patternGen-11-13-12.maxpat	pitch/rhythm generator (serial and Markov) and MIDI playback
11/17/2012	Audio-WAV	cleanBells111712.wav	3:25; 'cleanBells' (Tassman)-markov chains (1st+2cnd order) from MIDI of Flute/Clarinet series
11/17/2012	Audio-WAV	cripyBeats111712.wav	2:52; 'crispyBeats' (Tassman)-markov chains (1st+2cnd order) from MIDI of "ShapeShifters112012.wav"
11/17/2012	Audio-WAV	glassPlate111712.wav	4:28; 'glassPlate' (Tassman)-markov chains (1st+2cnd order) from MIDI of Flute series (patternGen)
11/17/2012	Audio-WAV	markovFrisell4-111712.wav	4:12; 'tiredBeluga' (Tassman)-markov chains (1st+2cnd order) from MIDI of "ShapeShifters112012.wav"
11/17/2012	Audio-WAV	markovFrisell5-111712.wav	3:36; 'tiredBeluga' (Tassman)-markov chains (1st+2cnd order) from MIDI of "ShapeShifters112012.wav"
11/17/2012	Audio-WAV	pianoImprov111712.wav	3:18; piano (pianoteq)-markov chains (1st+2cnd order) from MIDI of flute/clarinet hybrid (patternGen)
11/17/2012	Audio-WAV	testKoraLike111712.wav	3:34; 'tiredBeluga' (Tassman)-markov chains (1st+2cnd order) from MIDI of Flute/Clarinet series
11/17/2012	Audio-WAV	vibes1-111712.wav	4:20; 'vibes' (Tassman)-markov chains (1st+2cnd order) from MIDI of Flute series (patternGen)
11/17/2012	MaxMsp	patternGen-11-17-12.maxpat	pitch/rhythm generator (serial and Markov) and MIDI playback (w/ 1st, 2cnd, 3rd order systems)
11/17/2012	MaxMsp (json)	rhythmTable.json	(JavaScript Object Notation): probability table setting (pattrstorage)
11/17/2012	MIDI	cleanBells.midi	improv experimenting with rhythmic settings, using clarinet sketch/series as source for markov chains
11/17/2012	MIDI	glassPlate.midi	percussion experiment, rhythm matter here rather than pitches; pitched percussion sound used for improv
11/17/2012	MIDI	KeyBoard111712.midi	improv experimenting with rhythmic settings, using "shapeShifters" as source for markov chains
11/17/2012	MIDI	KeyBoard111712C.midi	improv experimenting with rhythmic settings, using clarinet sketch/series as source for markov chains
11/17/2012	MIDI	KeyBoard1117B12.midi	improv experimenting with rhythmic settings, using clarinet sketch/series as source for markov chains
11/17/2012	MIDI	kora.midi	improv experimenting with rhythmic settings, using clarinet sketch/series as source for markov chains
11/17/2012	MIDI	vibes1.midi	improv experimenting with rhythmic settings, using "shapeShifters" as source for markov chains
11/18/2012	Audio-WAV	harp1-111812.wav	6:12; harp (GPO) from markov chains (1st+2cnd order) derived from MIDI of Flute series (patternGen)
11/19/2012	Audio-WAV	harp2-111912.wav	6:40; harp (GPO) from markov chains (1st+2cnd order) derived from MIDI of Flute series (patternGen)
11/19/2012	Audio-WAV	harp3Clar111912.wav	2:01; harp (GPO) from markov chains (1st+2cnd order) derived from MIDI of Clarinet series (patternGen)
11/19/2012	Audio-WAV	harp4clar-111912.wav	7:20; harp (GPO) from markov chains (1st+2cnd order) derived from MIDI of Clarinet series (patternGen)
11/19/2012	MIDI	harp1finale.mid	improv experimenting with rhythmic settings, using "shapeShifters" as source for markov chains
11/19/2012	MIDI	harp2finale.midi	improv experimenting with rhythmic settings, using "shapeShifters" as source for markov chains

11/19/2012	MIDI	harp3finale.midi	improv experimenting with rhythmic settings, using "shapeShifters" as source for markov chains
11/19/2012	MIDI	harp4finale.midi	improv experimenting with rhythmic settings, using "shapeShifters" as source for markov chains
11/19/2012	MIDI	harp5.midi	improv experimenting with rhythmic settings, using "shapeShifters" as source for markov chains
11/19/2012	MIDI	harp6clar.midi	improv experimenting with rhythmic settings, using clarinet sketch/series as source for markov chains
11/19/2012	MIDI	harp7clar.midi	improv experimenting with rhythmic settings, using clarinet sketch/series as source for markov chains
11/19/2012	MIDI	keystest.midi	improv experimenting with rhythmic settings, using clarinet sketch/series as source for markov chains
11/20/2012	Audio-WAV	amazingGrace1-112012.wav	3:24; piano (pianoteq) from markov chains (1st+2cnd order) derived from MIDI of Satie's Gnossienne 4.
11/20/2012	Audio-WAV	satieGnoss4-112012.wav	2:02; piano (pianoteq) from markov chains (1st+2cnd order) derived from MIDI of Satie's Gnossienne 4.
11/20/2012	Audio-WAV	Shapeshifters112012.wav	9:48; finale mock-up
11/20/2012	Finale	Shapeshifters112012.mus	current final draft; to add: material from mm. 16-21(from 'Messenger') treated more melodically
11/20/2012	MIDI	amazingGrace1Markov.midi	improv experimenting with rhythmic settings, using "Amazing Grace" as source for markov chains
11/20/2012	MIDI	satieGnos4.midi	MIDI output from markov chains (1st+2cnd order) derived from MIDI of Satie's Gnossienne 4.
11/21/2012	Audio-WAV	markovFrisell6.wav	3:39; 'tiredBeluga' (Tassman)-markov chains (1st+2cnd order) from MIDI of "ShapeShifters112012.wav"
11/21/2012	Text	Notes-112112.rtf	brief notes from lesson (11/21/12)
11/27/2012	MaxMsp	granularClar112712.maxpat	beginning sketches:granular strategies-Nathan Woleck's tools(grainbang~, grainpulse~, grainstream~)
12/05/2012	Finale	Shapeshifters120512.mus	subtle adjustments: dynamics, few rhythms slightly adjusted, 1 tempo change
12/05/2012	Finale	ShapeshiftersMelodicTest120512.mus	working with quick melodic material to create a section of more lyrical quality
12/05/2012	Text (doc)	dissertationUpdate120512	dissertation update (mainly related to "messenger, and shapeshifters"material, and evolution of patternGen)
12/17/2012	MaxMsp	granularRecordPlay121712.maxpat	granular experiments for keyboard
12/22/2012	MaxMsp	granularRecordPlay122212.maxpat	granular experiments for keyboard
01/03/2013	Finale	KeyboardClarinetDuo.mus	short sketch
01/15/2013	PDF	clar-011513.pdf	early clarinet material based on the beginning of flute material and more, using clarinet pitches
01/22/2013	MaxMsp	spectralKeyboard012213.maxpat	spectral drone
01/23/2013	Audio-mp3	markovKeyboardCycle3-012313.mp3	6:14; keyboard improvisation from patterGen's Markov engine
01/23/2013	MIDI	markovKeyboardCycle3-012312.midi	keyboard improvisation from patterGen's Markov engine
01/24/2013	MaxMsp	spectralKeyboard012413.maxpat	spectral drone
01/26/2013	MaxMsp	testDualKeyboards.maxpat	two keyboards: 1 regular material form score, 1 from a Markov chain improvisation
01/27/2013	Audio-WAV	ensemble012713.wav	1:37; mock-up of short ensemble section
01/27/2013	Finale	PercussionSolo012713.mus	percussion solo, not used in the piece
01/27/2013	PDF	05.percussionSolo012713.pdf	percussion solo, not used in the piece
01/29/2013	Audio-WAV	airA1.wav	:40; bass clarinet breath sounds
01/29/2013	Audio-WAV	didjSounds1.wav	:24; bass clarinet with singing through mouthpiece
01/29/2013	Audio-WAV	ericJacobsRead1Direct.wav	10:39; first reading session. Bass clarinet direct
01/29/2013	Audio-WAV	EricJacobsRead1MIX.wav	10:50; first reading session. Bass clarinet mixed with electronics
01/29/2013	Audio-WAV	jacobsAir.wav	2:48; bass clarinet breath sounds
01/29/2013	Audio-WAV	multiPhonicsA1.wav	3:04; bass clarinet multiphonics samples
01/29/2013	MaxMsp	ClarShifter012913.maxpat	early frequency-shifting patch for clarinet
01/30/2013	MaxMsp	ClarShifter013013.maxpat	early frequency-shifting patch for clarinet
01/30/2013	MaxMsp	droneKeyboard.maxpat	drone as sample playback
02/03/2013	MaxMsp	granularClar020313.maxpat	Granular experiments for clarinet
02/06/2013	MaxMsp	ClarShifter020613.maxpat	frequency-shifting patch for clarinet
02/06/2013	MaxMsp	dynaPlaybackMod020613.maxpat	Amplitude-controlled sample playback module
02/06/2013	MaxMsp	dynaPlaybackMod020613B.maxpat	Amplitude-controlled sample playback module
02/12/2013	MaxMsp	ClarShifter021213.maxpat	frequency-shifting patch for clarinet
02/13/2013	MaxMsp	ClarShifter021313.maxpat	frequency-shifting patch for clarinet
02/13/2013	MaxMsp	phasorHarmonizer021313.maxpat	harmonizer
02/15/2013	MaxMsp	mypatch.json	presets for patternGen021513.maxpat
02/15/2013	MaxMsp	patternGen021513.maxpat	patternGen w/ minor advancements/edits
02/20/2013	Audio-WAV	read2MIX022013.wav	4:13; second reading of early-mid material, mixed with electronics
02/20/2013	Audio-WAV	read2MIX022013.wav	4:13; second reading of early-mid material, clarinet only
02/20/2013	Audio-WAV	read3MIX022013.wav	4:18; third reading, clarinet mixed with electronics
02/20/2013	Audio-WAV	read3MIX022013.wav	4:18; third reading, clarinet only
02/20/2013	Audio-WAV	readDirect1-022013.wav	1:40; long tone clarinet direct
02/20/2013	Audio-WAV	readMIX1-022013.wav	1:39; long tone clarinet sample mixed with electronics
02/20/2013	Audio-WAV	trial2-022013.wav	:39; more trials to calibrate electronics
02/20/2013	Audio-WAV	trial3-022013.wav	4:13; more trials to calibrate electronics
02/20/2013	Audio-WAV	trial4-022013.wav	4:21; more trials to calibrate electronics
02/20/2013	Audio-WAV	trialA022013.wav	:42; test of amplitude controlled playback with lion's roar samples
02/20/2013	Audio-WAV	trialB-022013.wav	4:21; test of amplitude controlled playback with lion's roar and frequency-shifting
02/20/2013	MaxMsp	ClarShifter022013.maxpat	patch used for first reading session
02/21/2013	Audio-WAV	trial5-022113.wav	15:26; more trials to calibrate electronics

02/21/2013	Audio-WAV	trial5-022113.wav	15:26; more trials to calibrate electronics
02/21/2013	Audio-WAV	Trial6-022113.wav	4:20; more trial to calibrate electronics
02/21/2013	PDF	02.Shapeshifters022113.pdf	Stand-alone score for flute and string trio (no electronics)
02/21/2013	PDF	03.clarinet022113.pdf	early clarinet material
02/21/2013	PDF	07.ensemble022113.pdf	early ensemble material
02/21/2013	PDF	seriesClarinetNew.pdf	documents clarinet series and patterns as of 2/21/13
02/22/2013	PDF	04.Keyboard022013.pdf	Stand-alone score _ comma meantone-tuned keyboard
03/03/2013	Audio-WAV	marimba2ndmarkov.wav	3:05; synth marimba improvisation from patterGen's Markov engine
03/03/2013	Audio-WAV	MarkovAllMaterial030313.wav	9:22; keyboard improvisation from patterGen's Markov engine
03/12/2013	Finale	03.newClarinet-031213.mus	new clarinet material
03/12/2013	Finale	04.Keyboard031213.mus	early keyboard material
03/16/2013	Finale	07.ensemble2-031613.mus	early ensemble 2 material
03/16/2013	Finale	KeyboardClar031613.mus	much of this material was incorporated in a different manner, but has some important clarinet material
04/03/2013	Audio-WAV	michaelMatsunoRunThrough040313.wav	matsuno run-through at home
04/03/2013	MaxMsp	CallOfTheMessenger040313.maxpat	Early Stand-alone patch for "Call of the Messenger" when programmed alone
04/09/2013	MaxMsp	patternGen040913.maxpat	patternGen w/ minor advancements/edits
04/09/2013	MaxMsp	patternGenB040913.maxpat	patternGen w/ minor advancements/edits
04/24/2013	PDF	00A.CeremonyContents.pdf	list of possible movements
04/26/2013	Audio-WAV	matsunoConcert042613.wav	recording from "What's Next" ensemble concert
04/26/2013	Audio-WAV	michaelMatsunoRunThruBoston042613.wav	matsuno run-through at Boston Court
04/26/2013	MaxMsp	CallOfTheMessenger042613.maxpat	Early Stand-alone patch for "Call of the Messenger" when programmed alone
05/07/2013	Finale	01.CallOfTHeMessenger050713.mus	Stand-alone score for flute and electronics
05/07/2013	Finale	02.Shapeshifters050713.mus	Stand-alone score for flute and string trio (no electronics)
05/08/2013	Finale	03.newClarinetA-050813.mus	new clarinet material
05/12/2013	Finale	08.CallOfTHeMessenger-2mm86-182.mus	Early assembly: material broken into sections for possible movement structure
05/12/2013	Finale	CallOfTHeMessenger-1.mus	Early assembly: material broken into sections for possible movement structure
05/12/2013	Finale	CallOfTHeMessenger-2.mus	Early assembly: material broken into sections for possible movement structure
05/12/2013	Finale	CallOfTHeMessenger-2ALTmm77-136.mus	Early assembly: material broken into sections for possible movement structure
05/12/2013	Finale	Gondolier-1mm1-21.mus	Early assembly: material broken into sections for possible movement structure
05/12/2013	Finale	Gondolier-2mm22-31.mus	Early assembly: material broken into sections for possible movement structure
05/13/2013	Finale	00.CallOfTHeMessenger-1A.mus	Early assembly: material broken into sections for possible movement structure
05/13/2013	Finale	01.Gondolier-Interlude1Amm2-3.mus	Early assembly: material broken into sections for possible movement structure
05/13/2013	Finale	02.CallOfTHeMessenger-1B.mus	Early assembly: material broken into sections for possible movement structure
05/13/2013	Finale	09.ensemble2-mm.mus	Early assembly: material broken into sections for possible movement structure
05/13/2013	Finale	10-13.Gondolier-.mus	Early assembly: material broken into sections for possible movement structure
05/13/2013	Finale	14.Clarinet-2mm.28-30.mus	Early assembly: material broken into sections for possible movement structure
05/13/2013	Finale	15-20.Shapeshifters-2mm158-end.mus	Early assembly: material broken into sections for possible movement structure
05/13/2013	Finale	21.ensemble1FULL.mus	Early assembly: material broken into sections for possible movement structure
05/13/2013	Finale	Shapeshifters-2mm158-.mus	Early assembly: material broken into sections for possible movement structure
05/15/2013	Finale	CeremonySuperheroes051513.mus	daily full score updates
05/20/2013	Finale	03.ensemble-1mm1-6.mus	Early assembly: material broken into sections for possible movement structure
05/20/2013	Finale	CeremonySuperheroes052013.mus	daily full score updates
05/21/2013	Finale	04.Shapeshifters-1mm1-157.mus	Early assembly: material broken into sections for possible movement structure
05/21/2013	Finale	05.ensemble1-2mm47-54.mus	Early assembly: material broken into sections for possible movement structure
05/21/2013	Finale	06.Clarinet-1mm1-15.mus	Early assembly: material broken into sections for possible movement structure
05/21/2013	Finale	07ensemble2-1mm.mus	Early assembly: material broken into sections for possible movement structure
05/21/2013	Finale	CeremonySuperheroes052113.mus	daily full score updates
05/22/2013	Finale	CeremonySuperheroes052213.mus	daily full score updates
06/08/2013	Finale	CeremonySuperheroes060813.mus	daily full score updates
06/10/2013	Finale	CeremonySuperheroes061013.mus	daily full score updates
06/11/2013	Finale	CeremonySuperheroes061113.mus	daily full score updates
06/14/2013	Finale	CeremonySuperheroes061413.mus	daily full score updates
06/15/2013	Finale	CeremonySuperheroes061513.mus	daily full score updates
09/05/2013	Finale	CeremonySuperheroes090513.mus	daily full score updates
09/06/2013	Finale	CeremonySuperheroes090613.mus	daily full score updates
09/07/2013	Finale	CeremonySuperheroes090713.mus	daily full score updates
09/09/2013	Finale	CeremonySuperheroes090913.mus	daily full score updates
09/10/2013	Finale	CeremonySuperheroes091013.mus	daily full score updates
09/11/2013	Finale	CeremonySuperheroes091113.mus	daily full score updates
09/12/2013	Finale	CeremonySuperheroes091213.mus	daily full score updates
09/13/2013	Finale	CeremonySuperheroes091313.mus	daily full score updates

09/17/2013	Finale	CeremonySuperheroes091713.mus	daily full score updates
09/20/2013	Finale	CeremonySuperheroes092013.mus	daily full score updates
09/21/2013	Finale	CeremonySuperheroes092113.mus	daily full score updates
09/22/2013	Finale	CeremonySuperheroes092213.mus	daily full score updates
09/24/2013	Finale	CeremonySuperheroes092413.mus	daily full score updates
09/26/2013	Finale	CeremonySuperheroes092613.mus	daily full score updates
09/27/2013	Finale	CeremonySuperheroes092713.mus	daily full score updates
09/29/2013	Finale	CeremonySuperheroes092913.mus	daily full score updates
09/30/2013	Finale	CeremonySuperheroes093013.mus	daily full score updates
12/04/2013	Finale	CeremonySuperheroes120413.mus	daily full score updates
12/06/2013	Finale	CeremonySuperheroes120613.mus	daily full score updates
12/07/2013	Finale	CeremonySuperheroes120713.mus	daily full score updates
12/08/2013	Finale	CeremonySuperheroes120813.mus	daily full score updates
12/09/2013	Finale	CeremonySuperheroes120913.mus	daily full score updates
12/26/2013	Finale	CeremonySuperheroes122613B.mus	daily full score updates
12/27/2013	Finale	CeremonySuperheroes122713.mus	daily full score updates
12/28/2013	Finale	CeremonySuperheroes122813.mus	daily full score updates
01/02/2014	Finale	CeremonySuperheroes010214.mus	daily full score updates
01/02/2014	Finale	CeremonySuperheroes010214B.mus	daily full score updates
01/03/2014	Finale	CeremonySuperheroes010314.mus	daily full score updates
01/04/2014	Finale	CeremonySuperheroes010414.mus	daily full score updates
01/04/2014	Finale	CeremonySuperheroes0104B14.mus	daily full score updates
01/05/2014	Finale	CeremonySuperheroes010514.mus	daily full score updates
01/07/2014	Finale	CeremonySuperheroes010714.mus	daily full score updates
01/08/2014	Finale	CeremonySuperheroes010814.mus	daily full score updates
01/08/2014	Finale	CeremonySuperheroes0108B14.mus	daily full score updates
01/09/2014	Finale	CeremonySuperheroes010914.mus	daily full score updates
01/09/2014	Finale	CeremonySuperheroes010914B.mus	daily full score updates
01/09/2014	MaxMsp	beatDrivenPlayer.maxpat	sample A amplitude drives amplitude of sample B
01/12/2014	Finale	CeremonySuperheroes011214.mus	daily full score updates
01/13/2014	Finale	CeremonySuperheroes011314.mus	daily full score updates
01/14/2014	Finale	CeremonySuperheroes011414.mus	daily full score updates
01/14/2014	Finale	CeremonySuperheroes0114B14.mus	daily full score updates
01/14/2014	Finale	CeremonySuperheroes0114C14.mus	daily full score updates
01/15/2014	Finale	CeremonySuperheroes011514.mus	daily full score updates
01/15/2014	Finale	CeremonySuperheroes0115B14.mus	daily full score updates
01/16/2014	MaxMsp	patternGen011614.maxpat	patternGen w/ minor advancements/edits
01/19/2014	Finale	CeremonySuperheroes011914.mus	daily full score updates
01/20/2014	Finale	CeremonySuperheroes012014.mus	daily full score updates
01/21/2014	Finale	CeremonySuperheroes012114.mus	daily full score updates
01/23/2014	Audio-WAV	clarinetTrialFull.wav	38:10; Mock-up to test electronics
01/23/2014	Finale	CeremonySuperheroes012314.mus	daily full score updates
01/23/2014	Finale	CeremonySuperheroes012314B.mus	daily full score updates
01/23/2014	MaxMsp	ClarShifter012314.maxpat	early frequency-shifting patch for clarinet
01/24/2014	Finale	CeremonySuperheroes012414.mus	daily full score updates
01/25/2014	Finale	CeremonySuperheroes012514.mus	daily full score updates
01/27/2014	Finale	CeremonySuperheroes012714.mus	daily full score updates
02/01/2014	Finale	CeremonySuperheroes020114.mus	daily full score updates
02/02/2014	Finale	CeremonySuperheroes020214.mus	daily full score updates
02/03/2014	Audio-WAV	CeremonySuperheroes020314B.wav	34:08; full mock up, no electronics
02/03/2014	Finale	CeremonySuperheroes020314.mus	daily full score updates
02/04/2014	Finale	CeremonySuperheroes020414.mus	daily full score updates
02/04/2014	Finale	CeremonySuperheroes0204B14.mus	daily full score updates
02/04/2014	Finale	CeremonySuperheroes0204C14.mus	daily full score updates
02/05/2014	Finale	CeremonySuperheroes020514.mus	daily full score updates
02/05/2014	PDF	CeremonySuperheroes020514.pdf	daily full score updates
02/11/2014	Finale	CeremonySuperheroes021114.mus	daily full score updates
02/12/2014	Finale	CeremonySuperheroes021214.mus	daily full score updates
02/12/2014	Finale	CeremonySuperheroes0212B14.mus	daily full score updates
02/12/2014	PDF	CeremonySuperheroes021214.pdf	daily full score updates
02/13/2014	Finale	CeremonySuperheroes021314.mus	daily full score updates

02/13/2014	Text	ListOfMvmnt's021314	list of movements with names, 7th movement missing name
02/16/2014	MaxMsp	CallOfTheMessenger021614.maxpat	Stand-alone patch for "Call of the Messenger" when programmed alone
02/16/2014	MaxMsp	cosClarinet021614.maxpat	new, cleaned up design of clarinet module for performance
02/16/2014	MaxMsp	cosFlute021614.maxpat	new, cleaned up design of Flute module for performance
02/16/2014	MaxMsp	cosKeyboard021614.maxpat	new, cleaned up design of keyboard module for performance; incomplete
02/16/2014	MaxMsp	cosStrings021614.maxpat	new, cleaned up design of strings module for performance
02/17/2014	Finale	CeremonySuperheroes021714.mus	daily full score updates
02/17/2014	PDF	CeremonySuperheroes021714.pdf	printable score update

Appendix B

Draft Scores

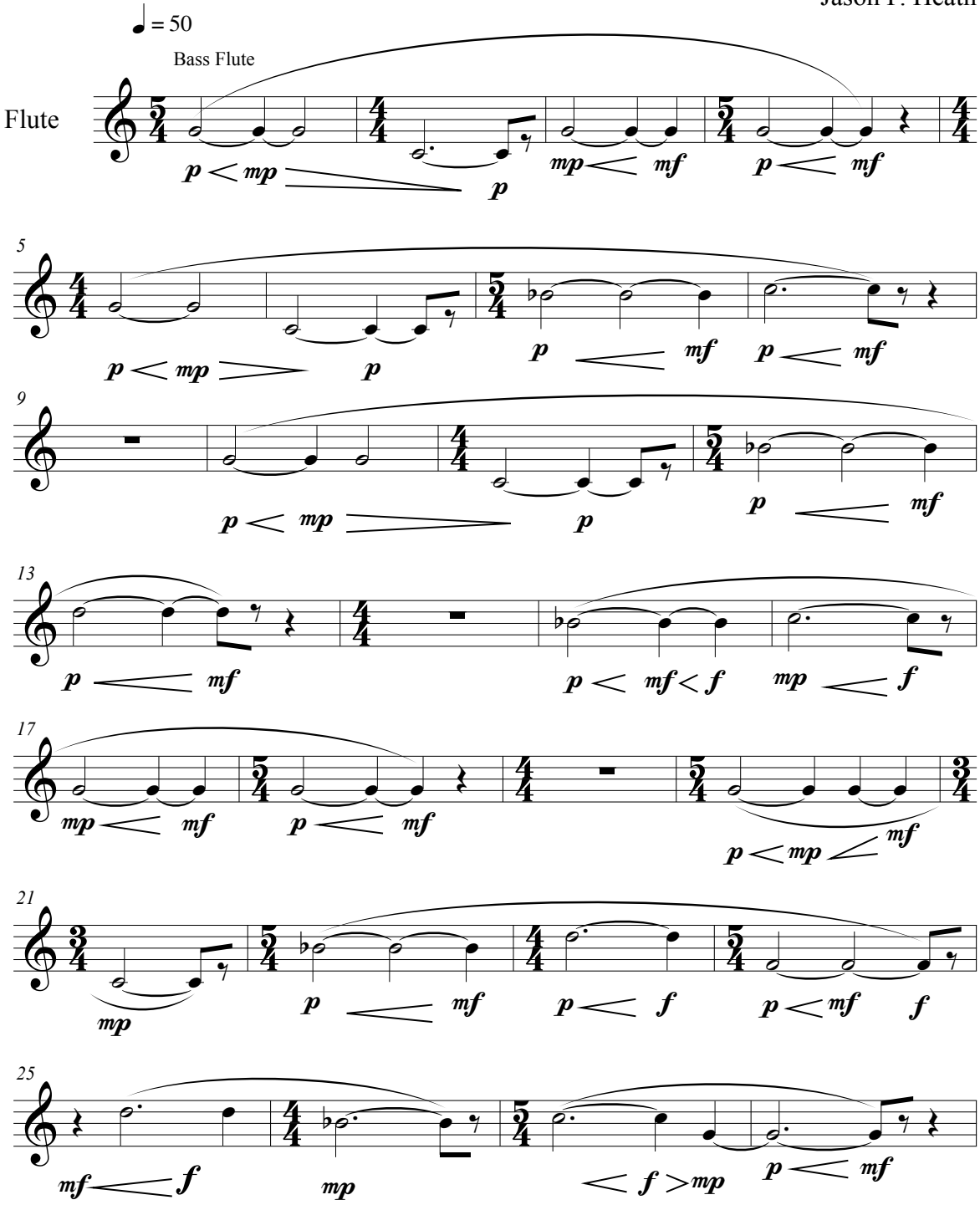
The following scores are included as drafts for reference and further analysis:

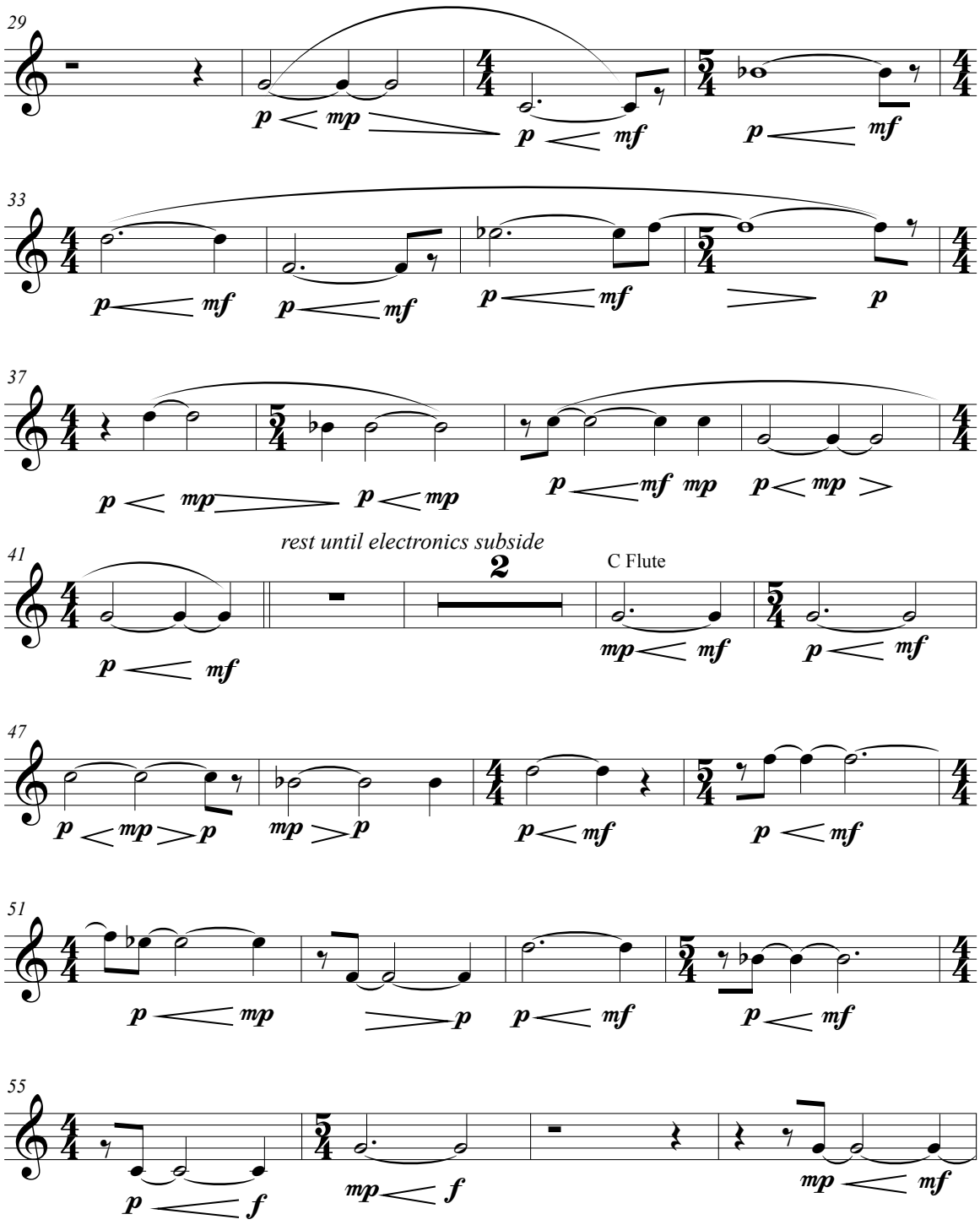
1. *Call of the Messenger-draft* (5/31/12)
2. *Lullaby of the Lonely Gondolier-draft* (4/22/13)
3. *Shapeshifters-draft* (4/07/13)

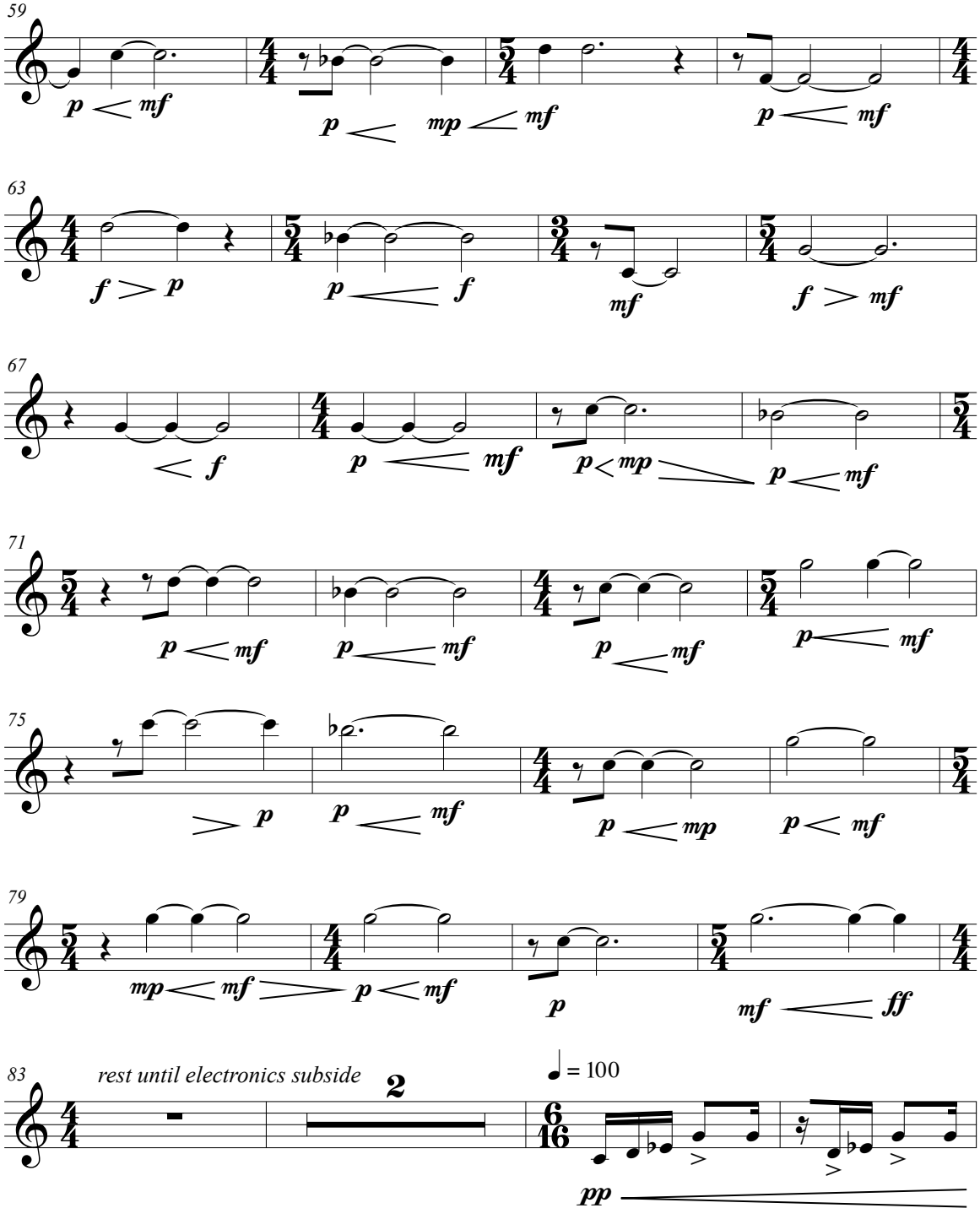
While these scores are incomplete and in draft form, they contain many of the early musical materials and sketches that were later developed into the final piece, *Ceremony of Superheroes.* The are provided unedited and no attempt has been made to finalize, correct or manage the material for final playability.

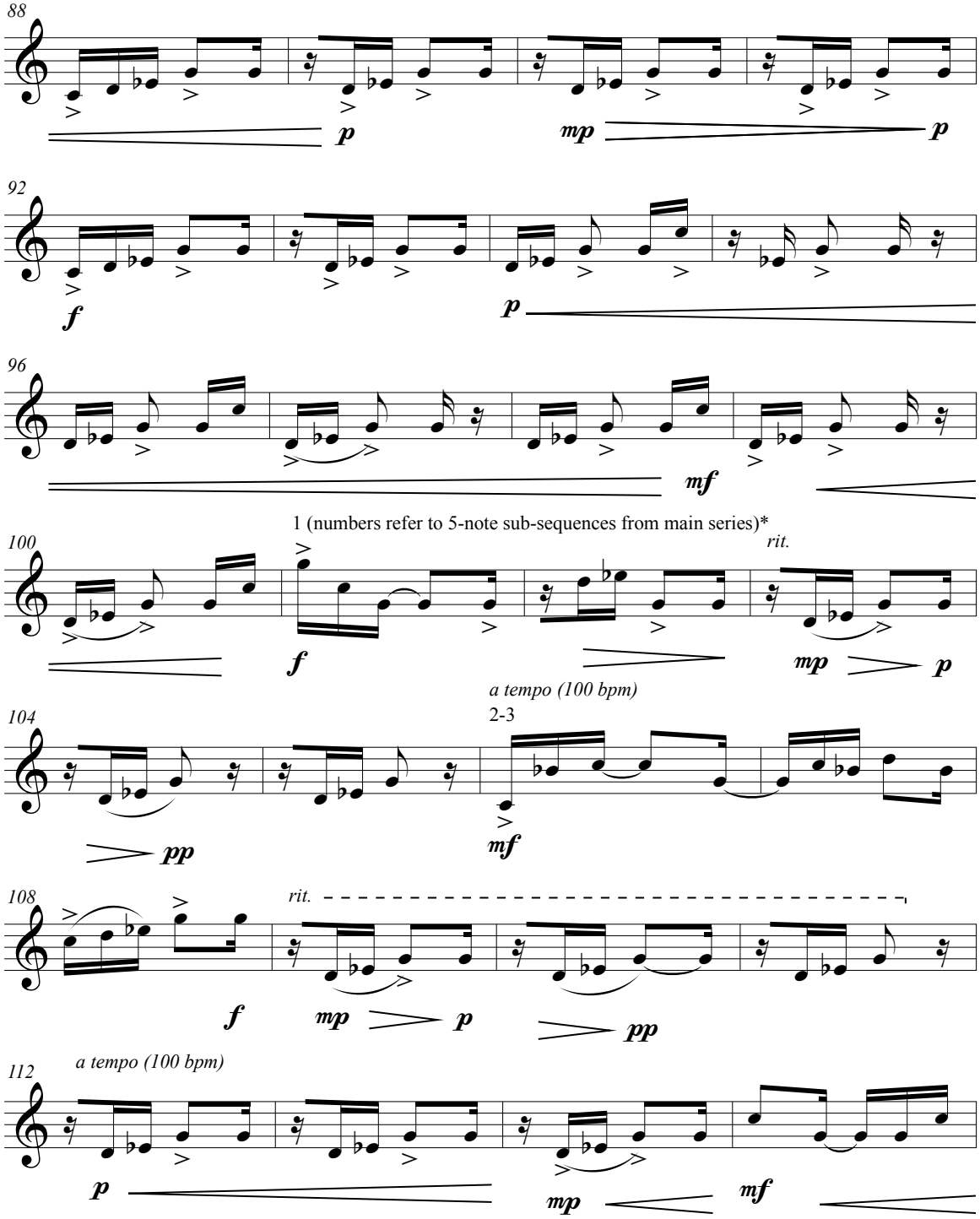
i. Call of the Messenger-draft (05/31/12)

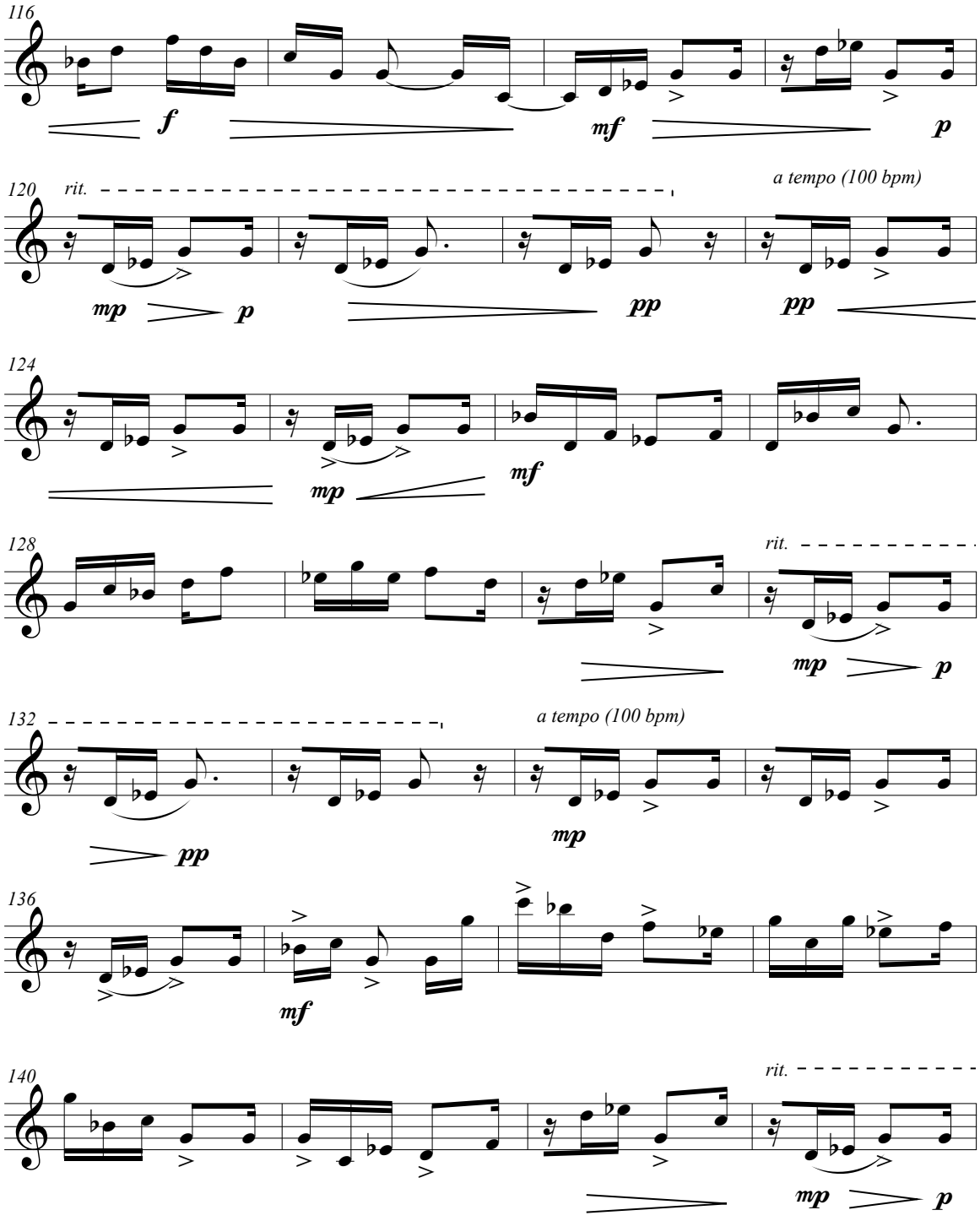
Jason F. Heath

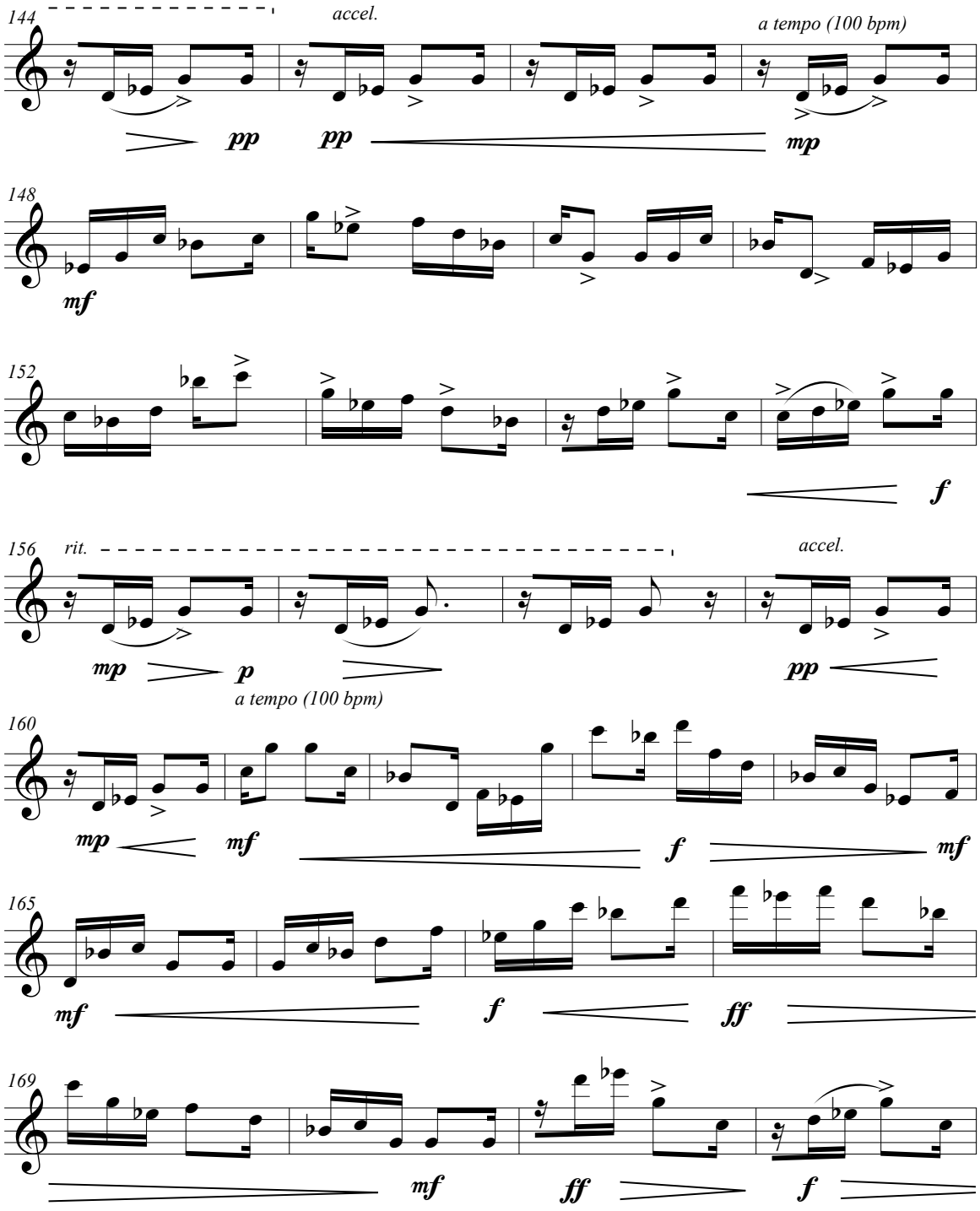


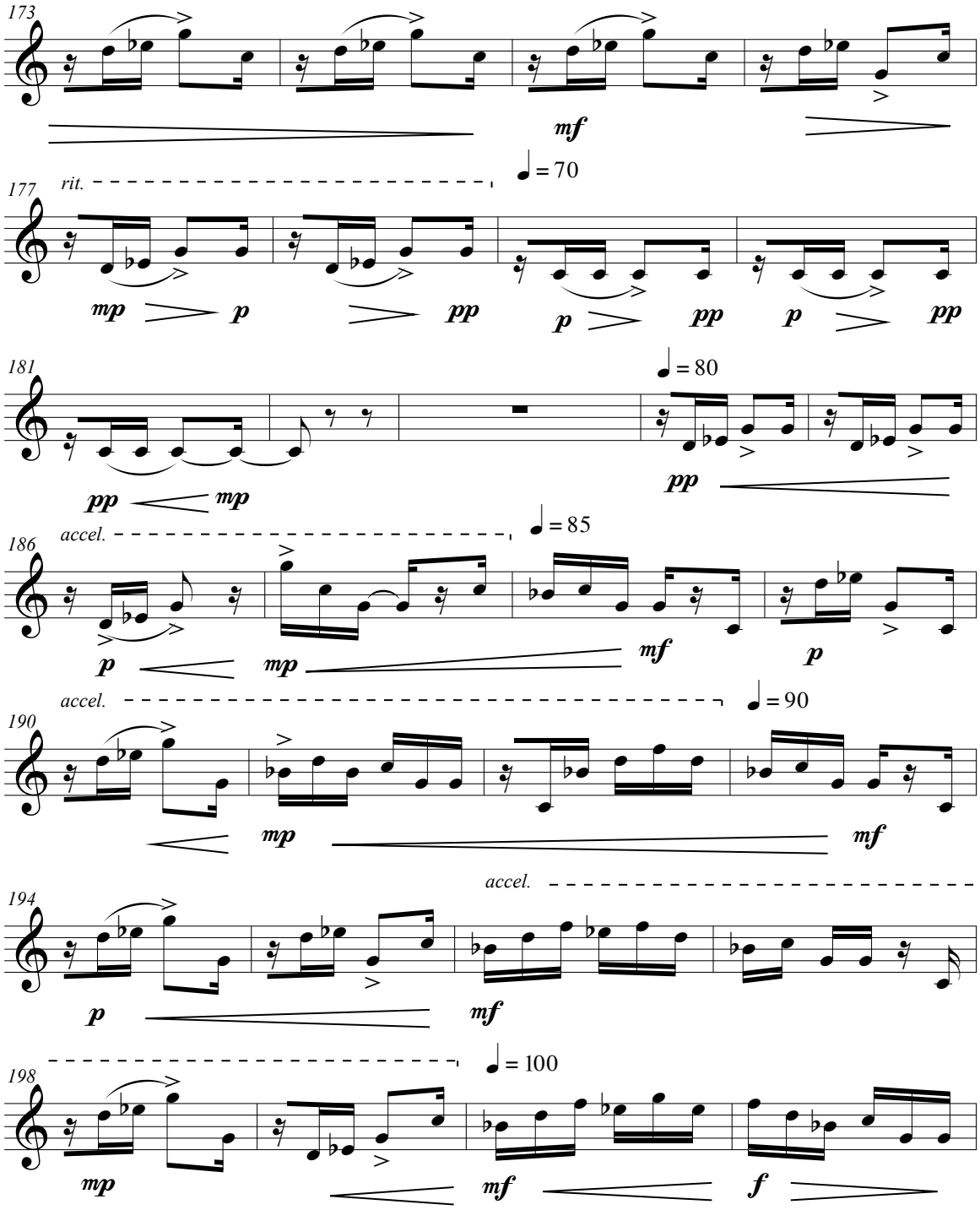

29
33
37
41
rest until electronics subside
2
C Flute
47
51
55

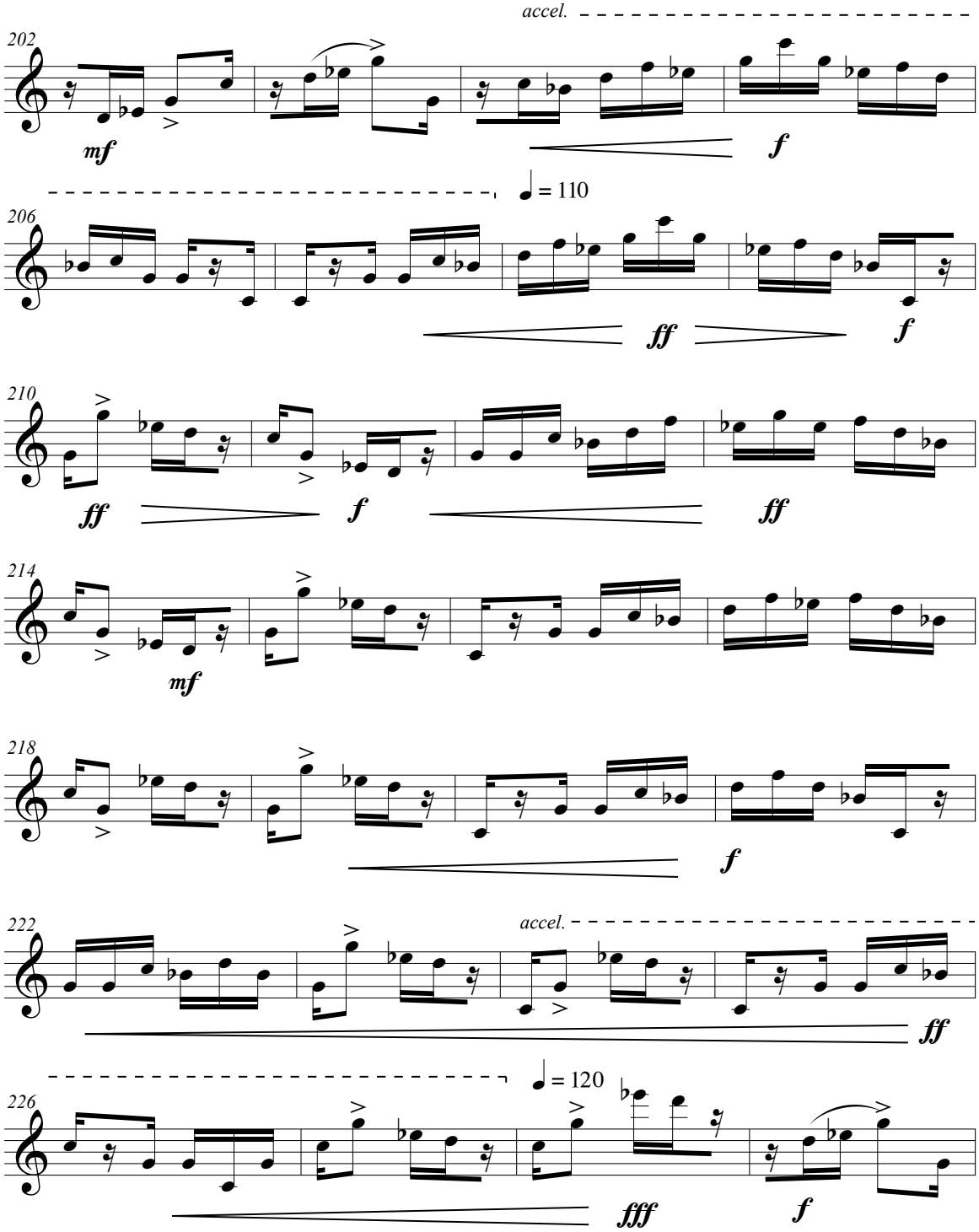

59
63
67
71
75
79
83
rest until electronics subside
2
♩ = 100

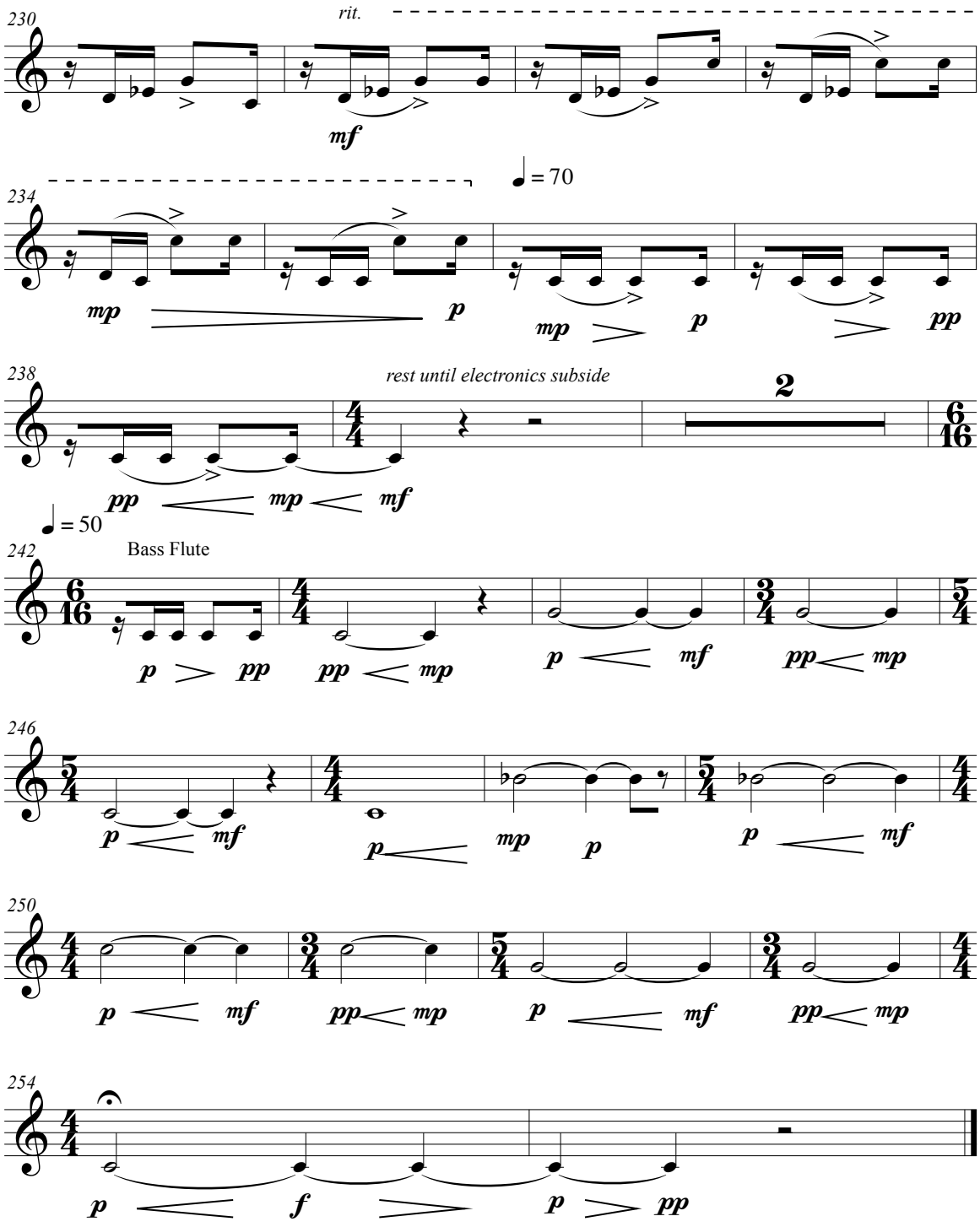

88
p
mp
p
92
f
p
96
mf
1 (numbers refer to 5-note sub-sequences from main series)*
100
f
rit.
mp
p
a tempo (100 bpm)
2-3
104
pp
mf
108
rit.
f
mp
p
pp
112
a tempo (100 bpm)
p
mp
mf


116
f
mf
p
120
rit.
a tempo (100 bpm)
mp
p
pp
pp
124
mp
mf
128
rit.
mp
p
132
a tempo (100 bpm)
pp
mp
136
mf
140
rit.
mp
p


144
accel.
a tempo (100 bpm)
pp
pp
mp
148
mf
152
f
156
rit.
accel.
mp
p
pp
a tempo (100 bpm)
160
mp
mf
f
mf
165
mf
f
ff
169
mf
ff
f

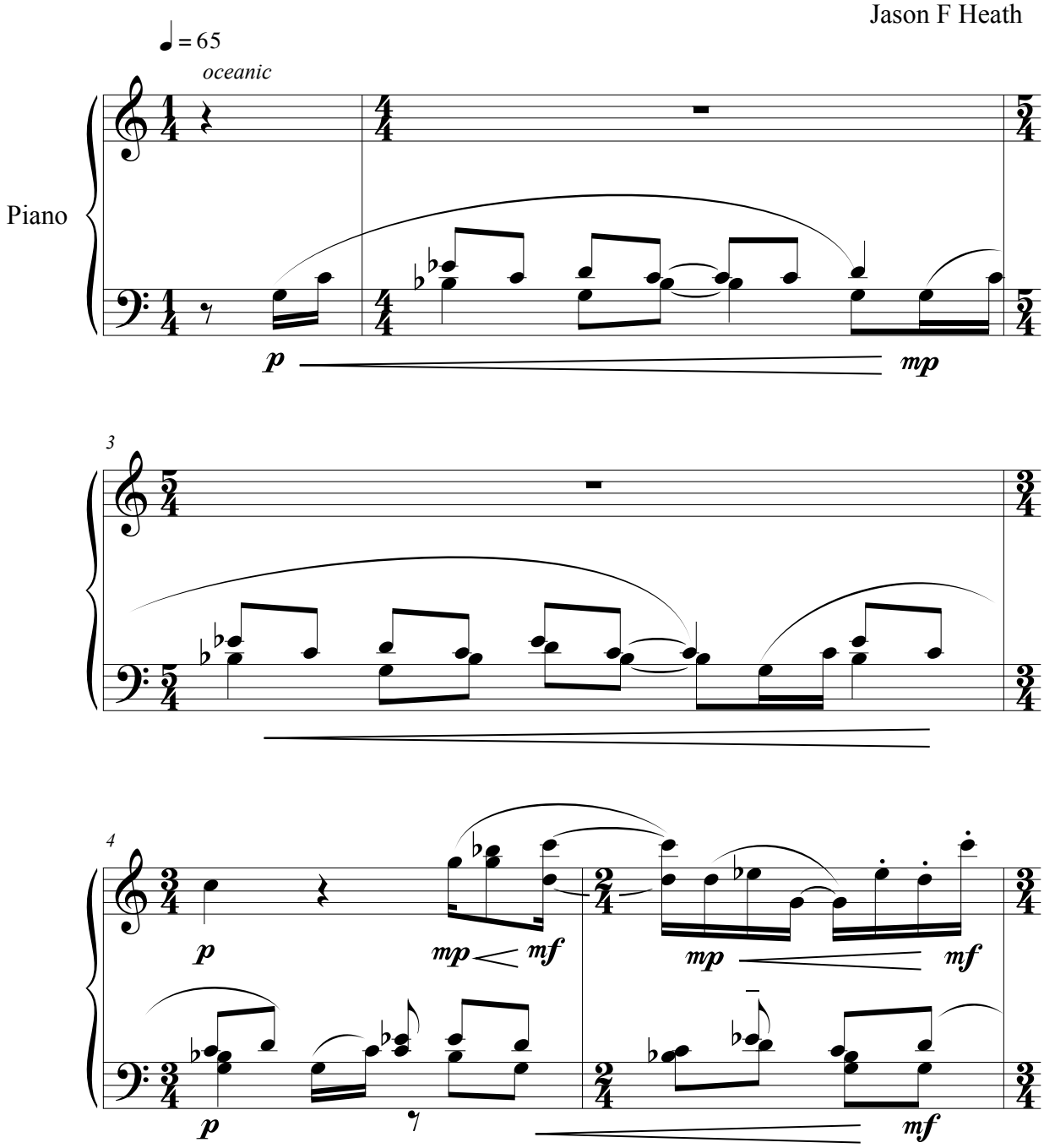

173
mf
177
rit.
♩ = 70
mp
p
pp
p
pp
p
pp
181
♩ = 80
pp
mp
pp
186
accel.
♩ = 85
p
mp
mf
p
190
accel.
♩ = 90
mp
mf
194
accel.
p
mf
198
♩ = 100
mp
mf
f

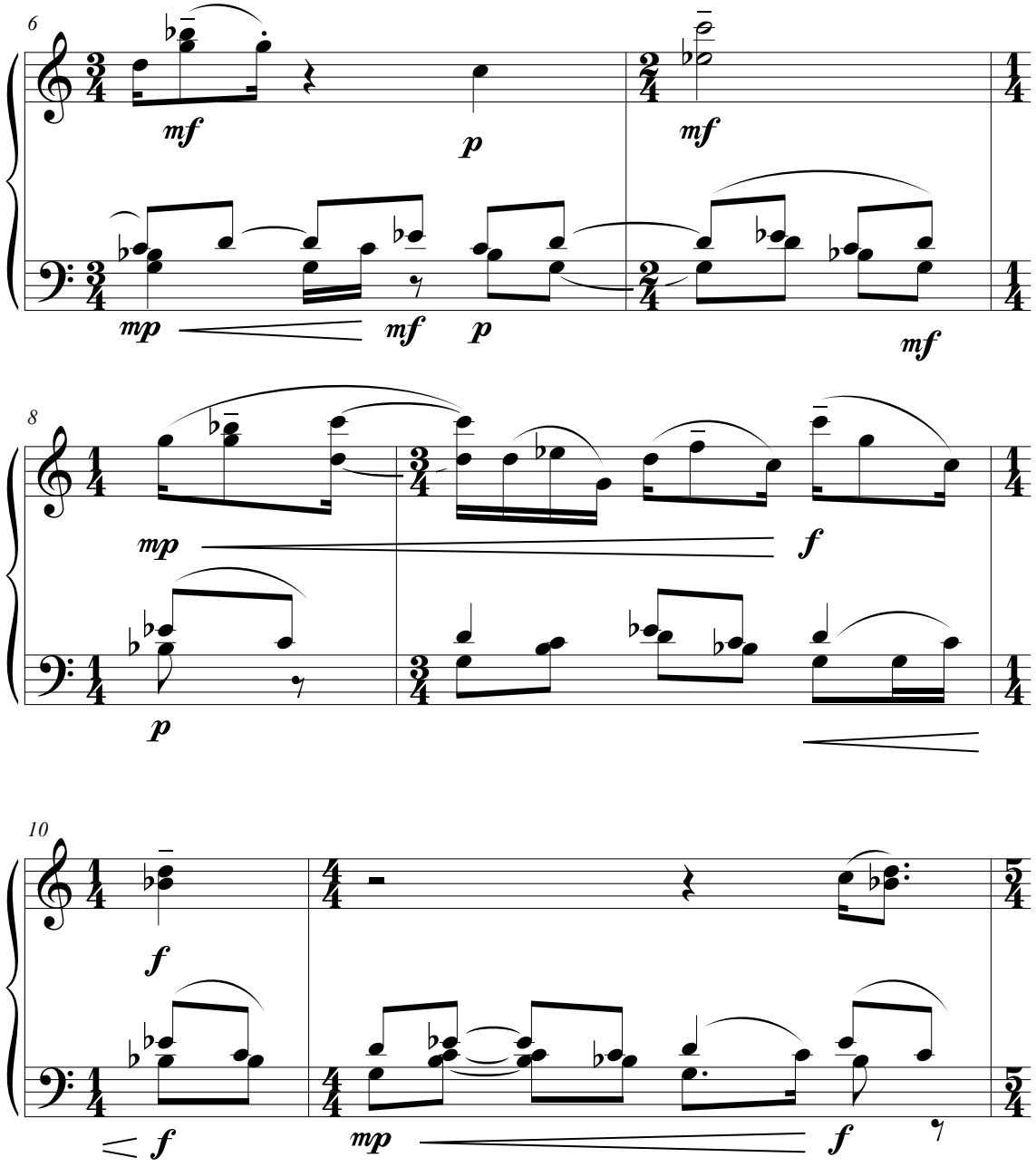

accel.
202
mf
f
♩ = 110
206
ff
f
210
ff
f
ff
214
mf
218
f
accel.
222
ff
♩ = 120
226
fff
f

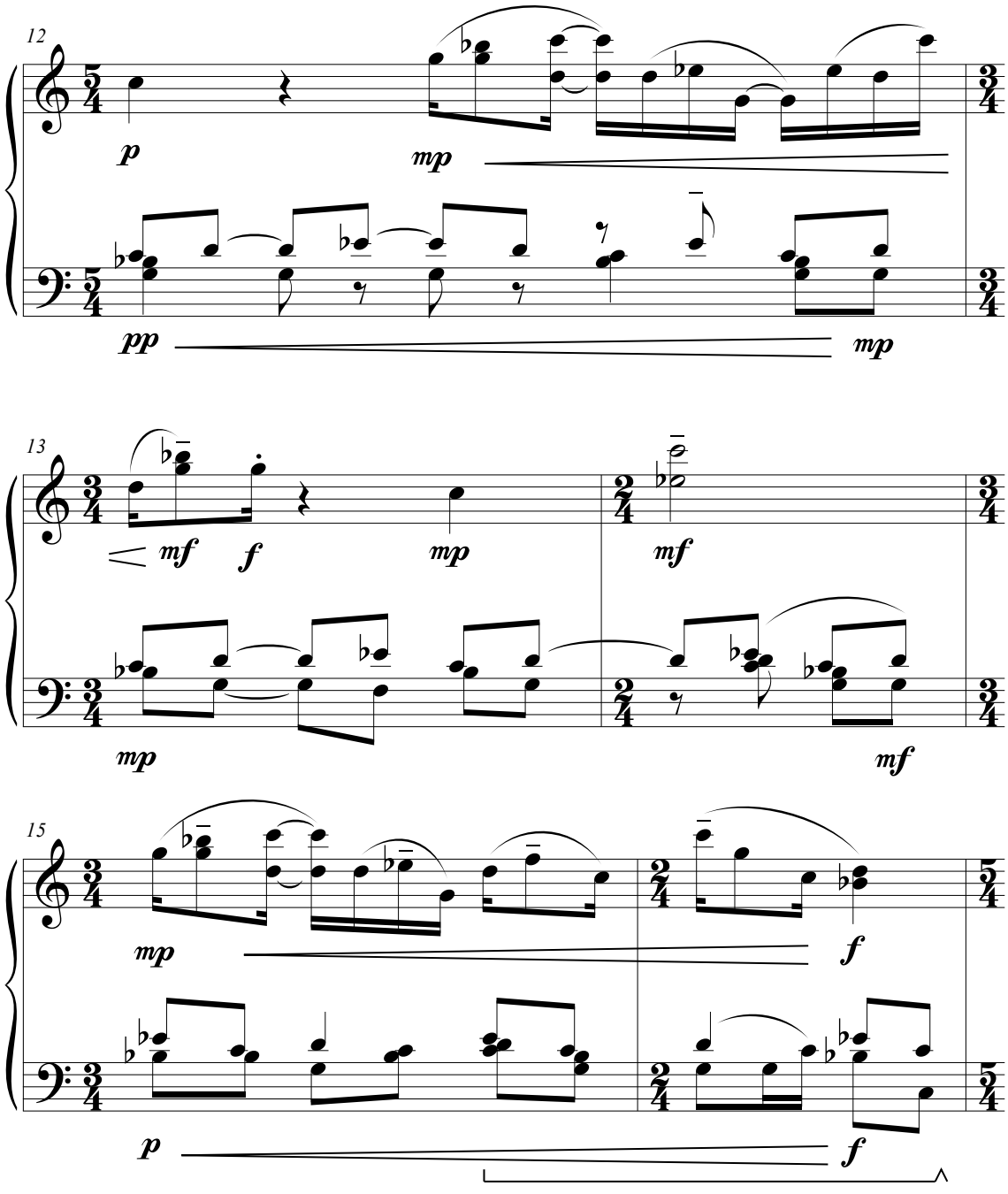

230
rit.
mf
234
♩ = 70
mp
p
mp
p
pp
238
rest until electronics subside
2
pp
mp
mf
♩ = 50
242
Bass Flute
p
pp
pp
mp
p
mf
pp
mp
246
p
mf
p
mp
p
p
mf
250
p
mf
pp
mp
p
mf
pp
mp
254
p
f
p
pp

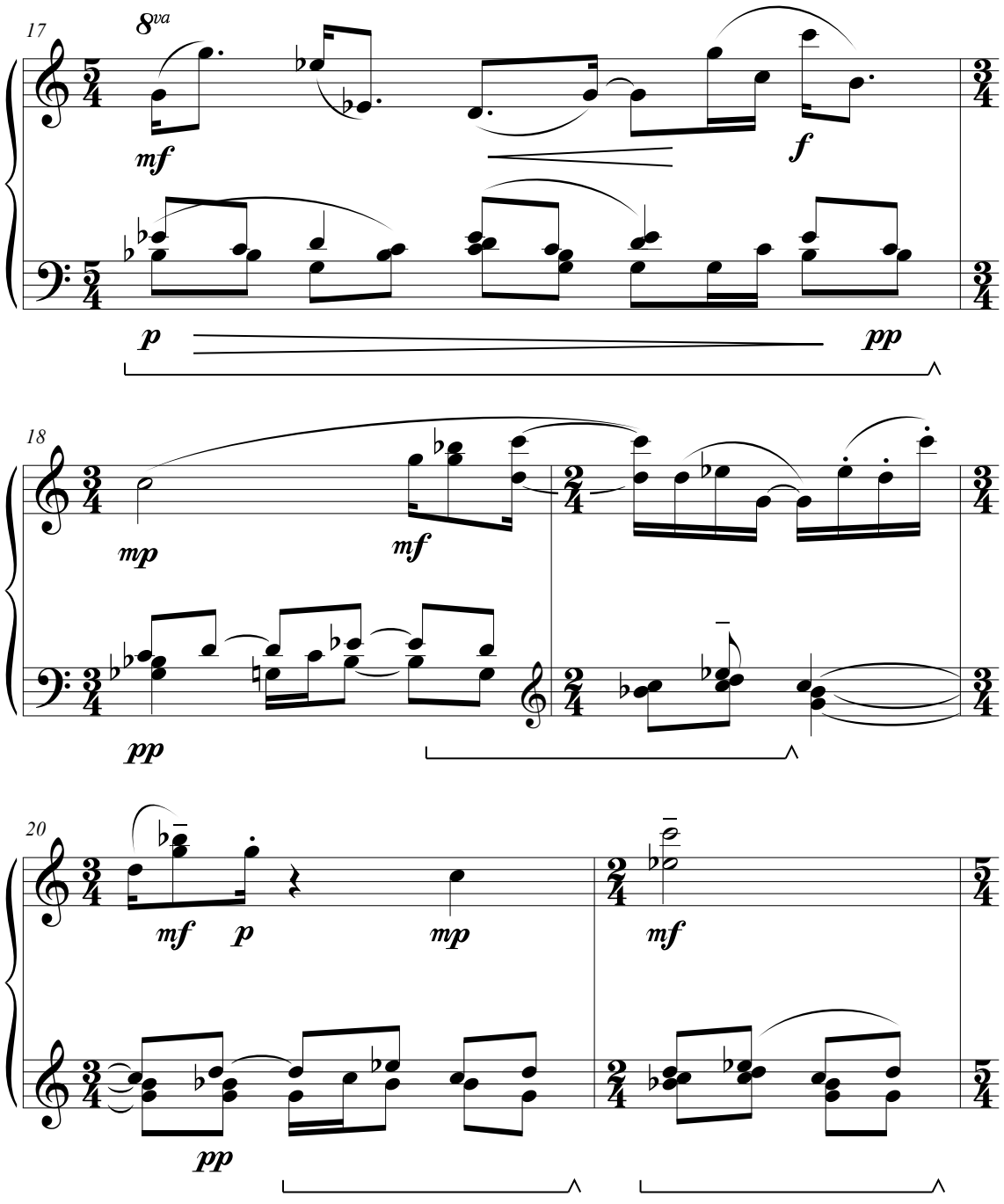
ii. Lullaby of the Lonely Gondolier - draft (4/22/13)

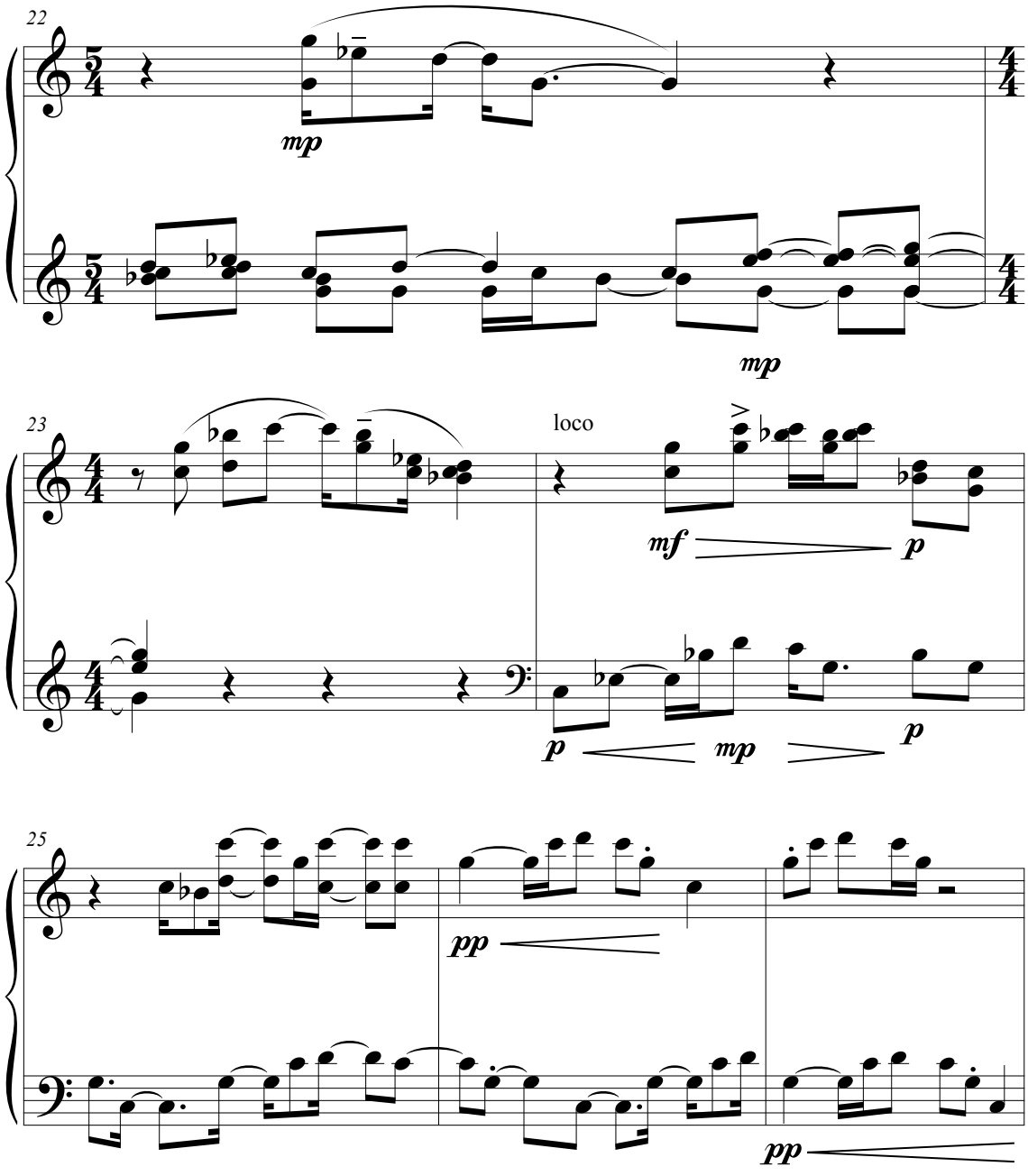
Jason F Heath

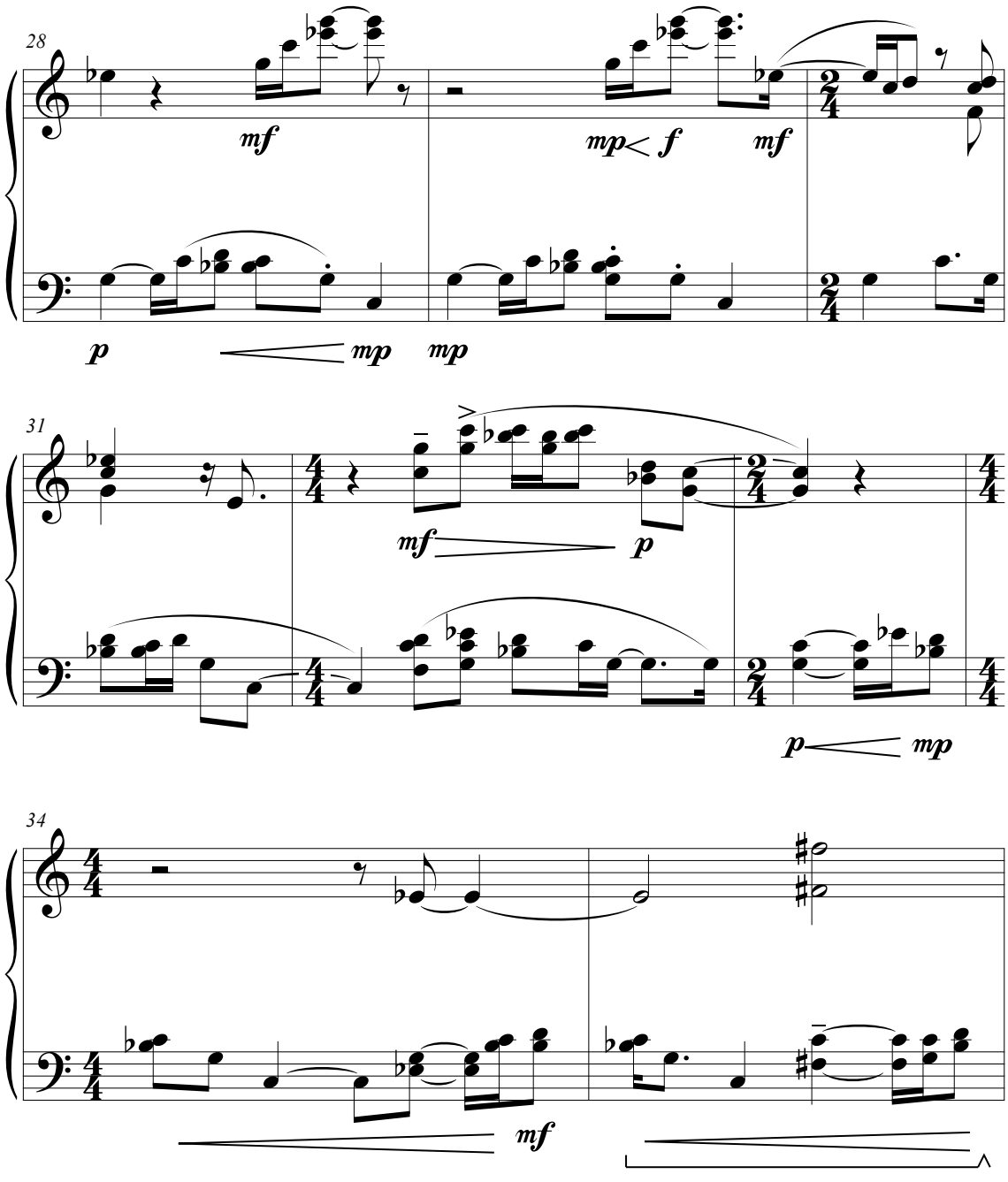


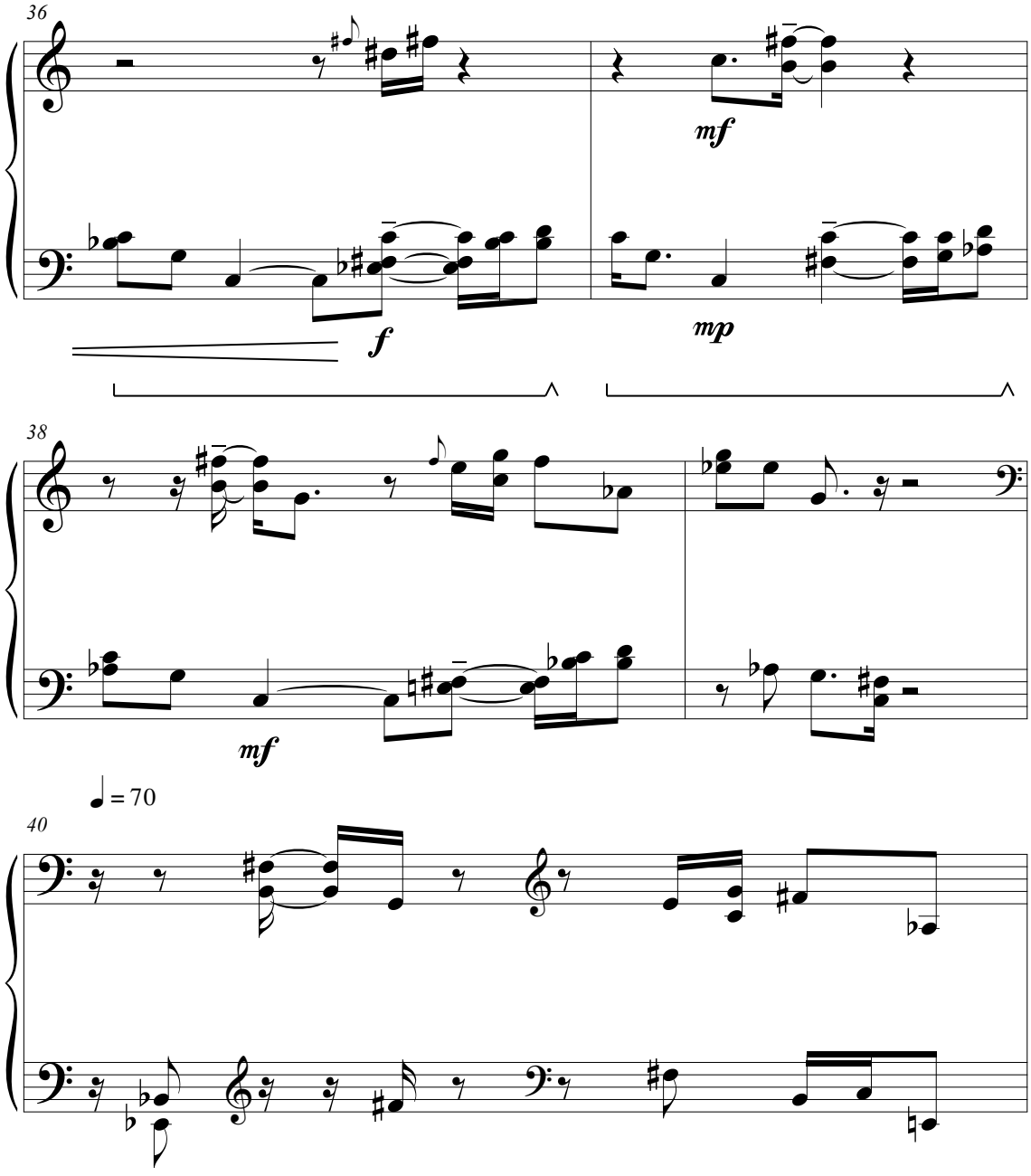

6
mf
p
mf
mp
mf
p
mf
8
mp
f
p
10
f
f
mp
f

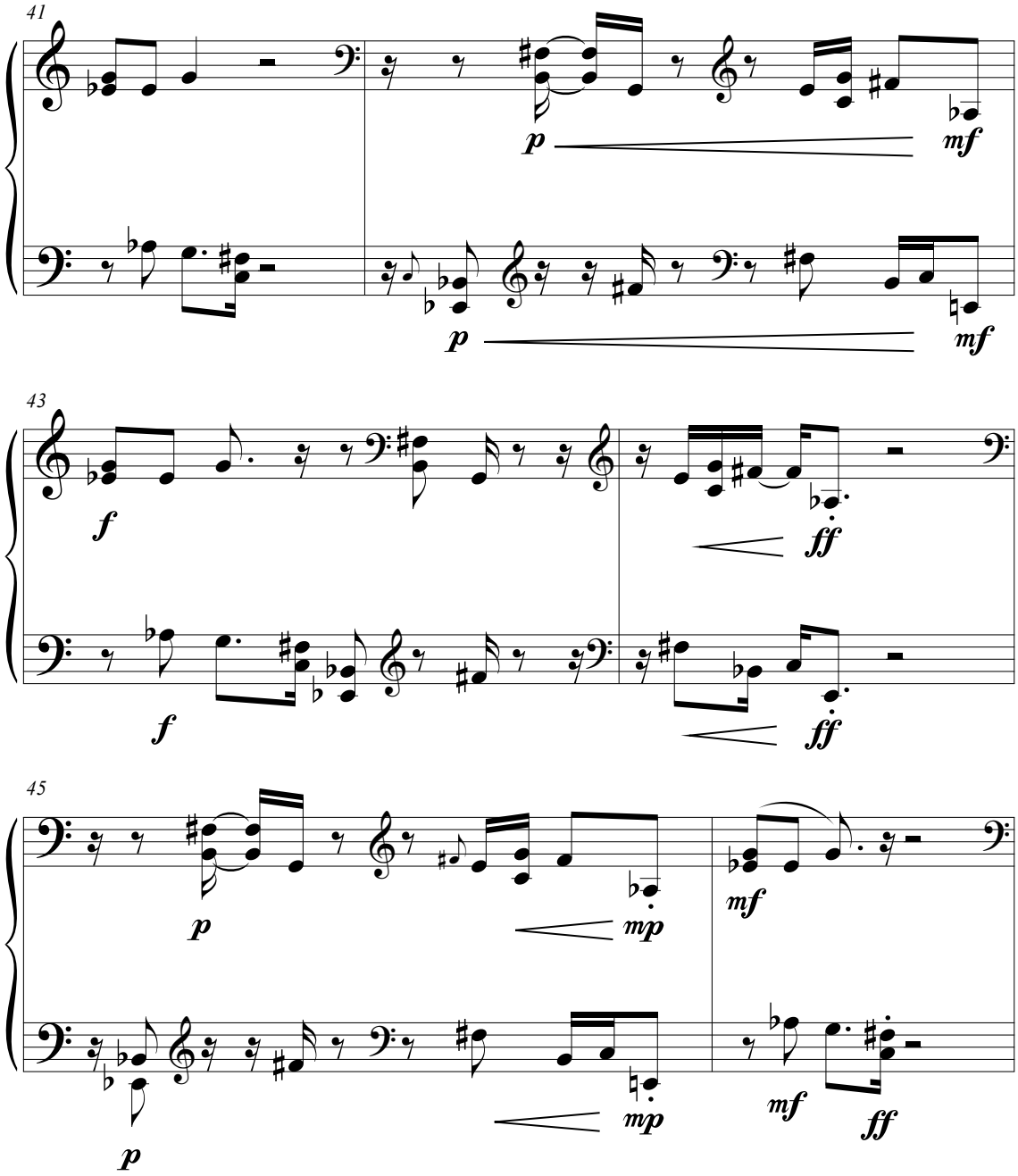

12
p
mp
pp
mp
13
mf
f
mp
mf
mp
mf
15
mp
f
p
f

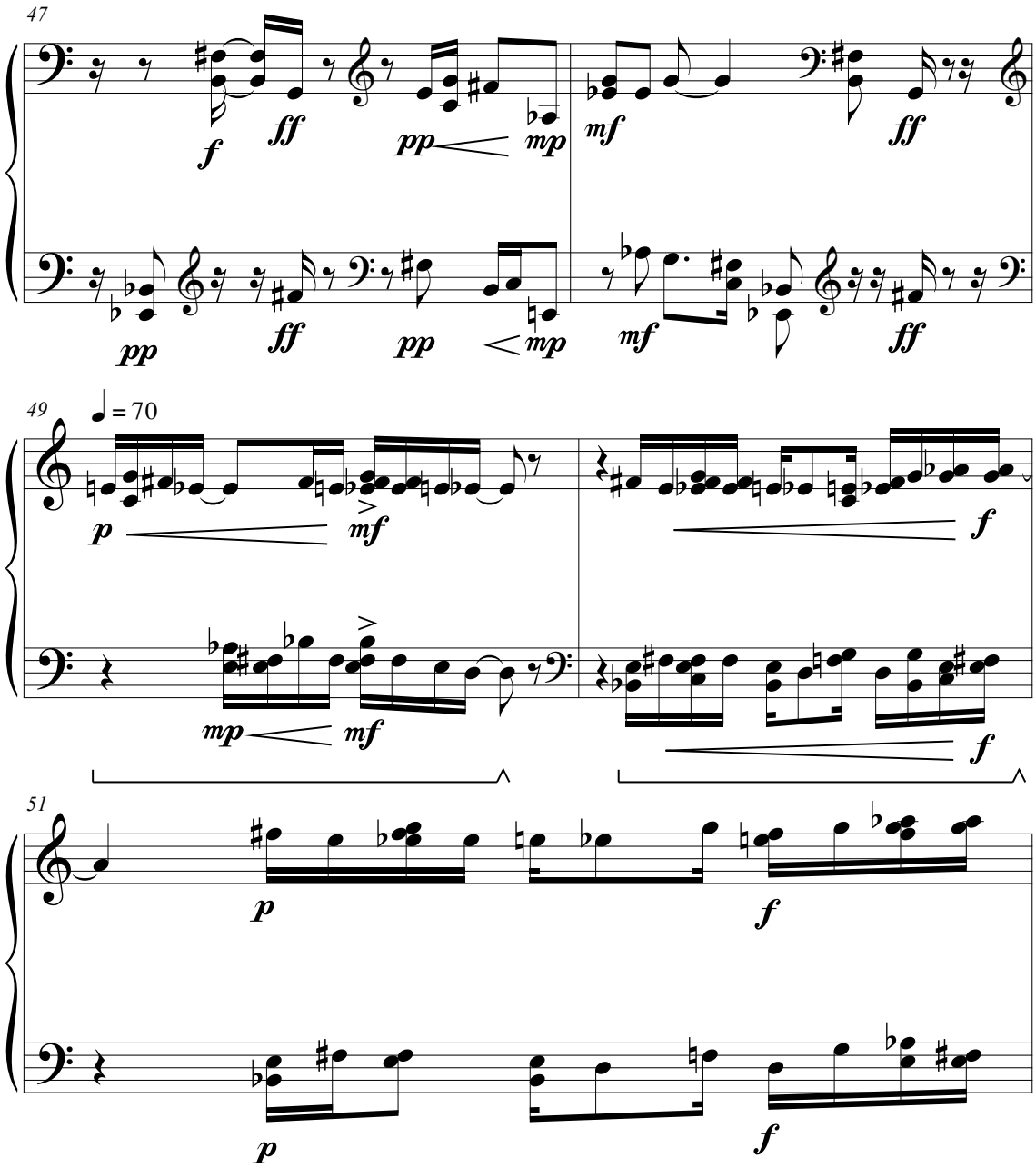

17
8va
mf
f
p
pp
18
mp
mf
pp
20
mf
p
mp
mf
pp

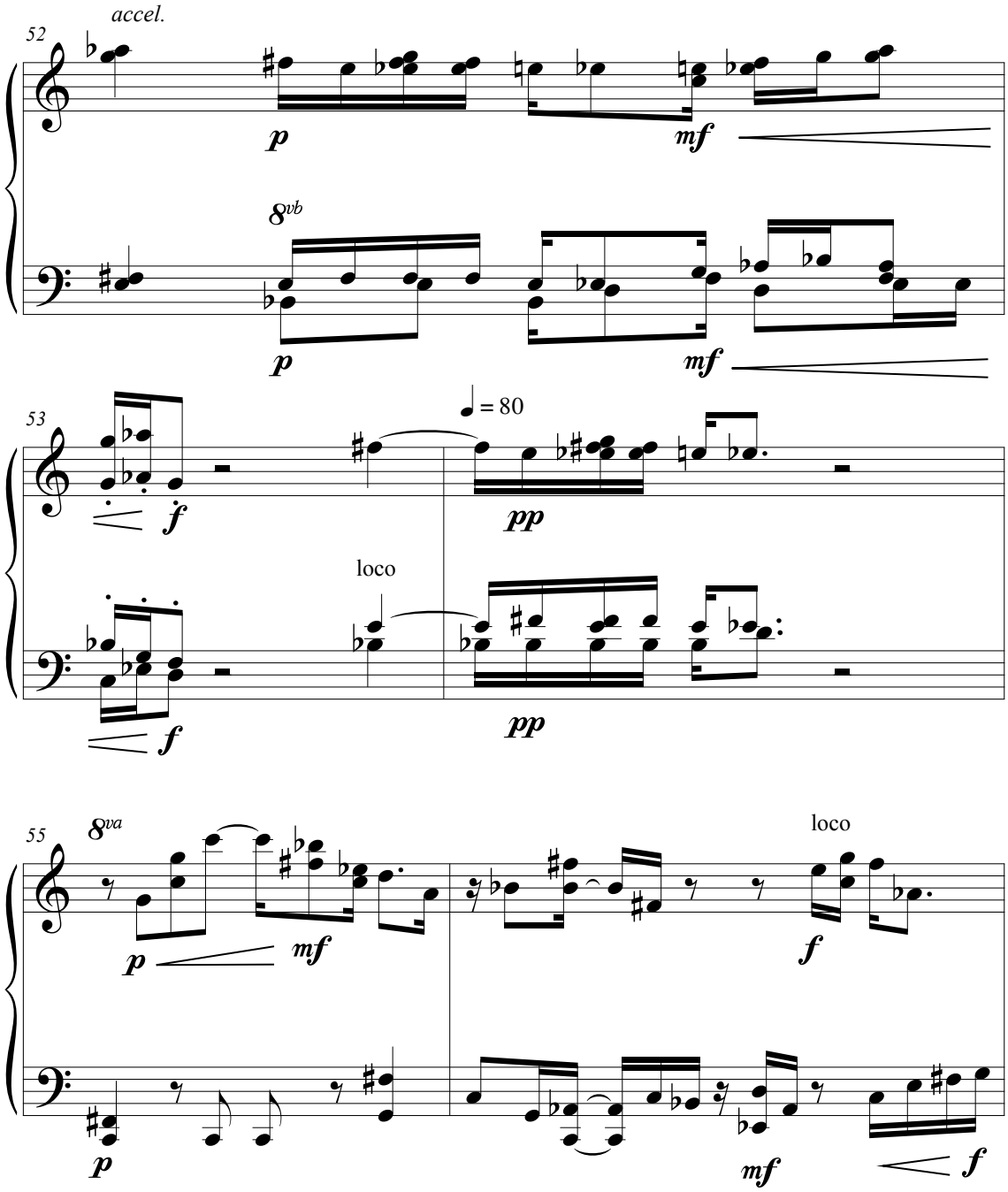

22
mp
mp
23
loco
mf
p
p
mp
p
25
pp
pp

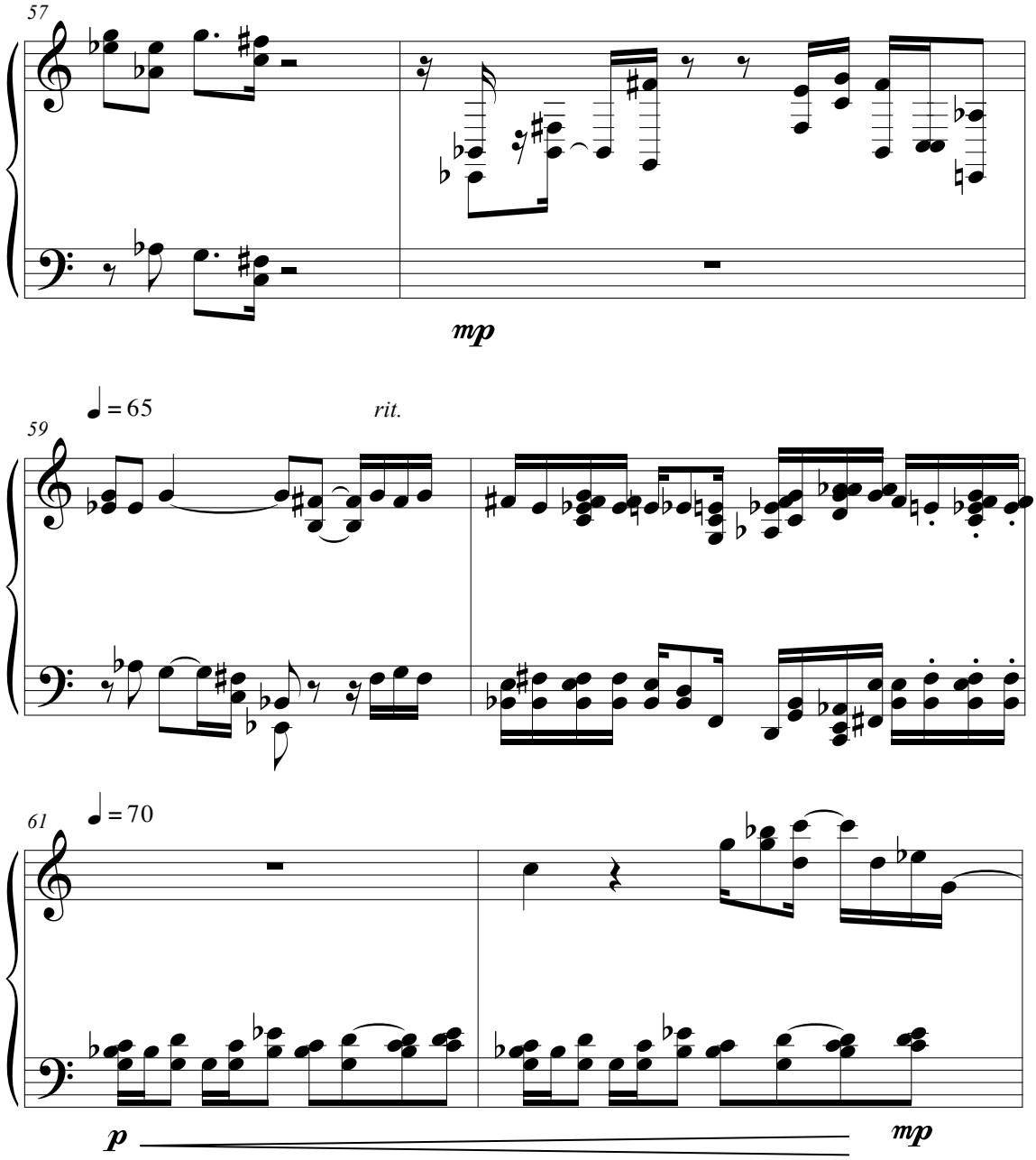

28
mf
mp < f
mf
p
mp
mp
31
mf
p
p
mp
34
mf

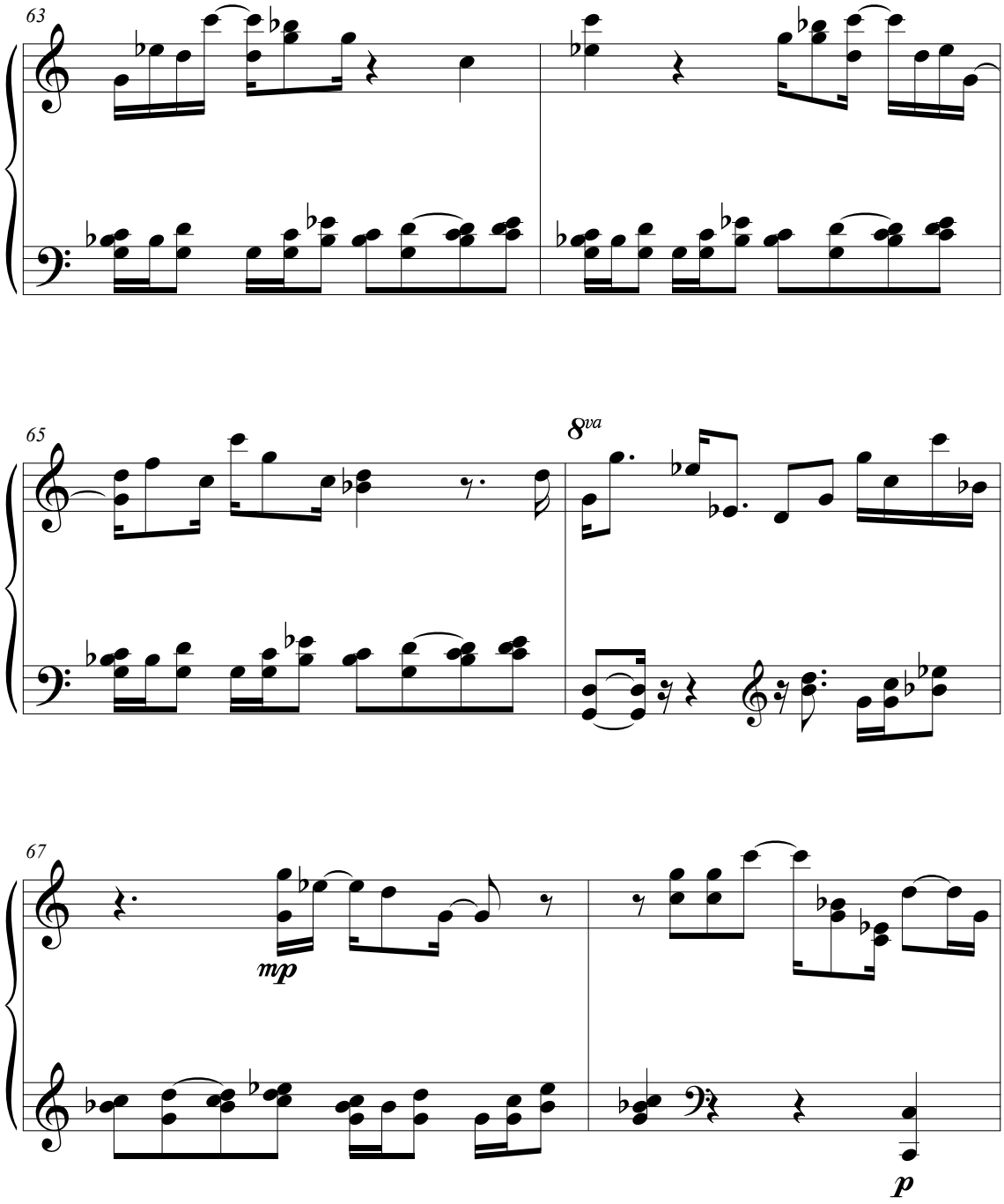

36
mf
f
mp
38
mf
♩ = 70
40

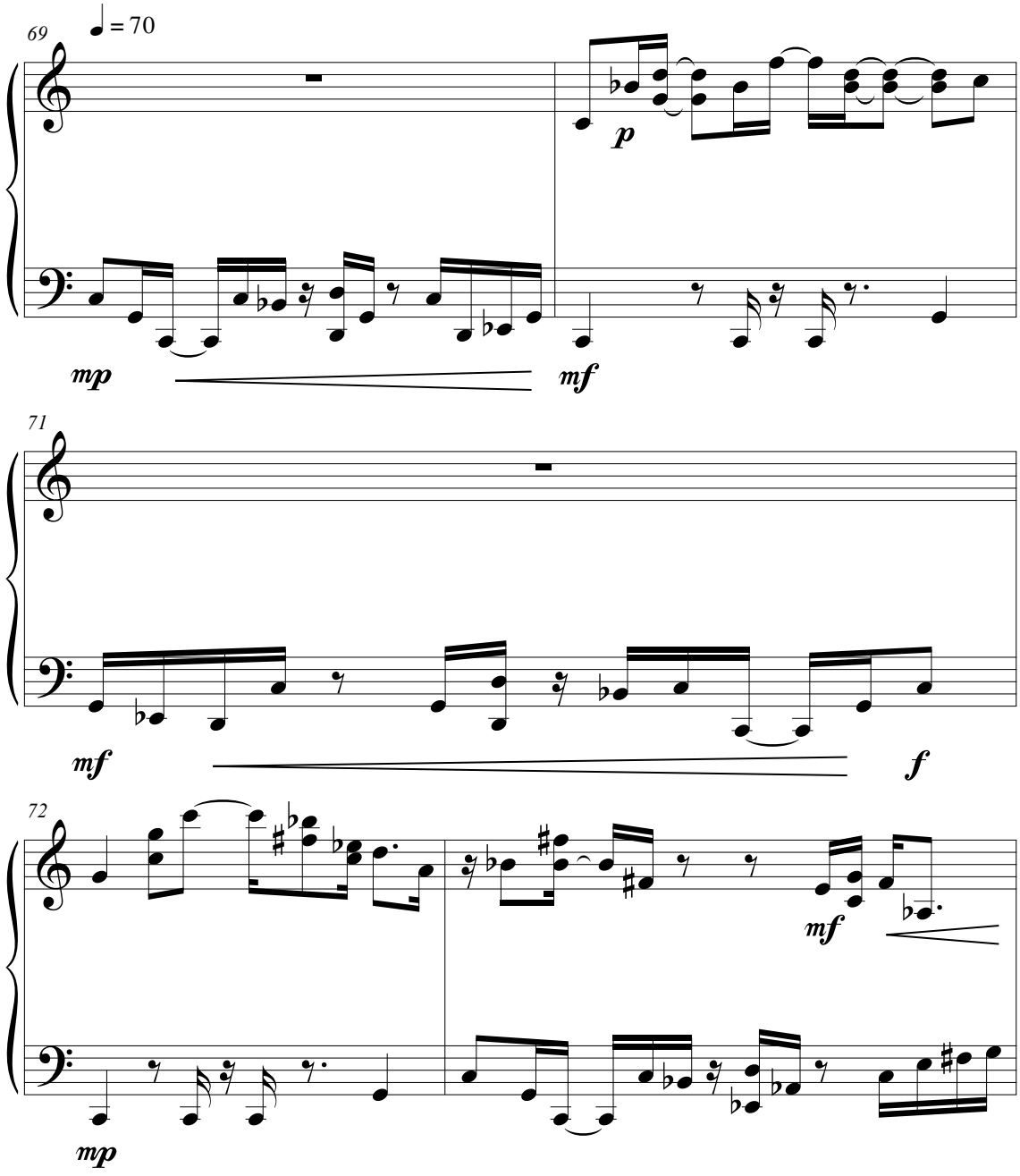

41
p
mf
p
mf
43
f
ff
f
ff
45
p
mp
mf
p
mp
mf
ff

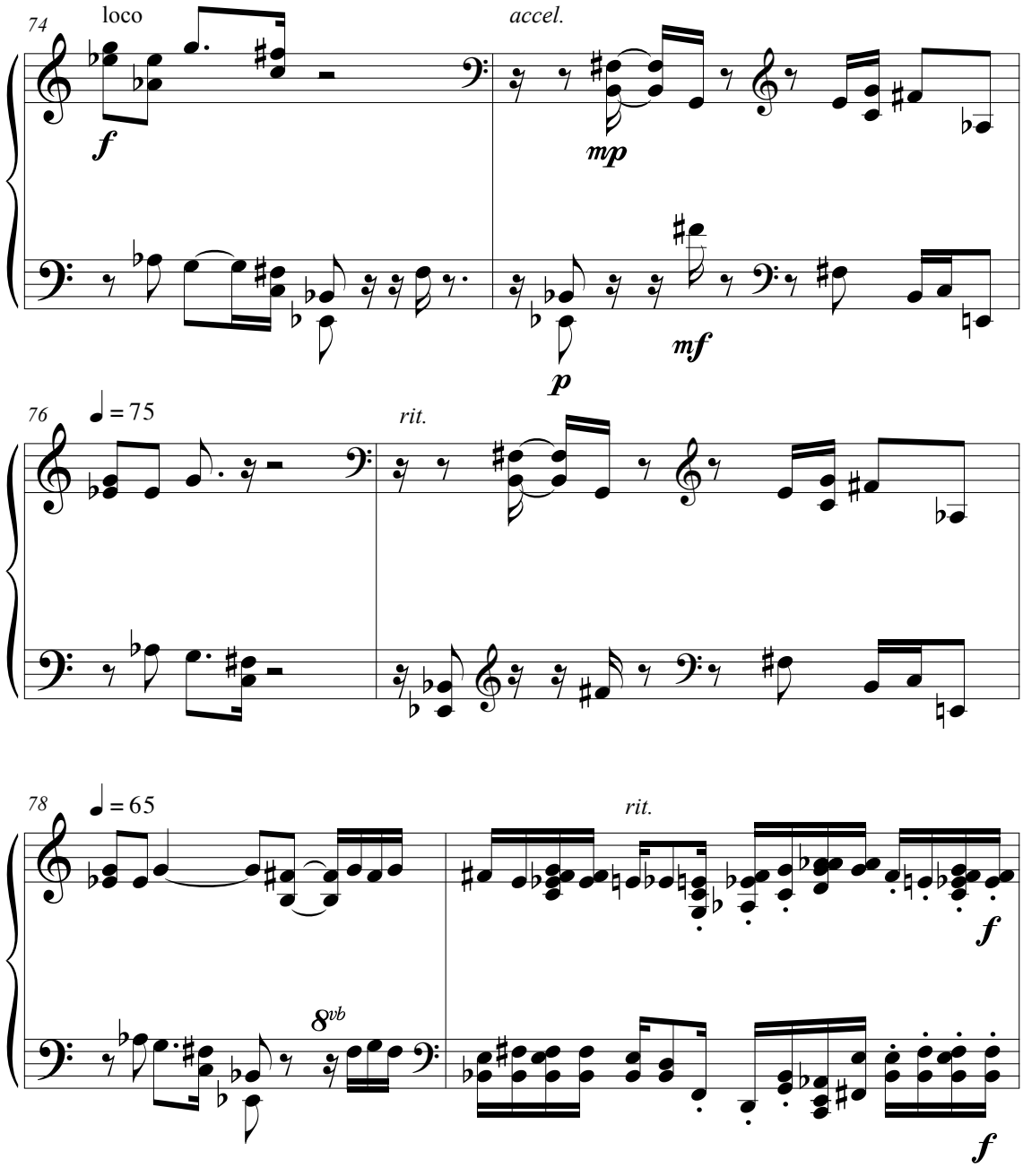

47
49
51
♩ = 70

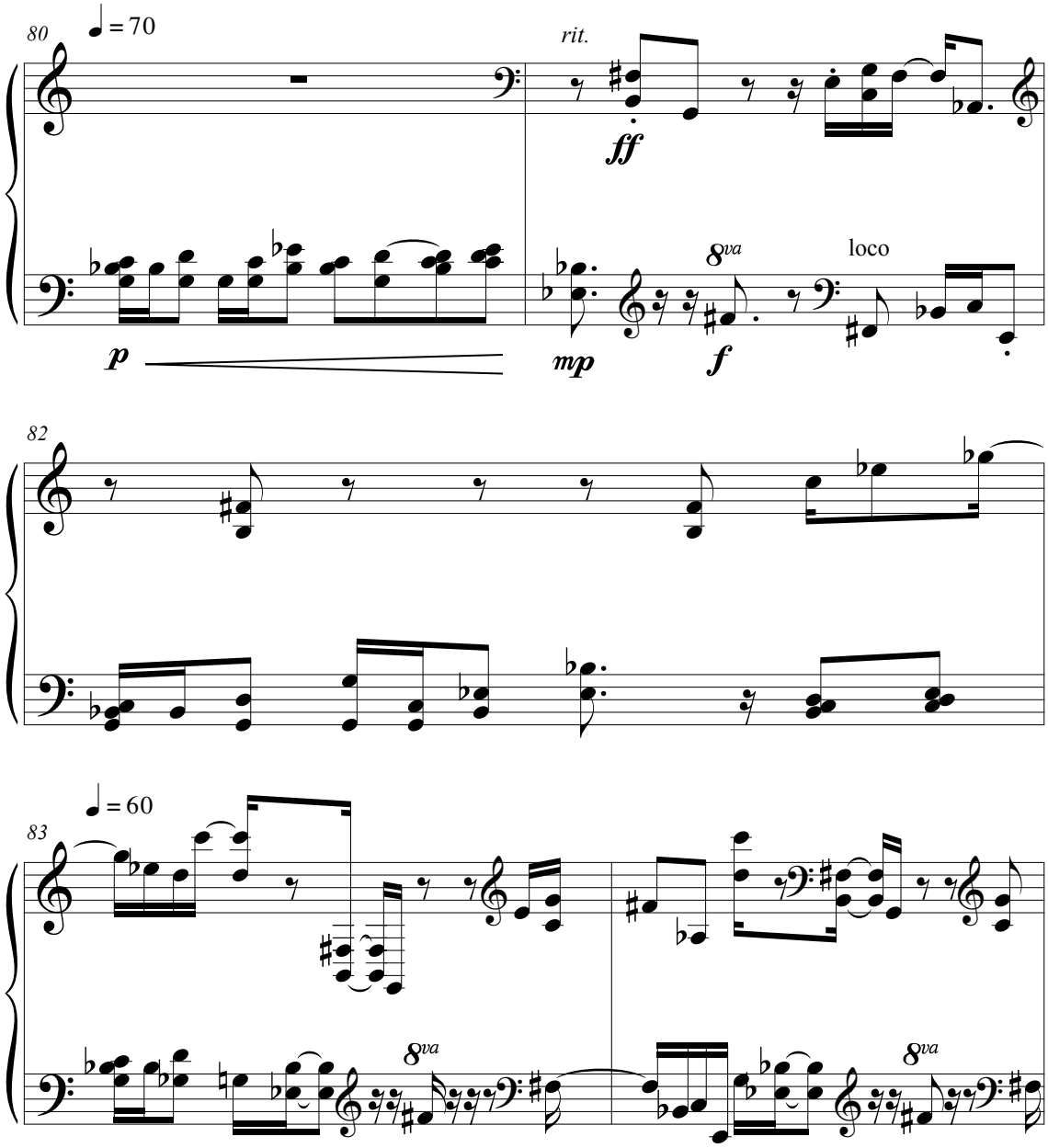

accel.
52
p
mf
8vb
p
mf
53
= 80
f
pp
loco
f
pp
55
8va
p
mf
loco
f
p
mf
f

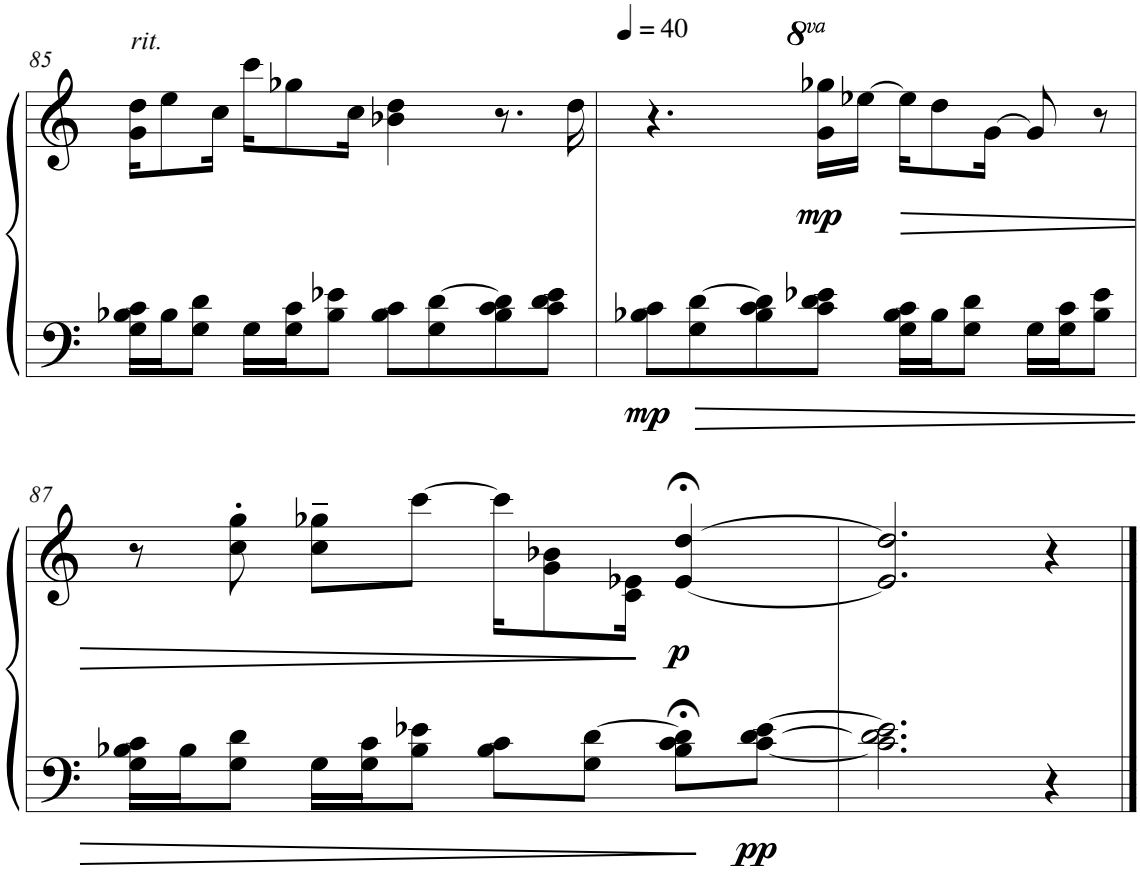

57
mp
♩ = 65
rit.
59
61
♩ = 70
p
mp


63
65
8va
67
mp
p


69
♩ = 70
p
mp
mf
71
mf
f
72
mf
mp

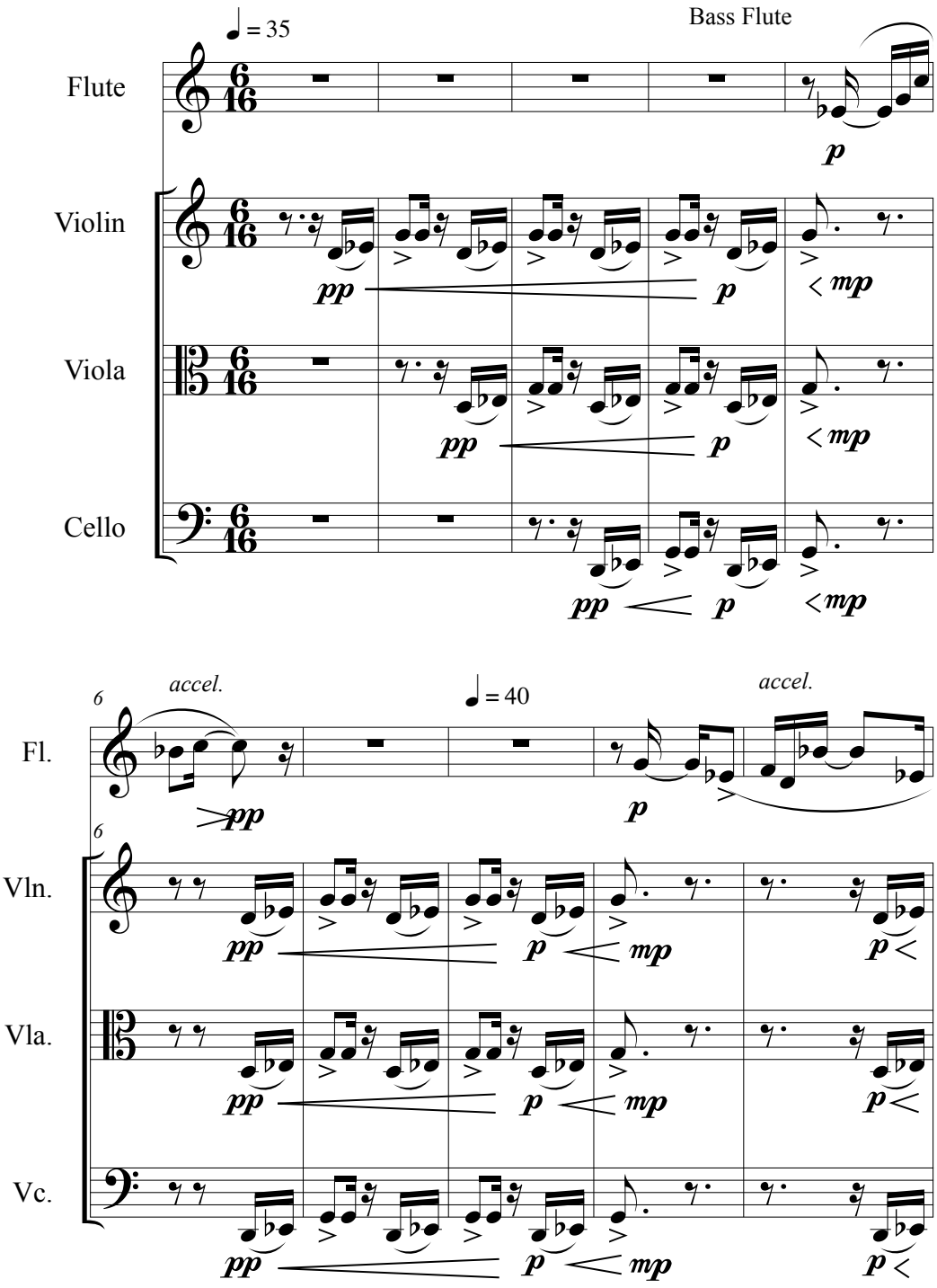

74
loco
f
accel.
mp
mf
p
76
♩ = 75
rit.
78
♩ = 65
rit.
f
8vb
f

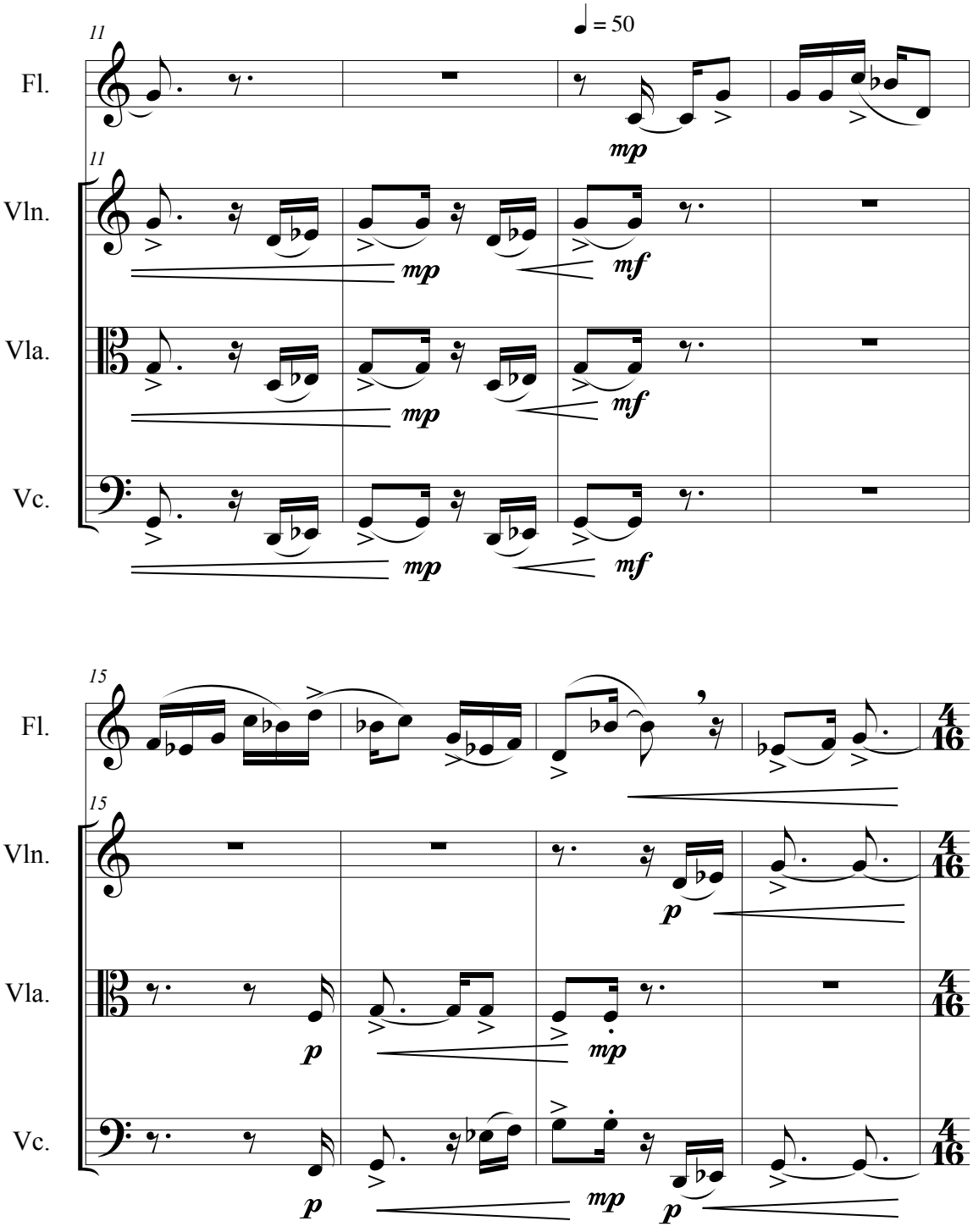

80
♩ = 70
rit.
ff
p
mp
f
8va
loco
82
♩ = 60
83
8va
8va

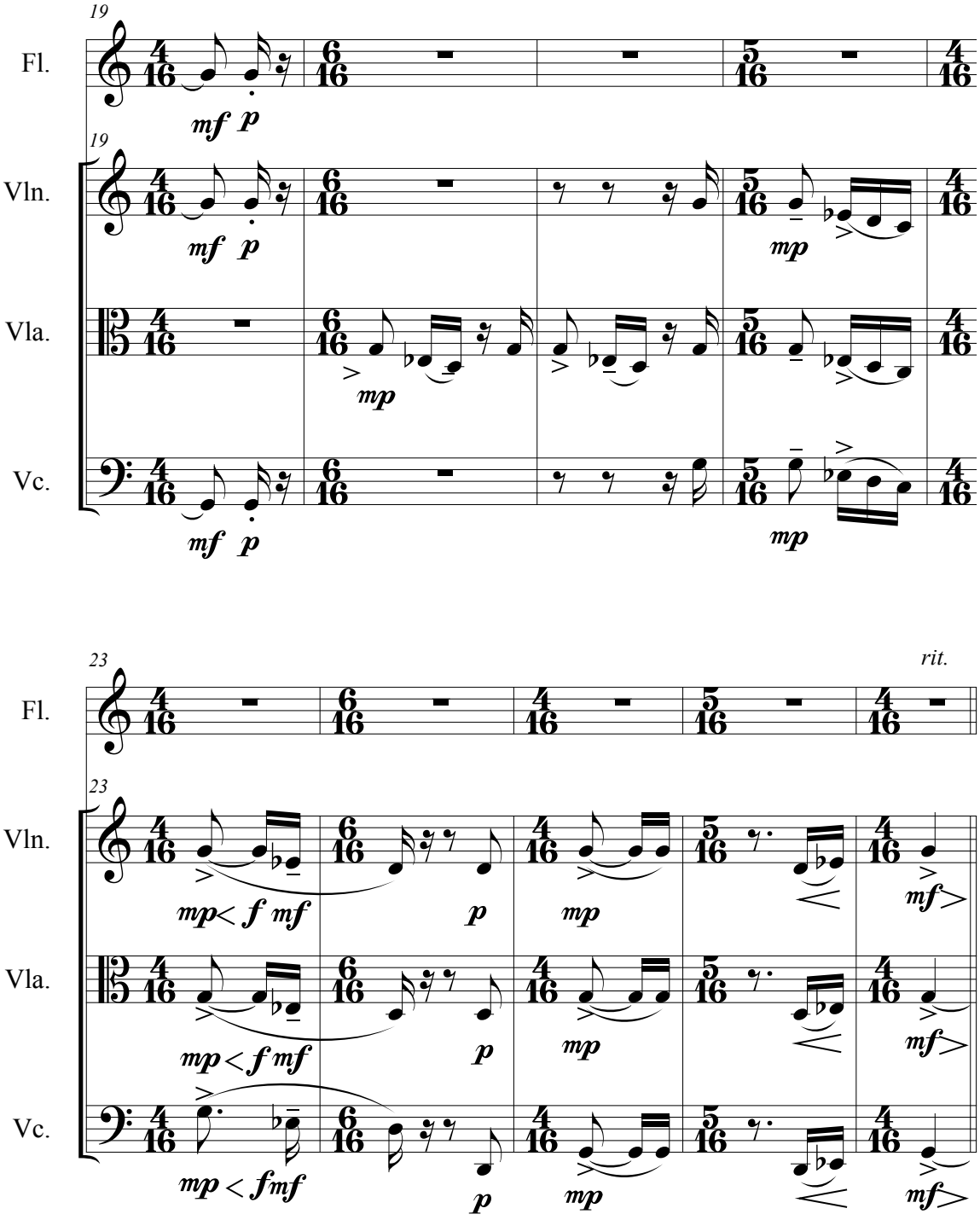

rit.
85
♩ = 40
8va
mp
mp
87
p
pp

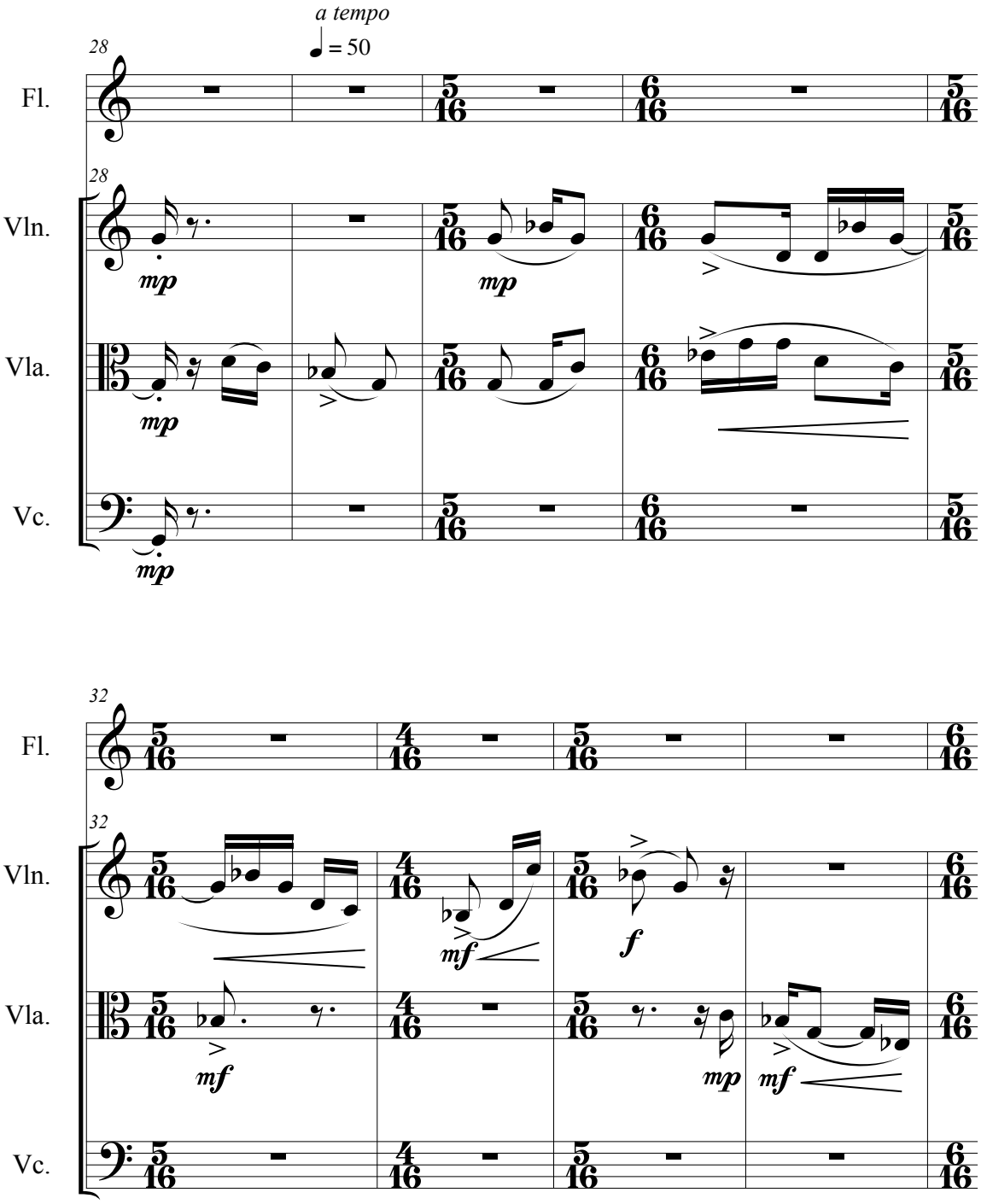
iii. Shapeshifters-draft 04/07/13

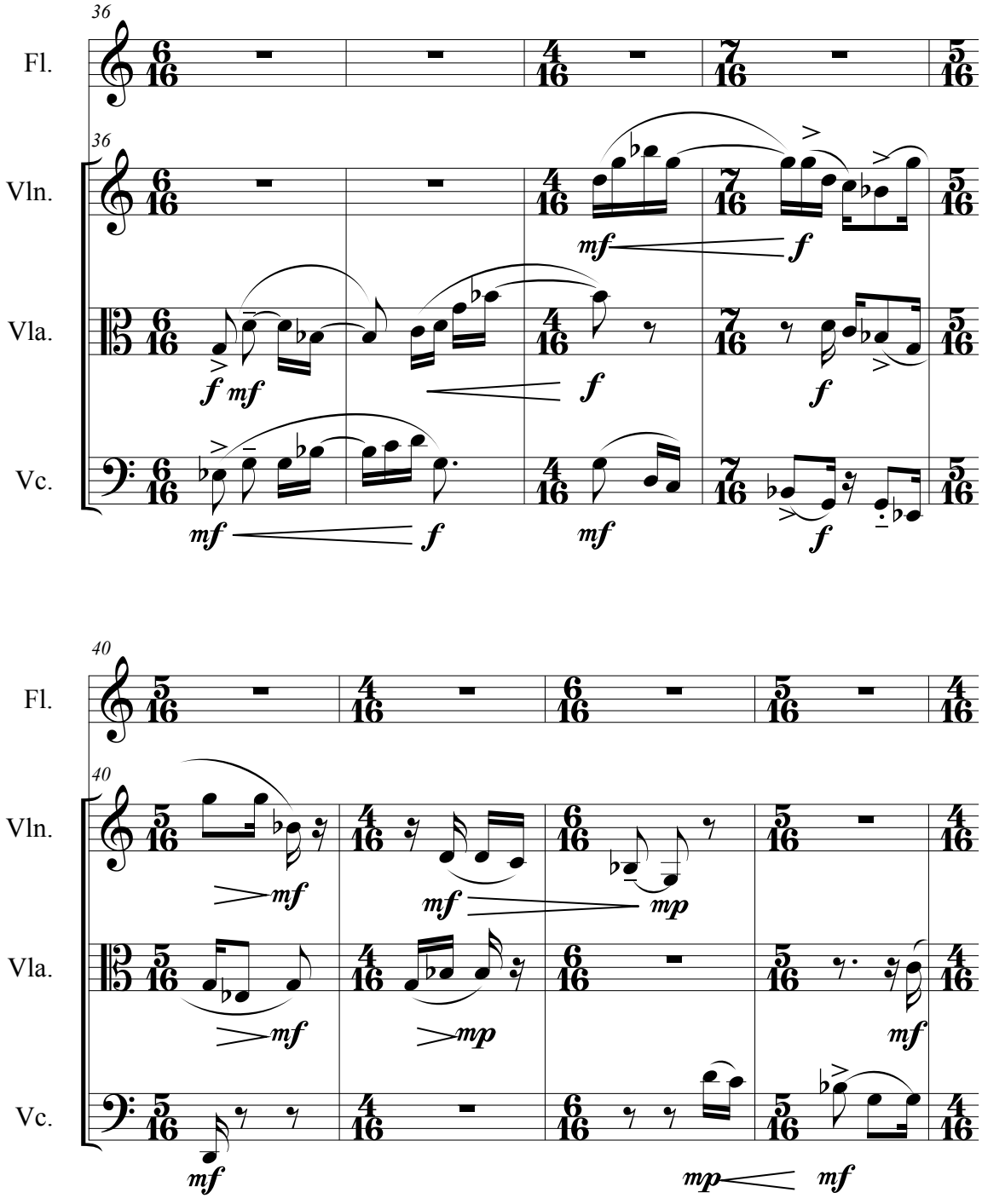
Jason F. Heath




11
♩ = 50
Fl.
mp
11
Vln.
mp
mf
Vla.
mp
mf
Vc.
mp
mf
15
Fl.
4
16
15
Vln.
p
4
16
Vla.
p
mp
4
16
Vc.
p
mp
p
4
16


19
Fl.
Vln.
Vla.
Vc.
mf p
mp
23
rit.
mp< f mf
p
mf>


a tempo
♩ = 50
28
Fl.
Vln.
Vla.
Vc.
mp
32
mf
f


36
Fl.
Vln.
Vla.
Vc.
40
Fl.
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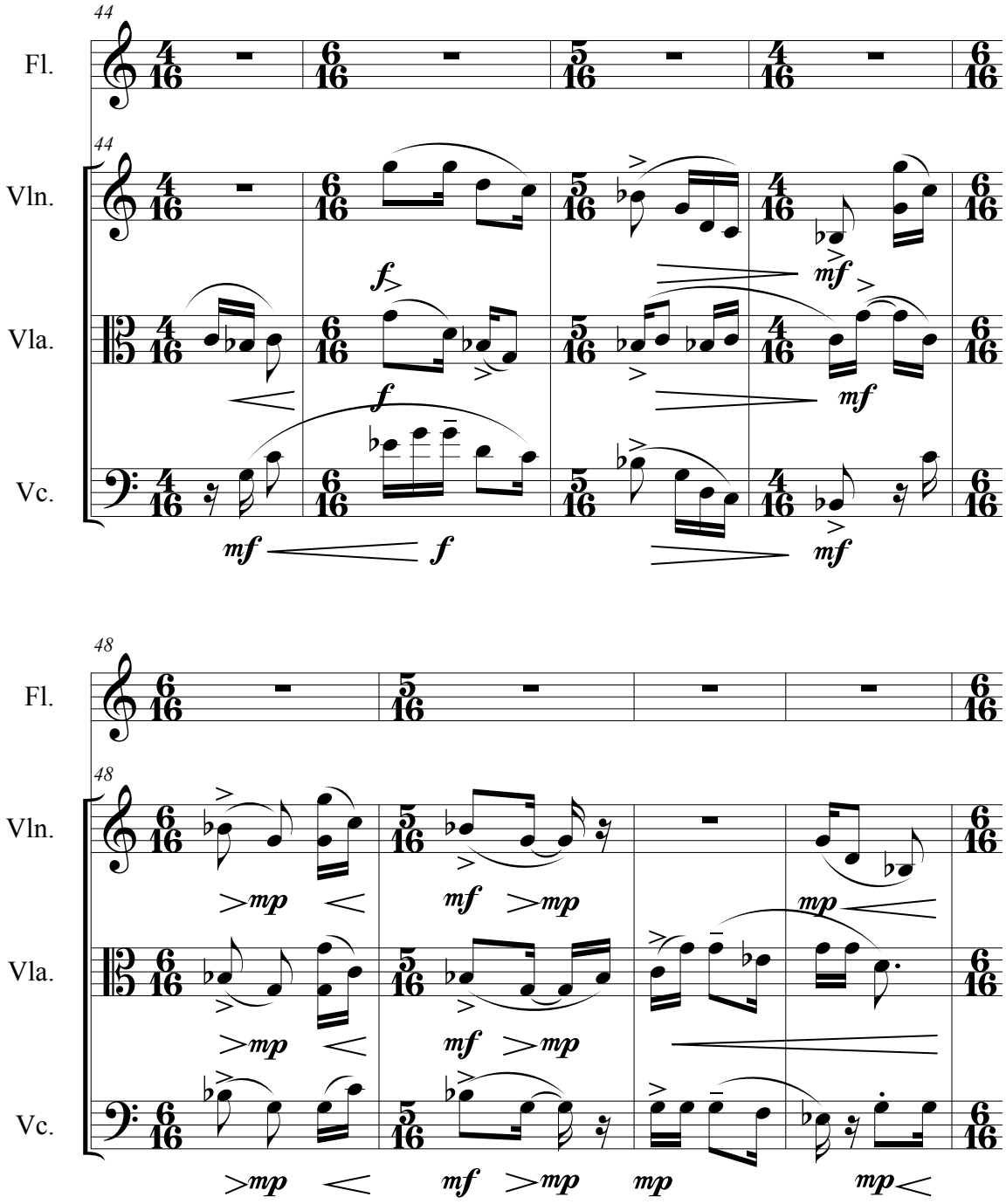
Vla.
Vc.


44
Fl.
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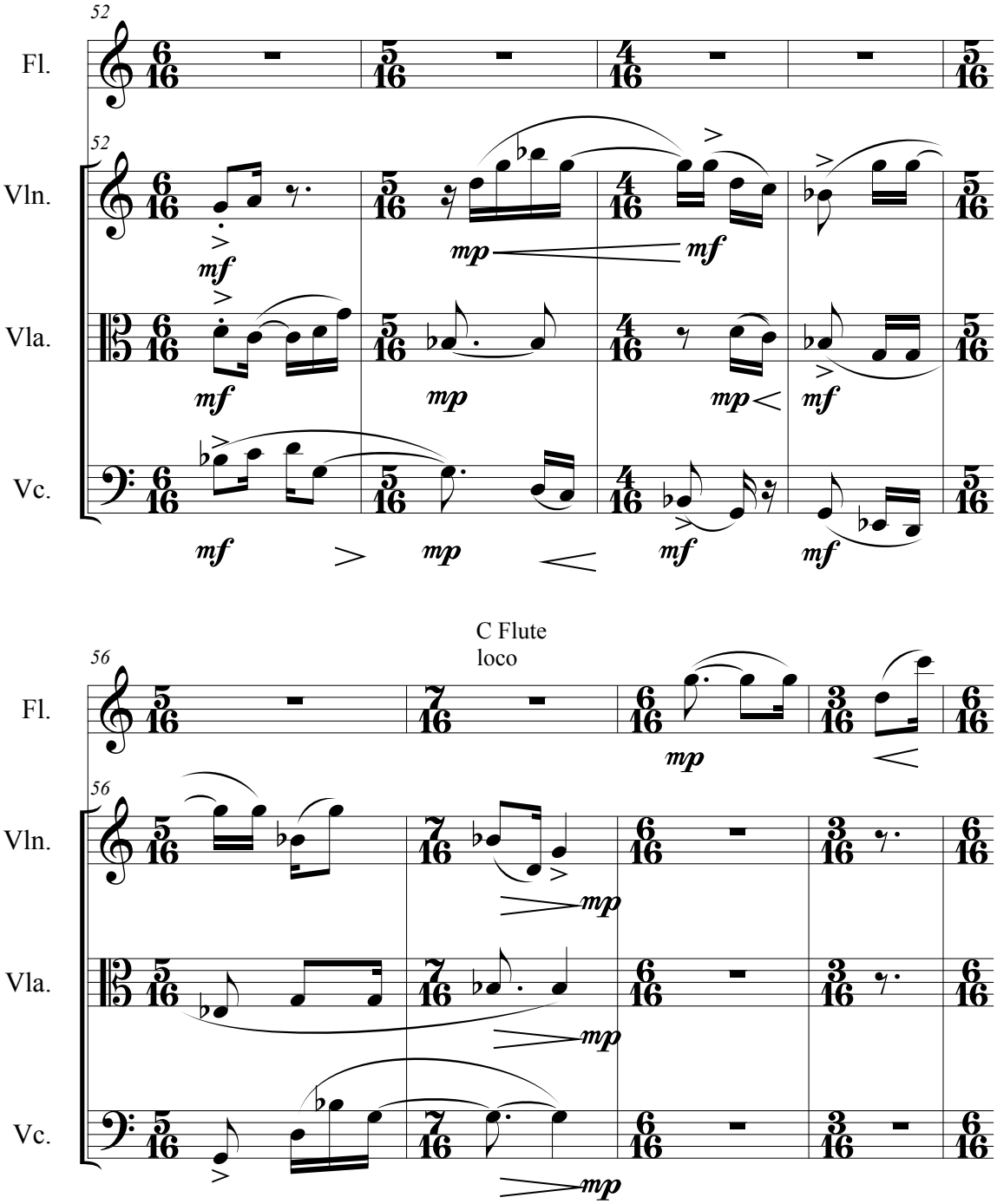
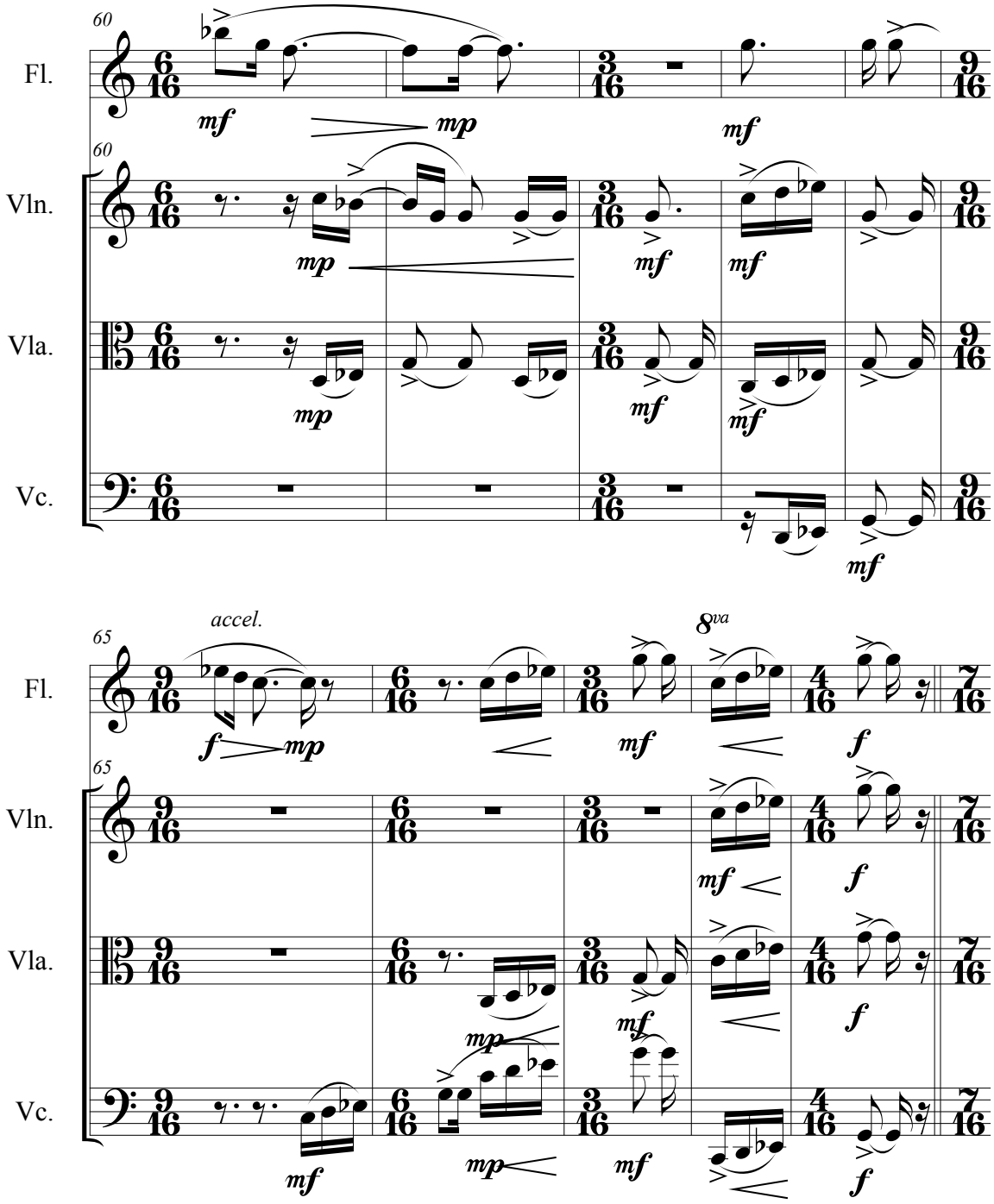
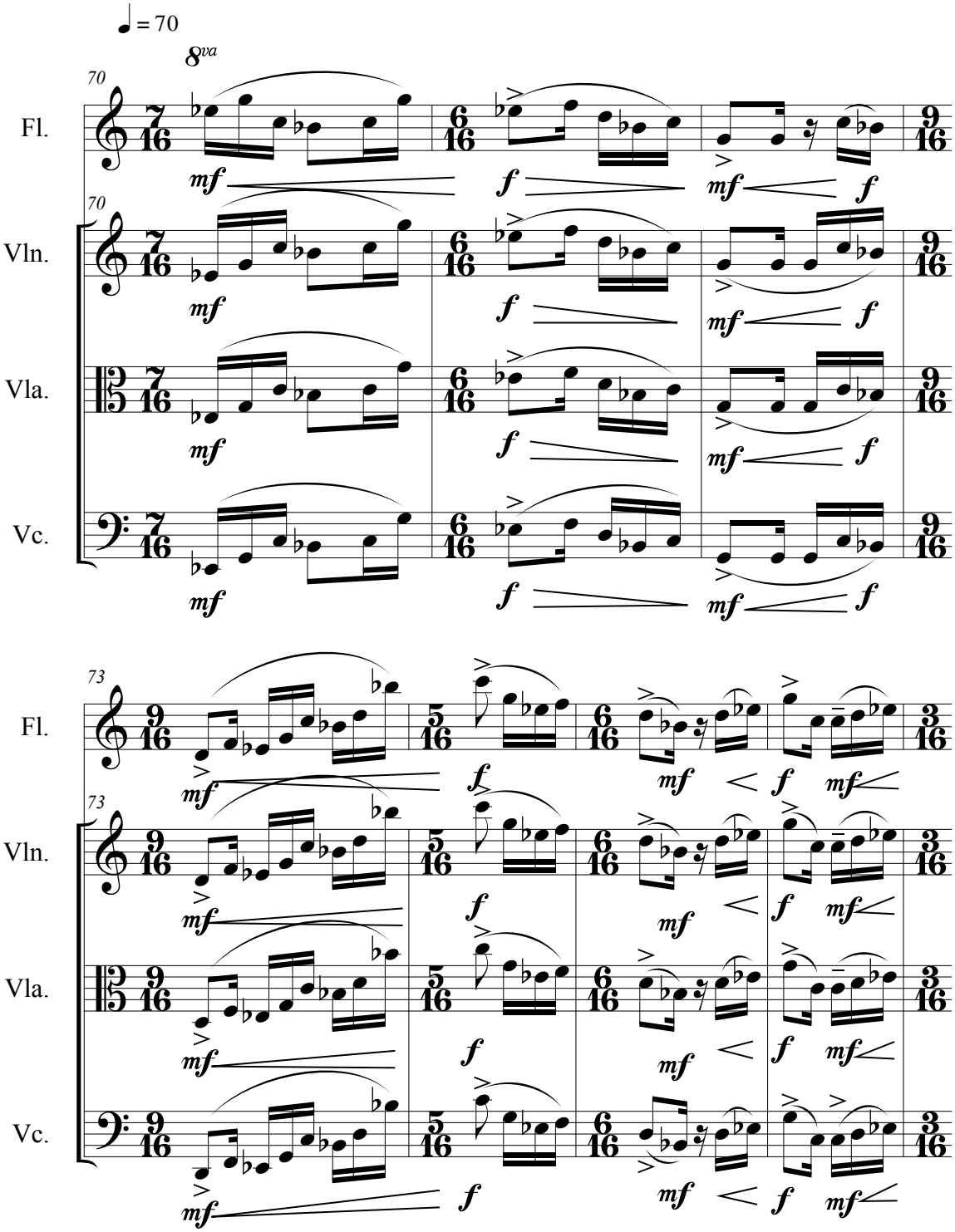
Vla.
Vc.
f
mf
48
mp


52
Fl.
Vln.
Vla.
Vc.
mf
mp
mf
C Flute
loco
56


60
Fl.
Vln.
Vla.
Vc.
mf
mp
mf
mp
mf
mf
mp
mf
mf
mf
65
accel.
8va
Fl.
Vln.
Vla.
Vc.
f
mp
mf
f
mf
f
mf
mp
mf
f
mf
mp
mf
f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8va
70
Fl.
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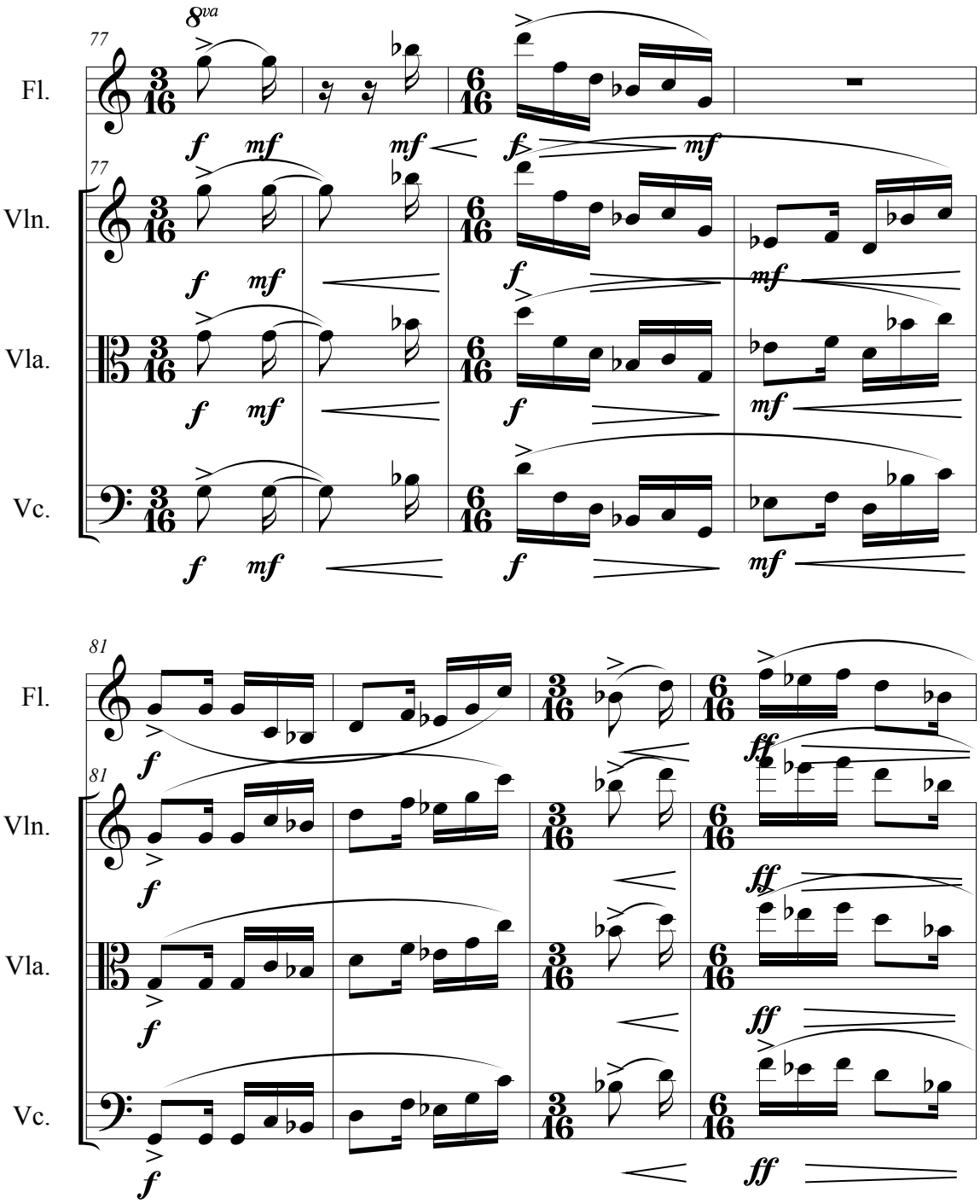
Vla.
Vc.
mf
f
73


77
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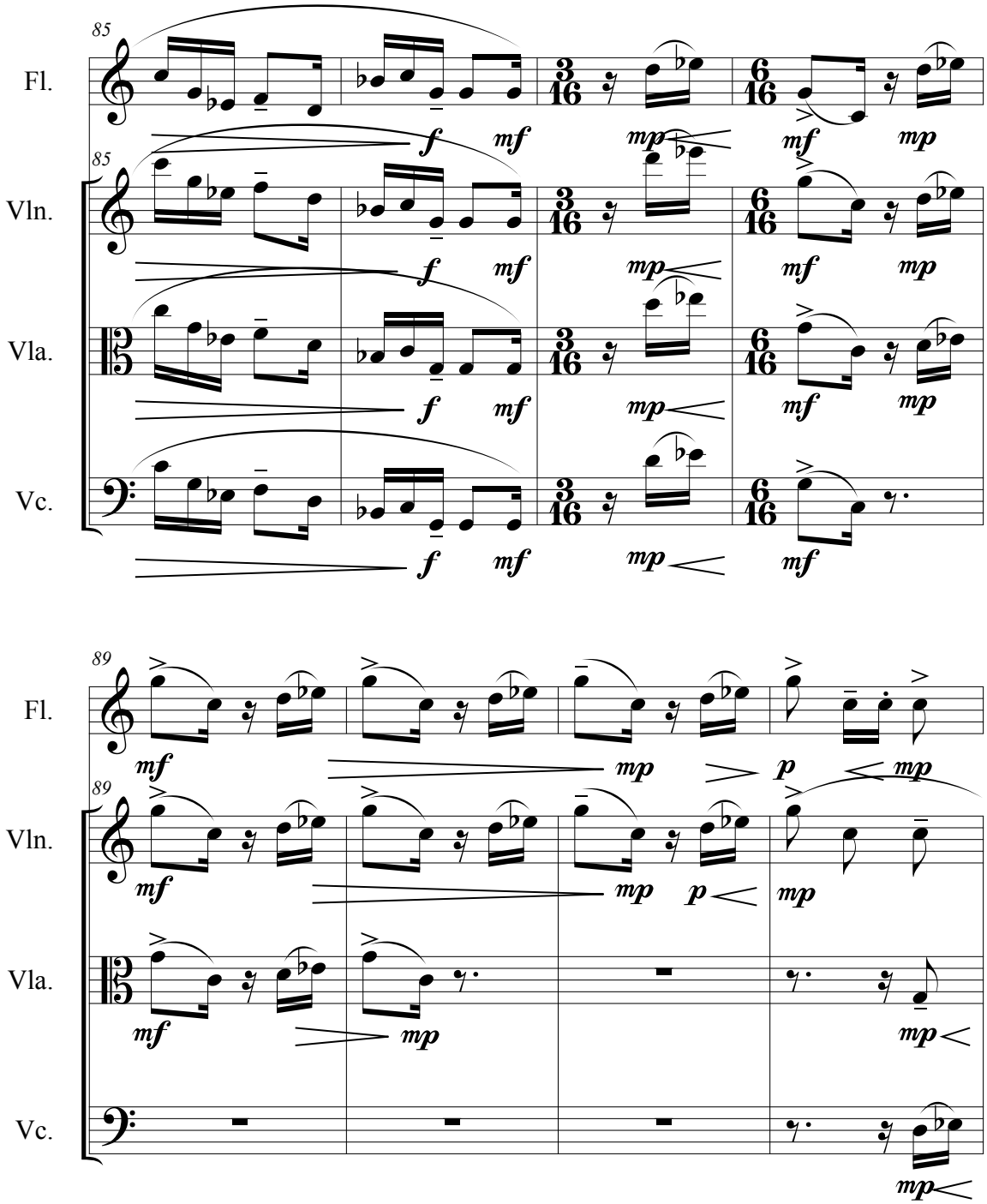
Fl.
Vln.
Vla.
Vc.
f mf
mf
f
mf
81
ff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Vla.
Vc.
89
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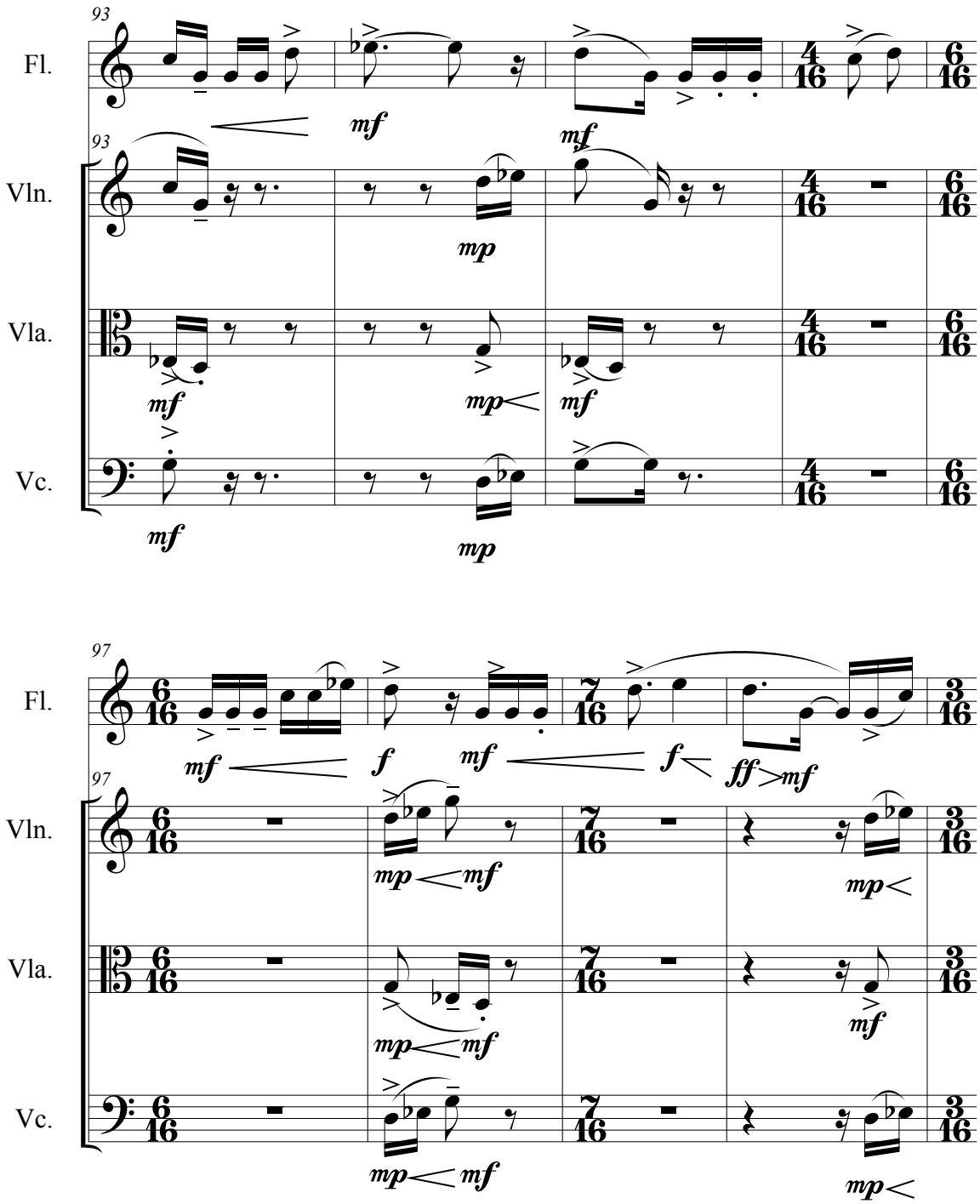
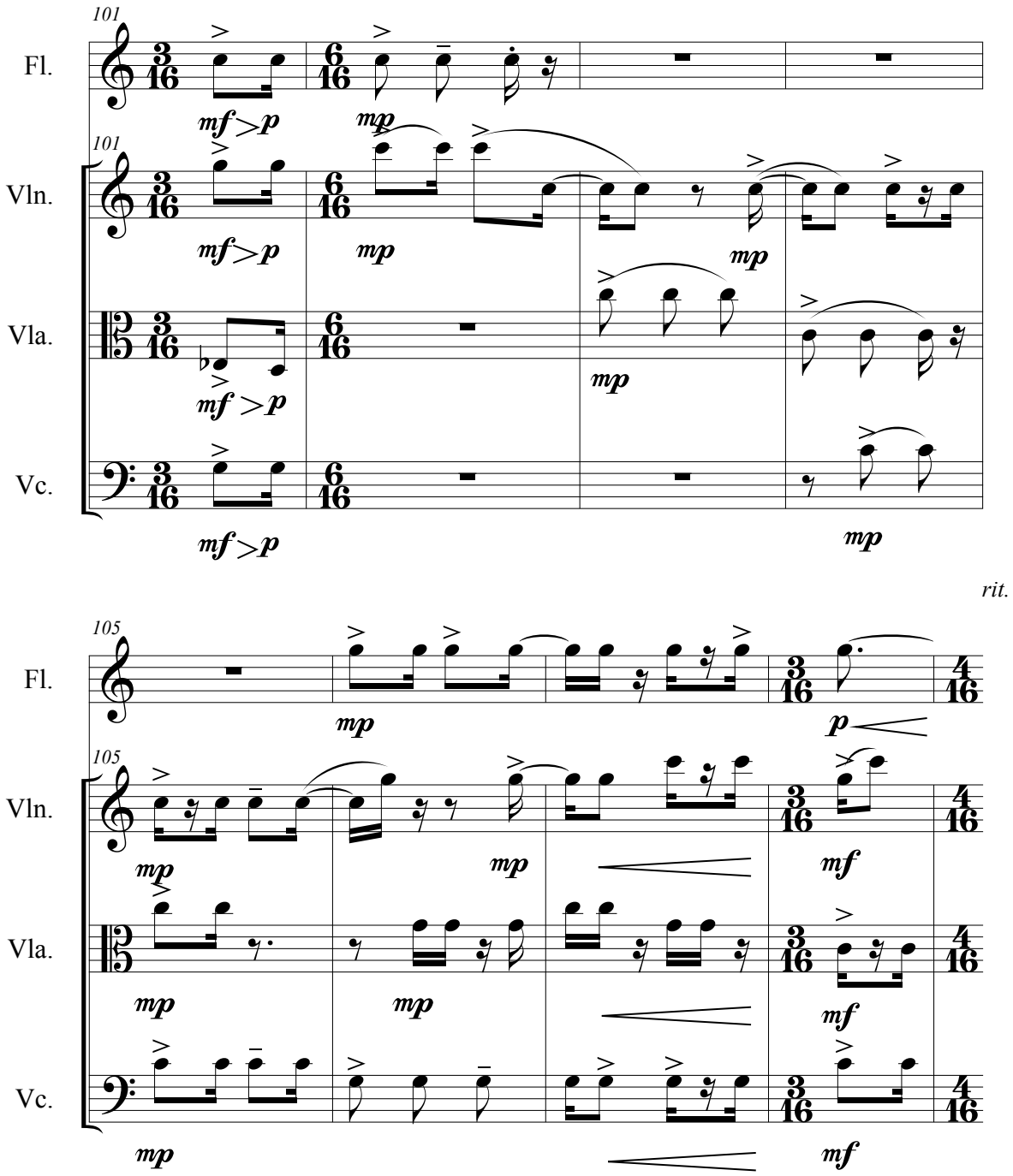
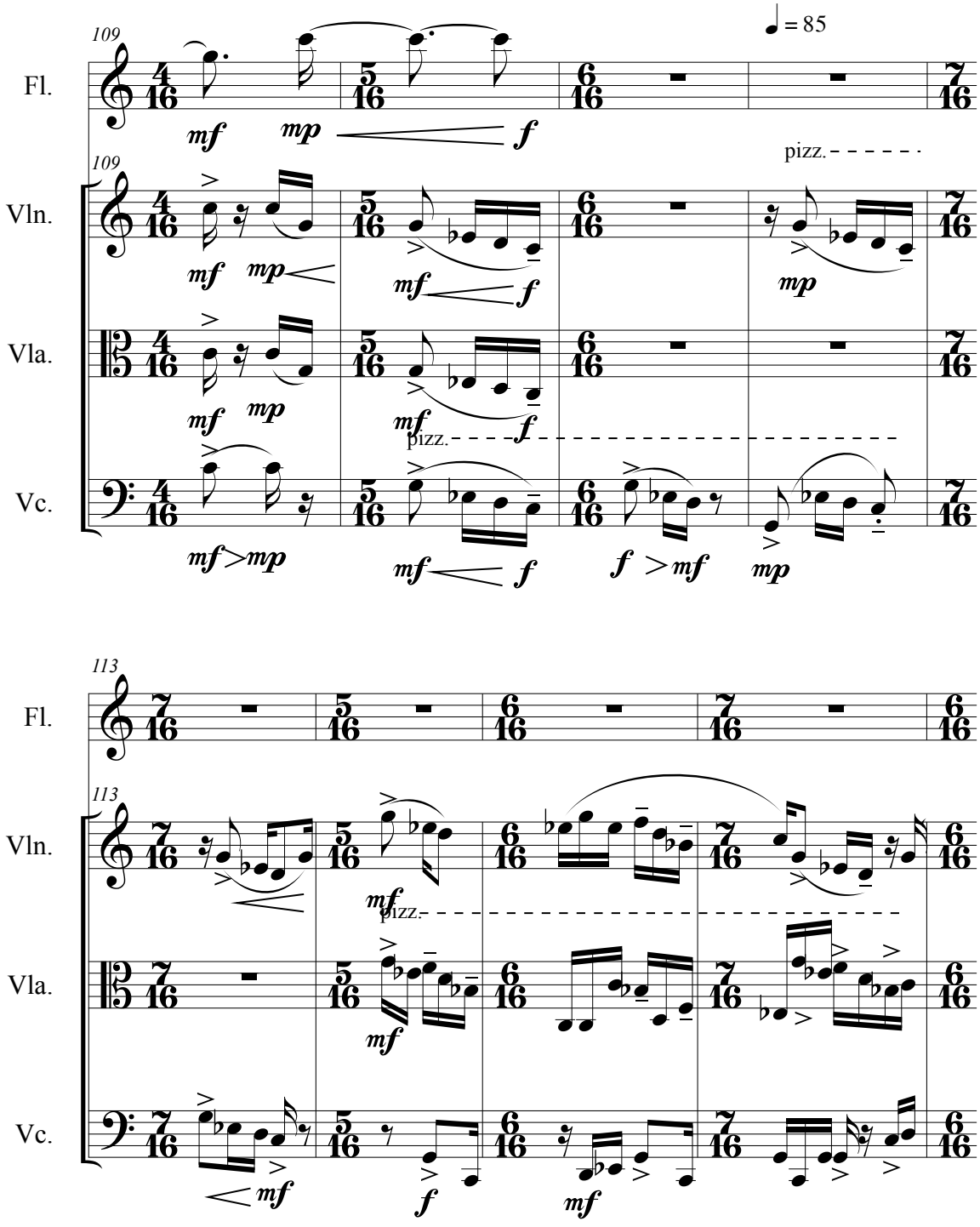
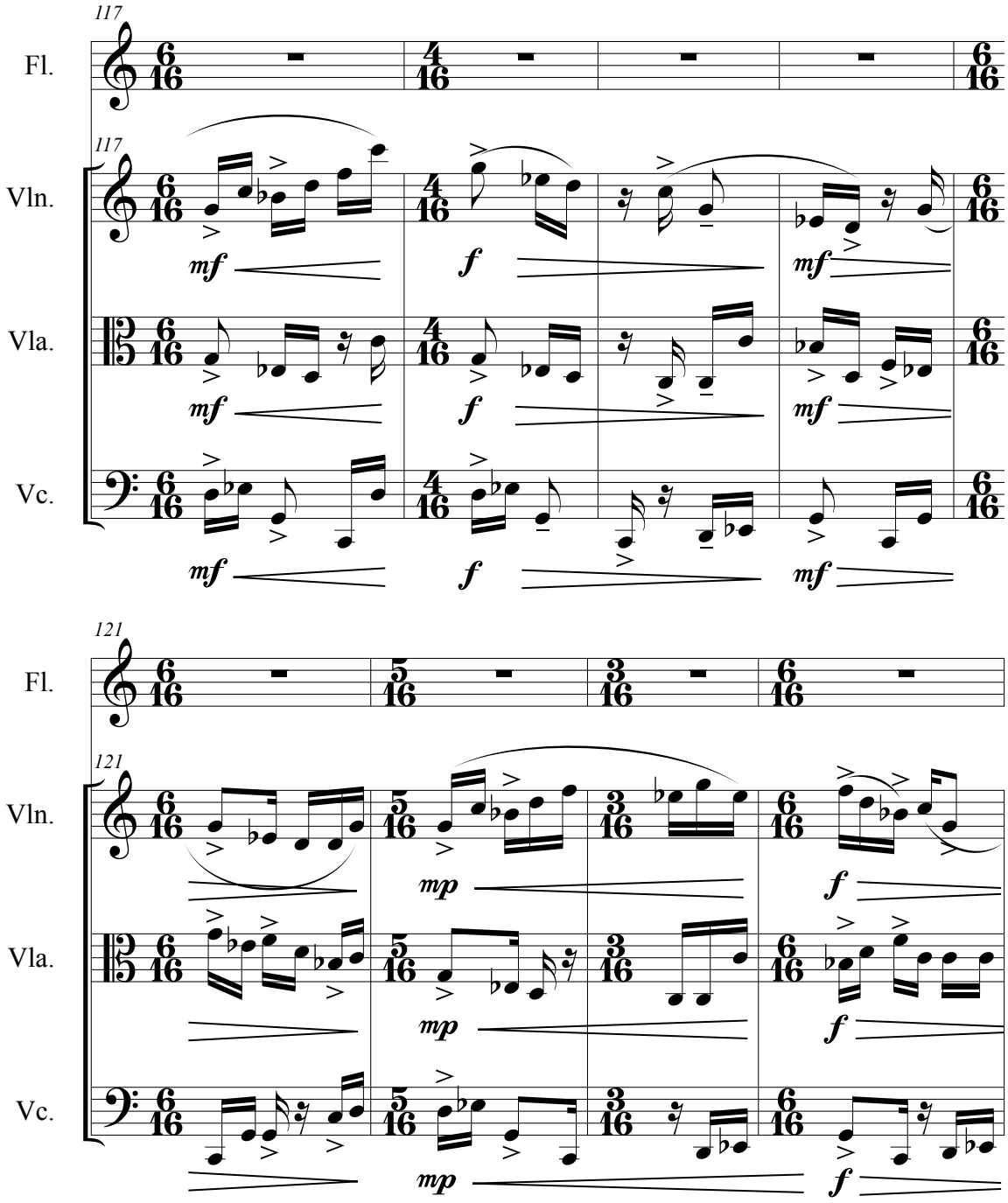
Vla.
Vc.


93
Fl.
Vln.
Vla.
Vc.
mf
mp
97
f
ff


101
Fl.
Vln.
Vla.
Vc.
mf>p
mp
rit.
105
p
mf


109
♩ = 85
Fl.
Vln.
Vla.
Vc.
pizz.
113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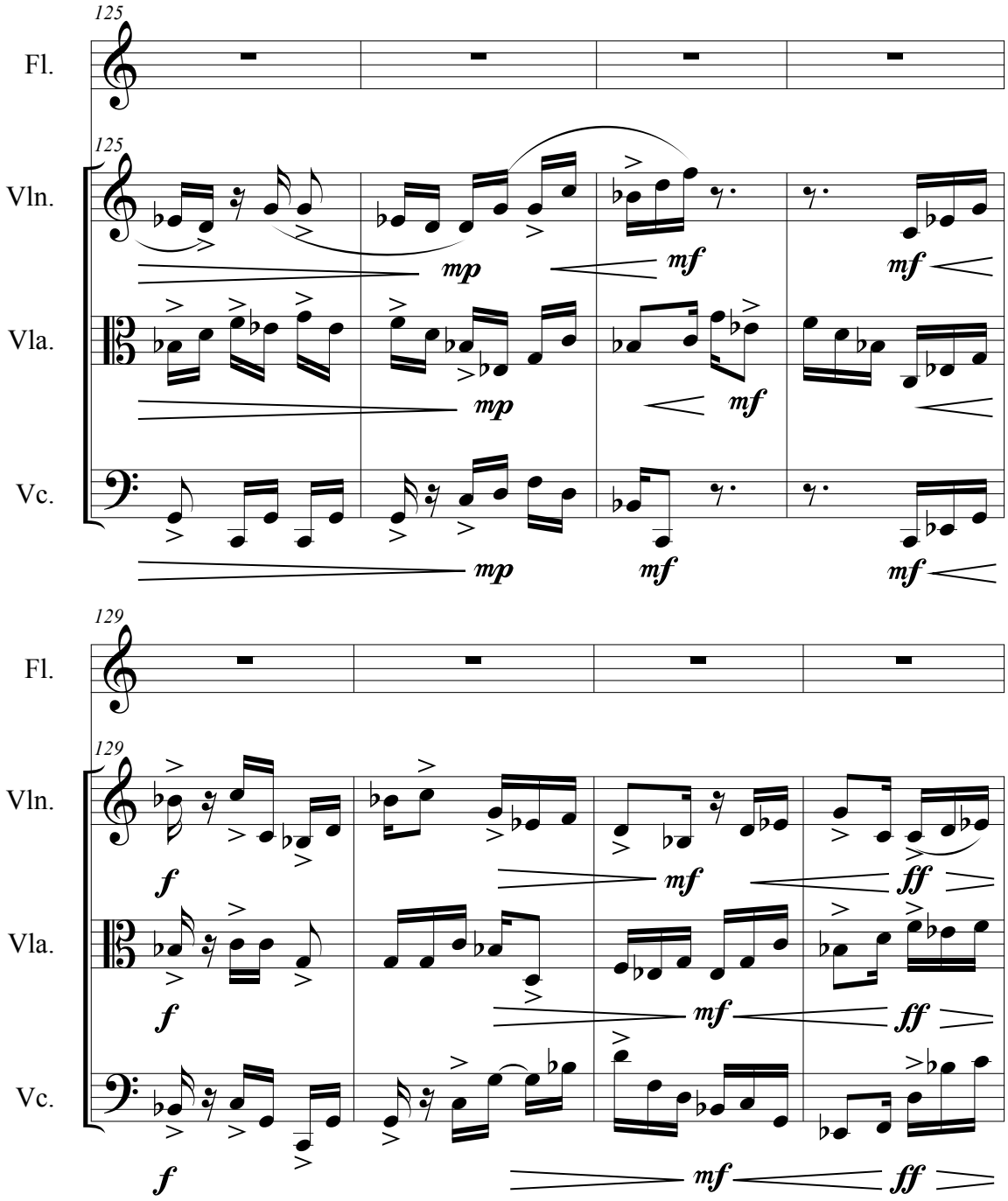
Vln.
Vla.
Vc.
mf
f
mf
121
Fl.
Vln.
Vla.
Vc.
mp
f


125
Fl.
125
Vln.
Vla.
Vc.
mp
mf
mf
mp
mf
mf
mp
mf
mf
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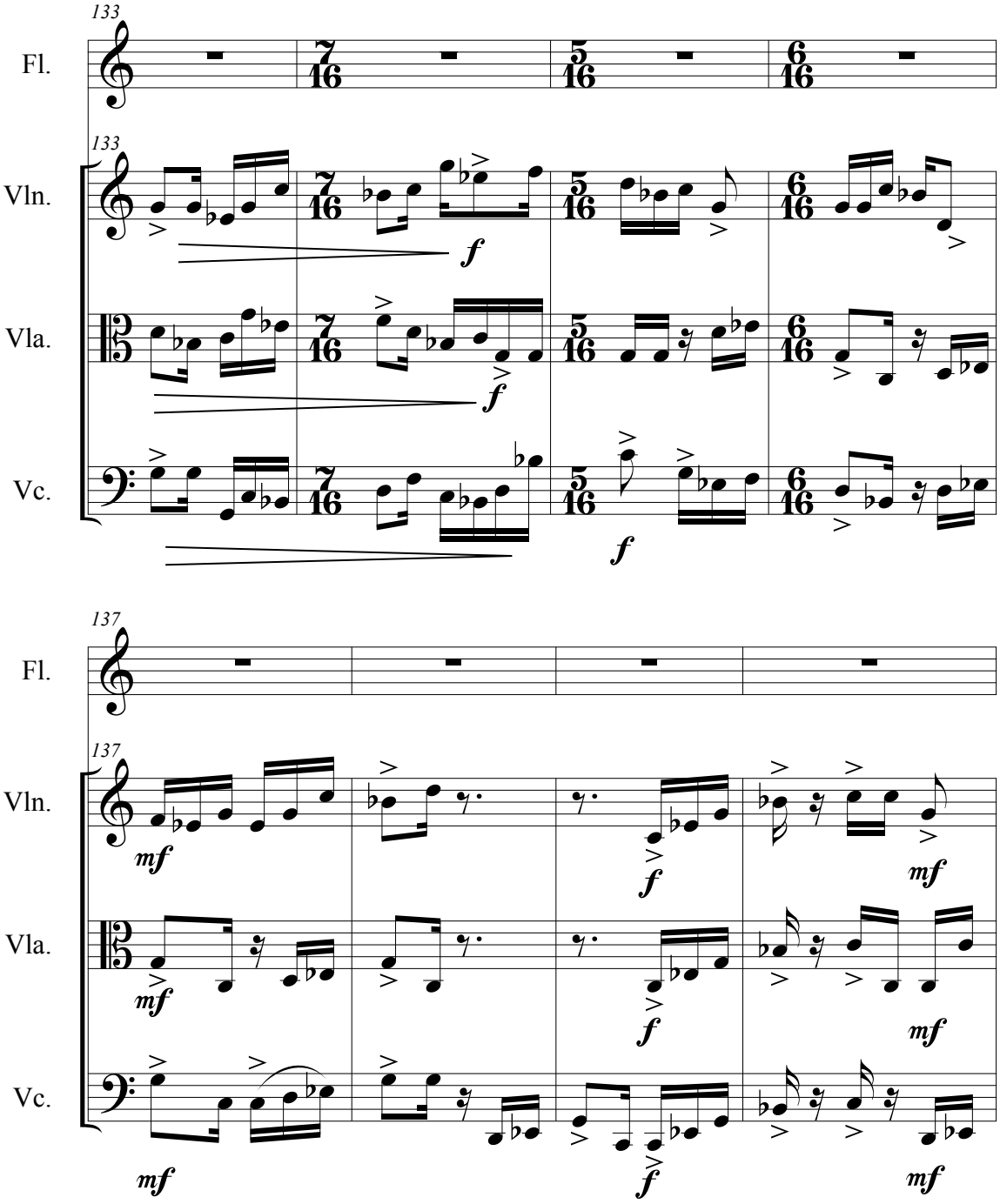
Fl.
129
Vln.
Vla.
Vc.
f
mf
ff
f
mf
ff
f
mf
ff


133
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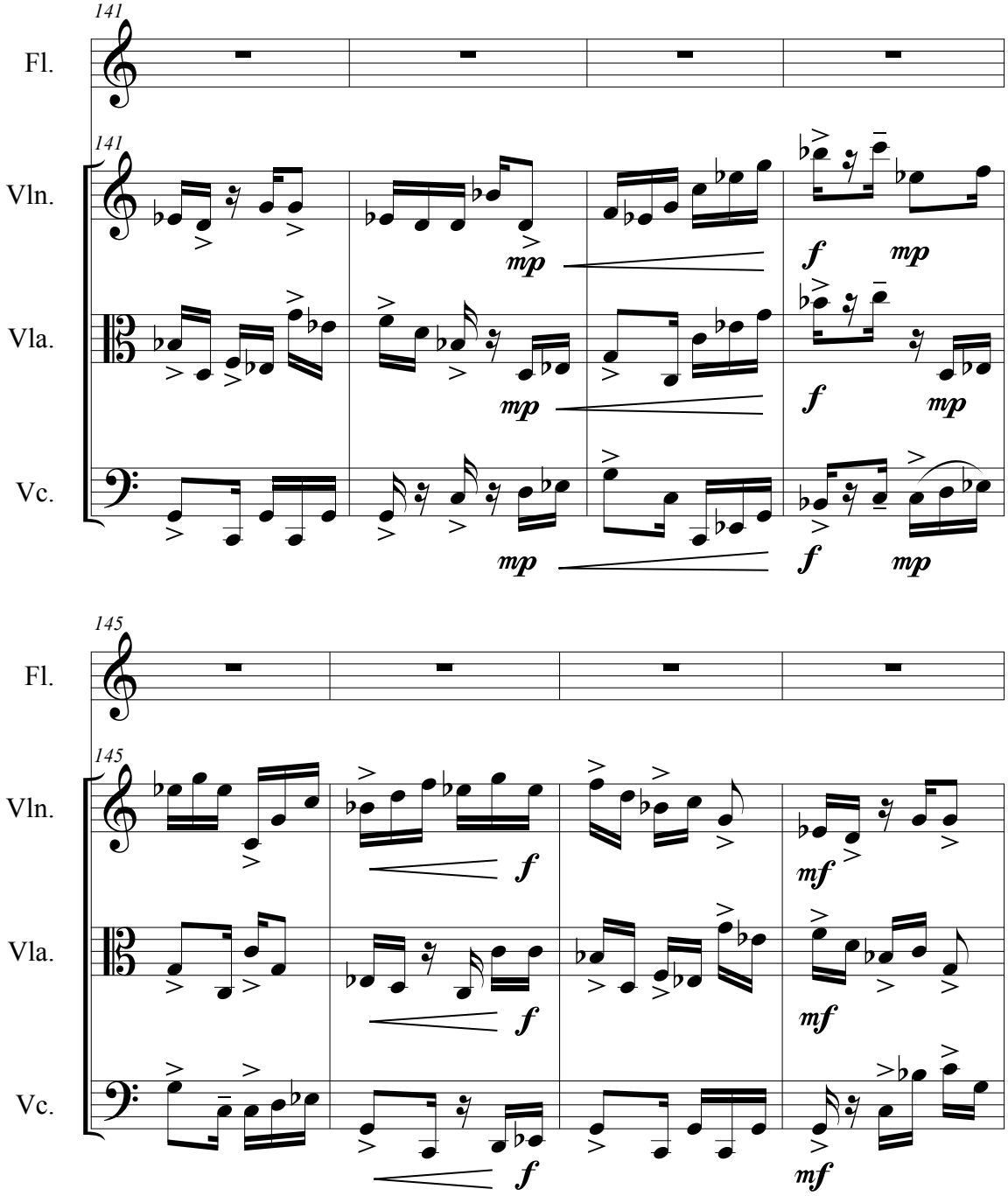
Vla.
Vc.
f
137
mf


141
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Vla.
Vc.
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f
mp
145
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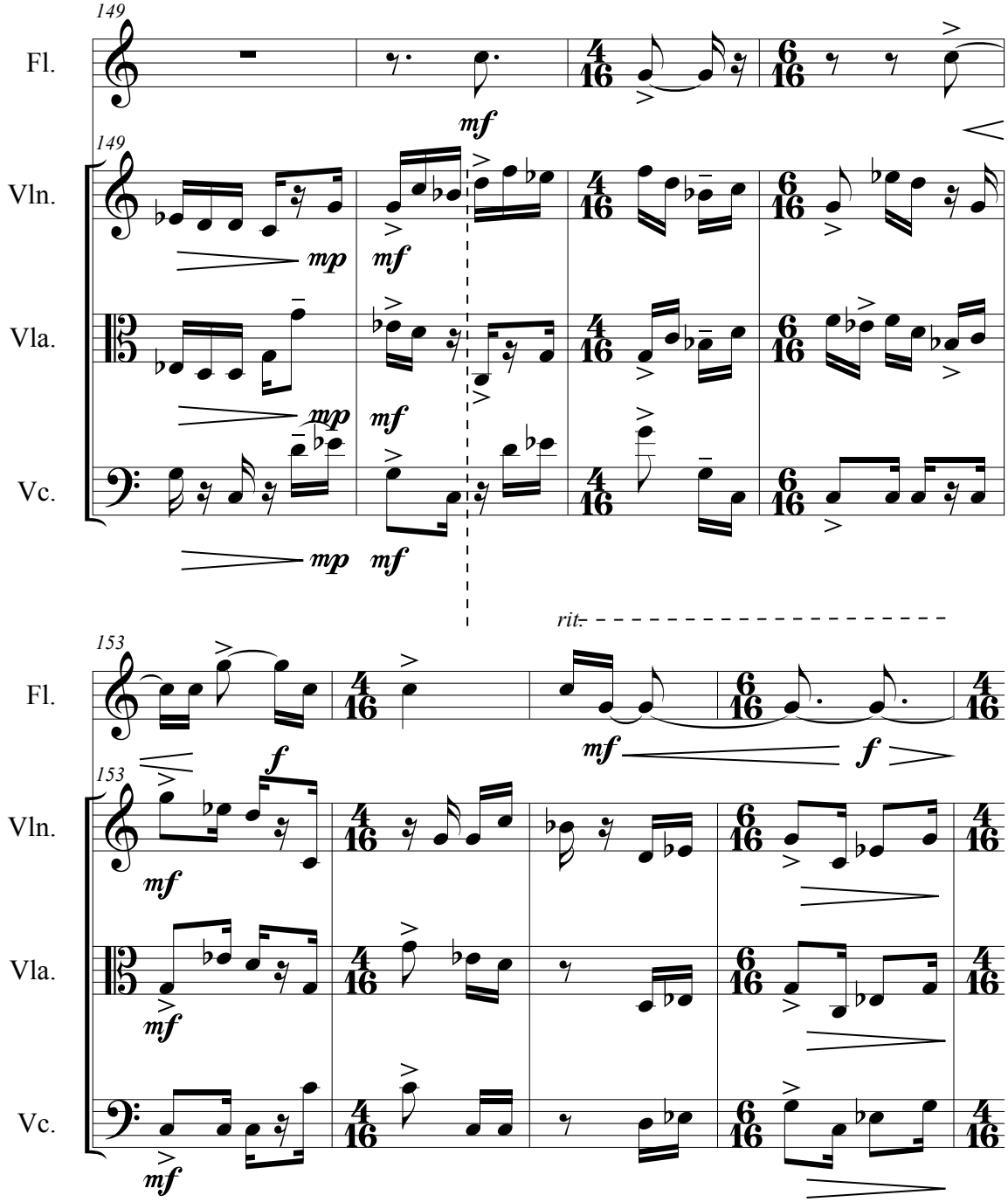
145
Vln.
Vla.
Vc.
f
mf


149
Fl.
mf
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Vln.
mp
mf
Vla.
mp
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Vc.
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mf
rit.
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Fl.
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mf
f
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Vln.
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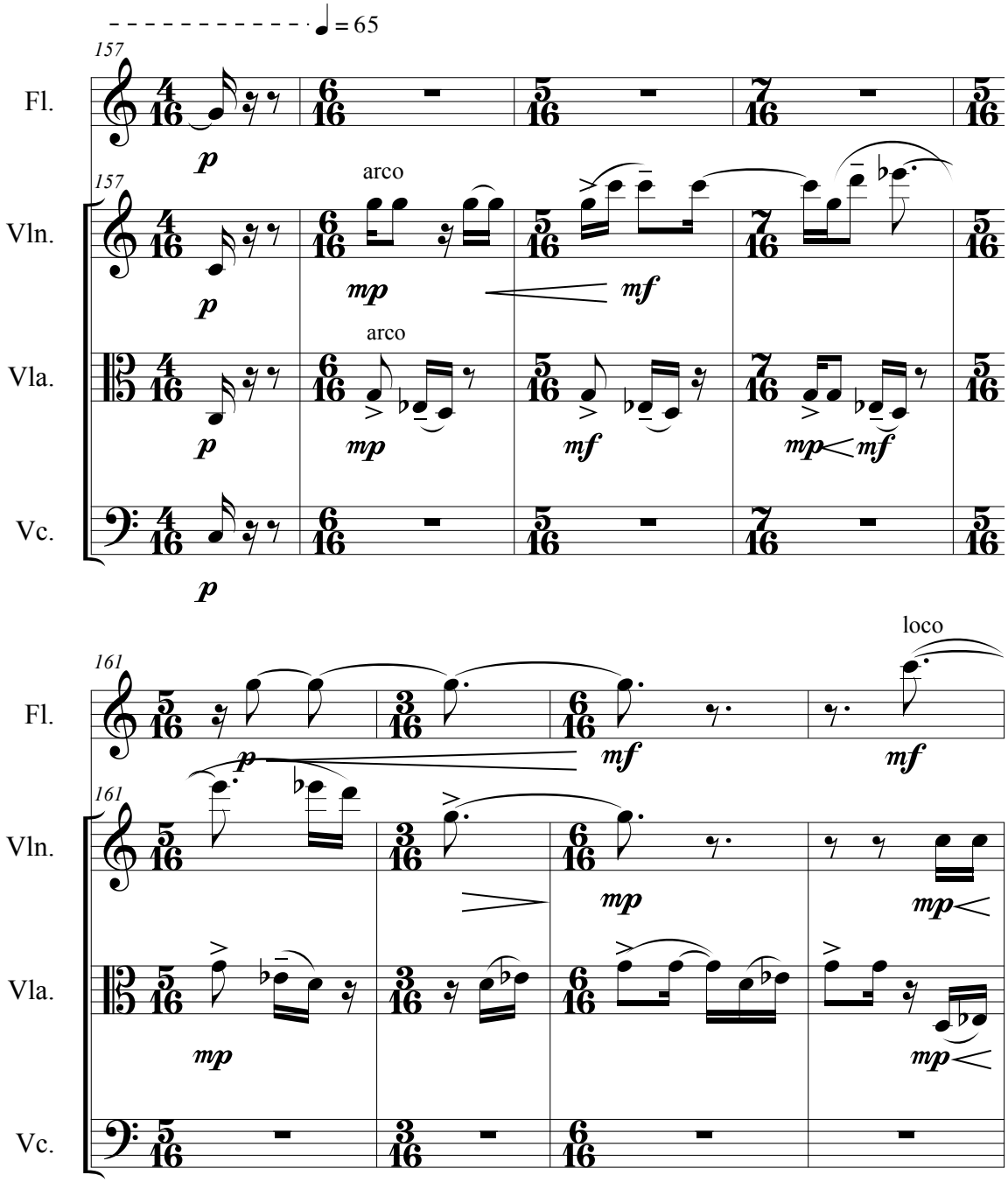
Vla.
mf
Vc.
mf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157
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Vla.
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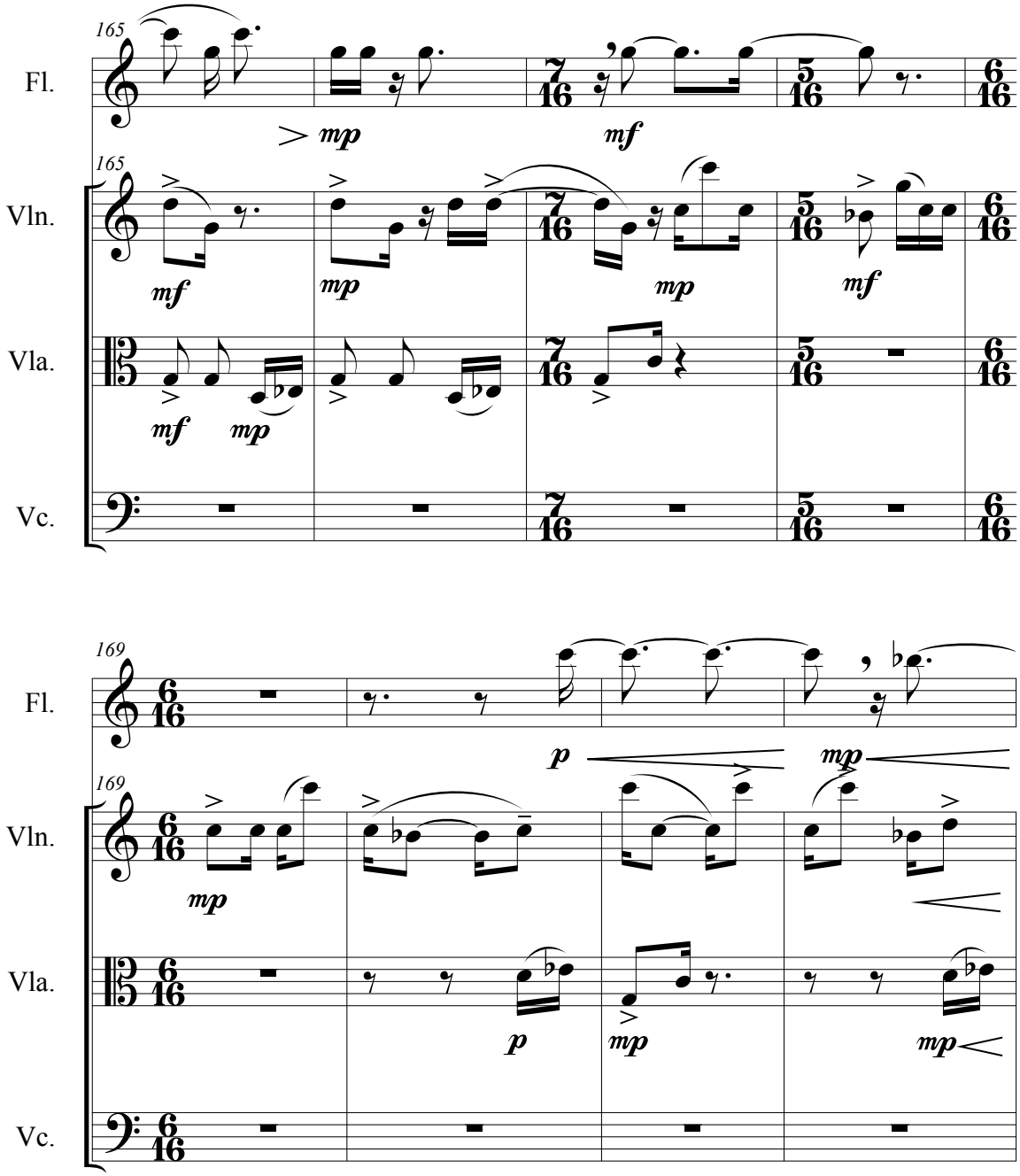
arco
161
loco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Fl.
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Vla.
Vc.
mp
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mf
mp
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Fl.
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Vc.
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mp
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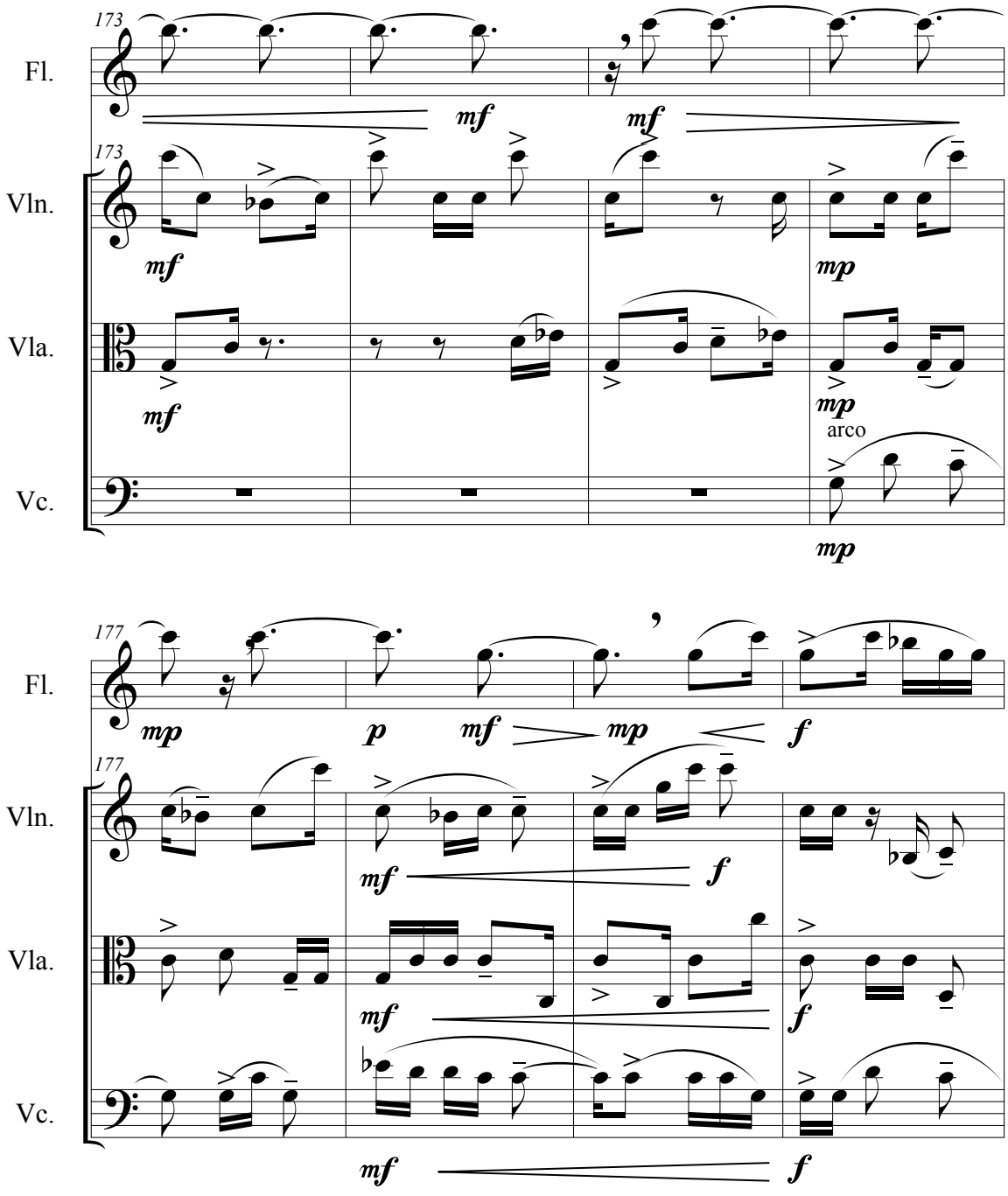
mp
mp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Fl.
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mf
173
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mp
Vla.
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mp
arco
Vc.
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f
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Vla.
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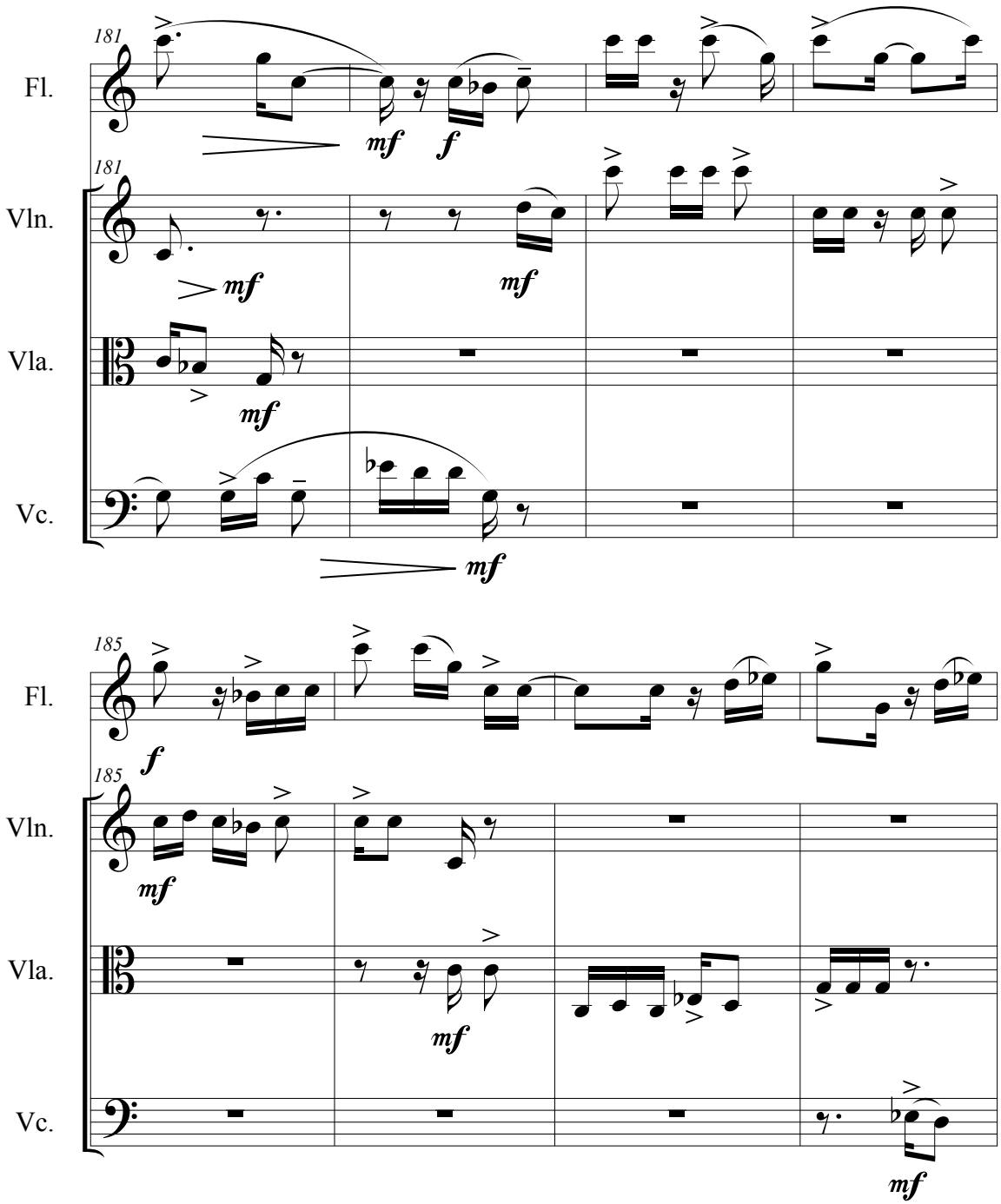
Vc.
mf
f


181
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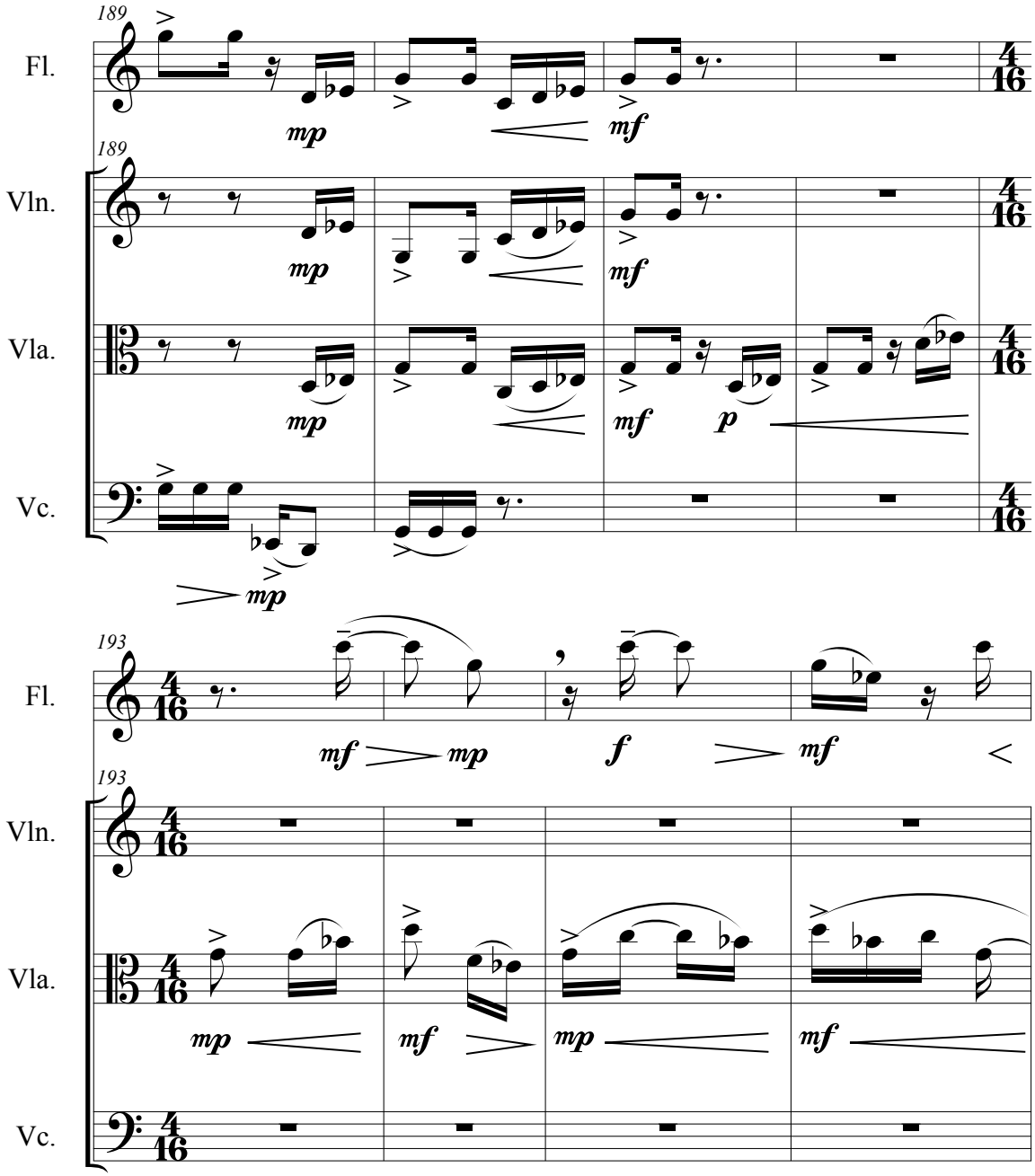
Vc.
mf
f
185


189
Fl.
Vln.
Vla.
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p
193
Fl.
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Vla.
Vc.
mf
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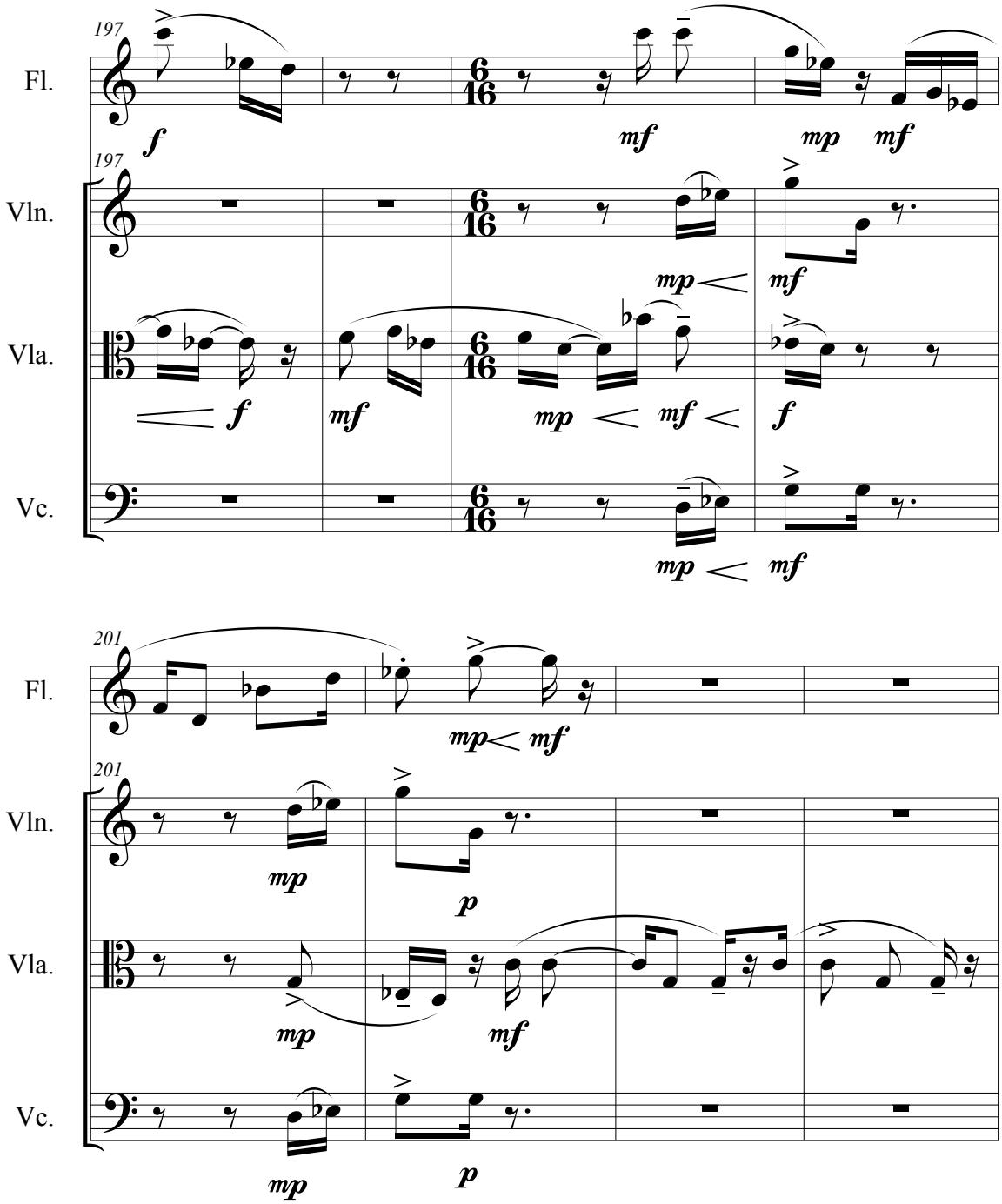
mp
mf
mp
mf


197
Fl.
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mp
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Vln.
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Vla.
f
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mp
mf
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201
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mf
201
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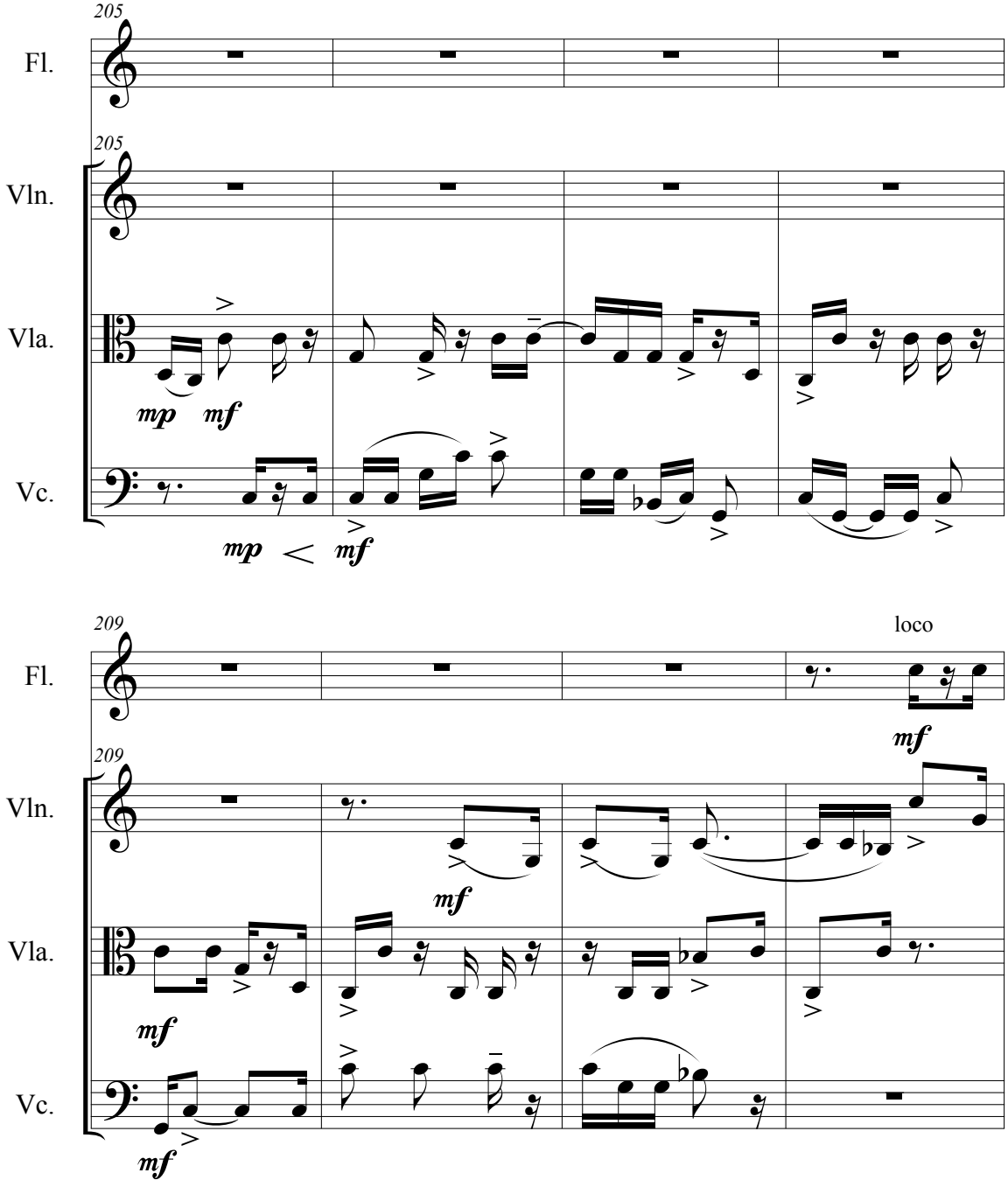
Vla.
mp
mf
Vc.
mp
p


205
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205
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mp mf
Vc.
mp < mf
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loco
Fl.
mf
209
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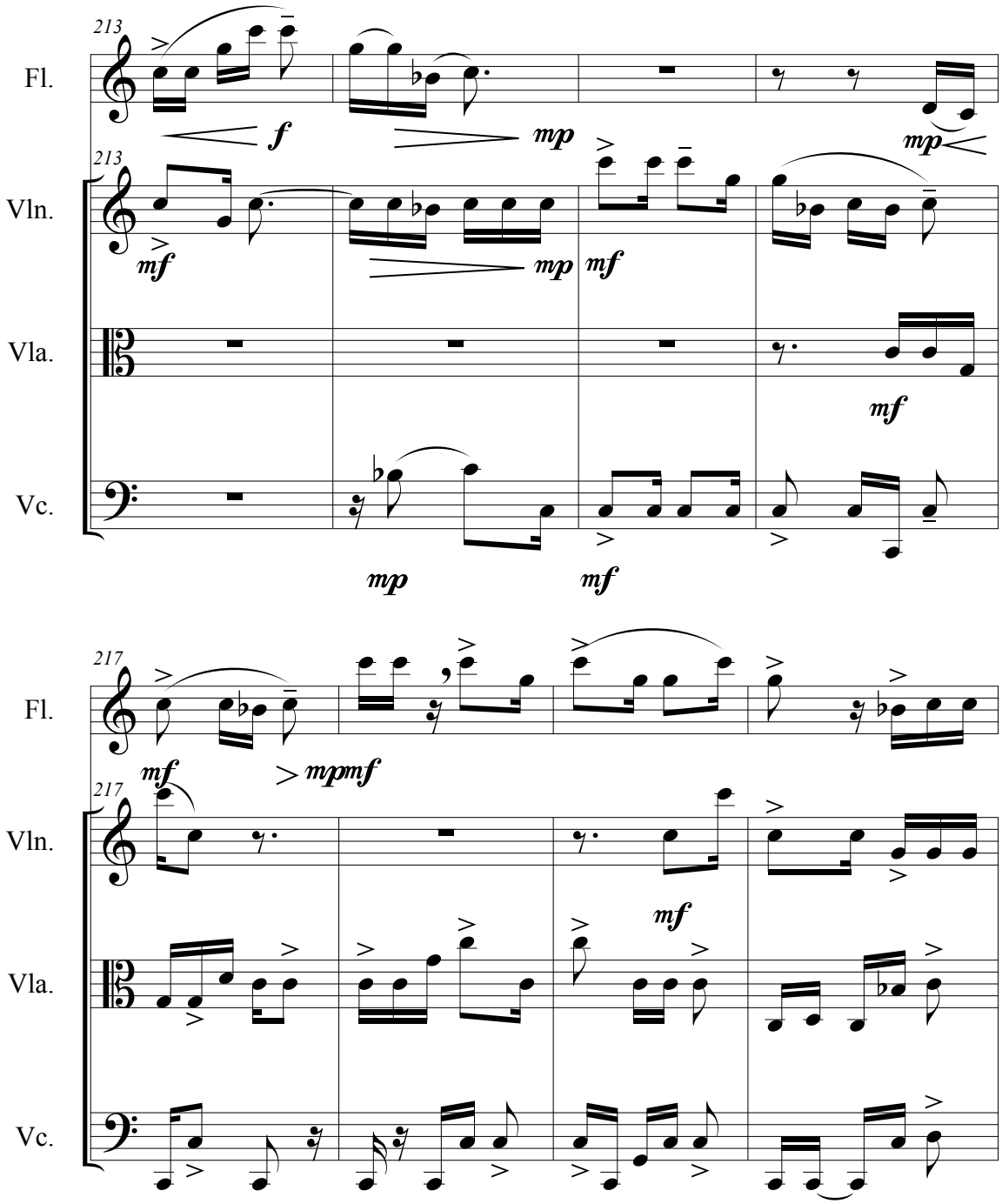
mf
Vc.
mf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mp
mf
217
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mpmf
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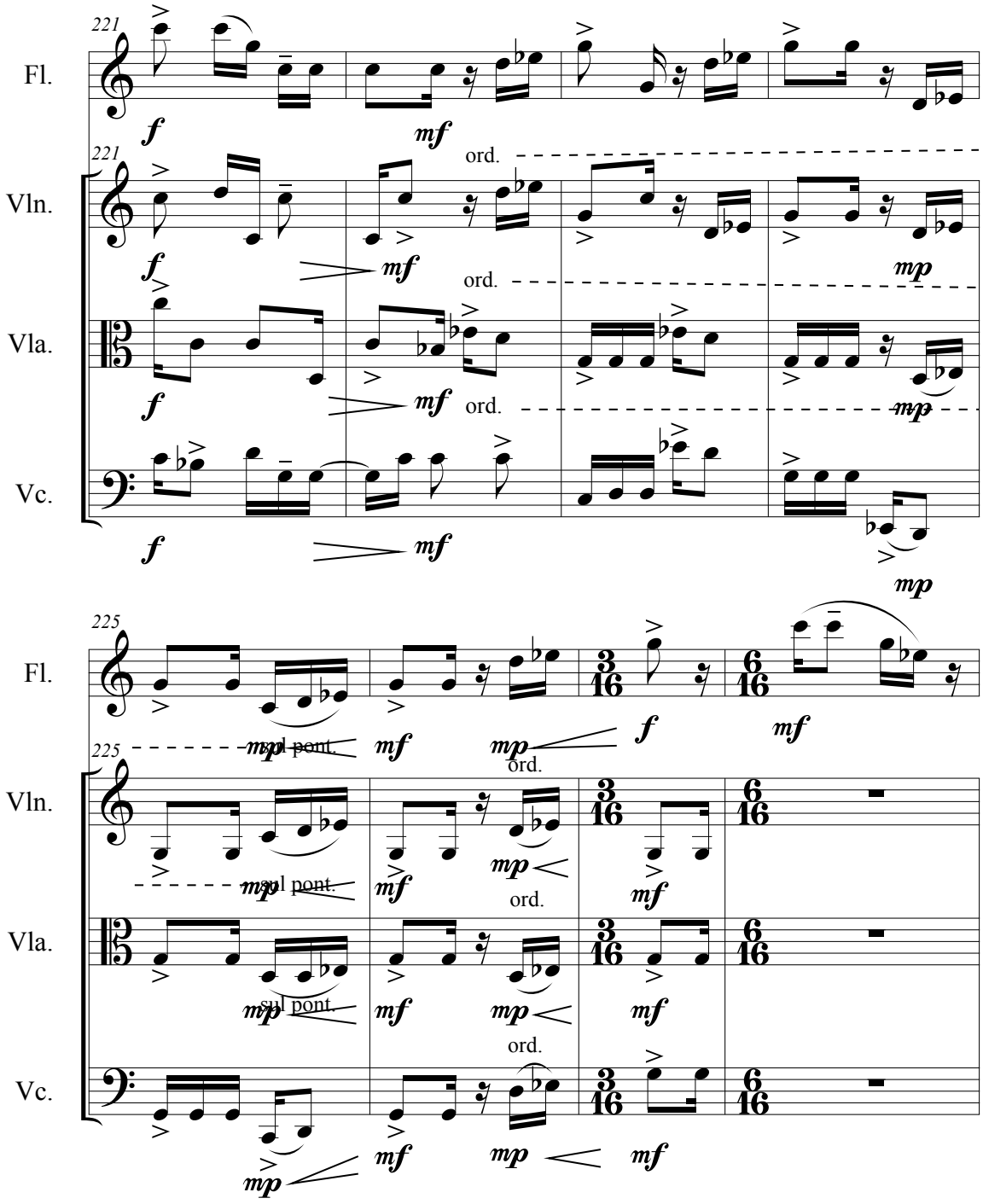
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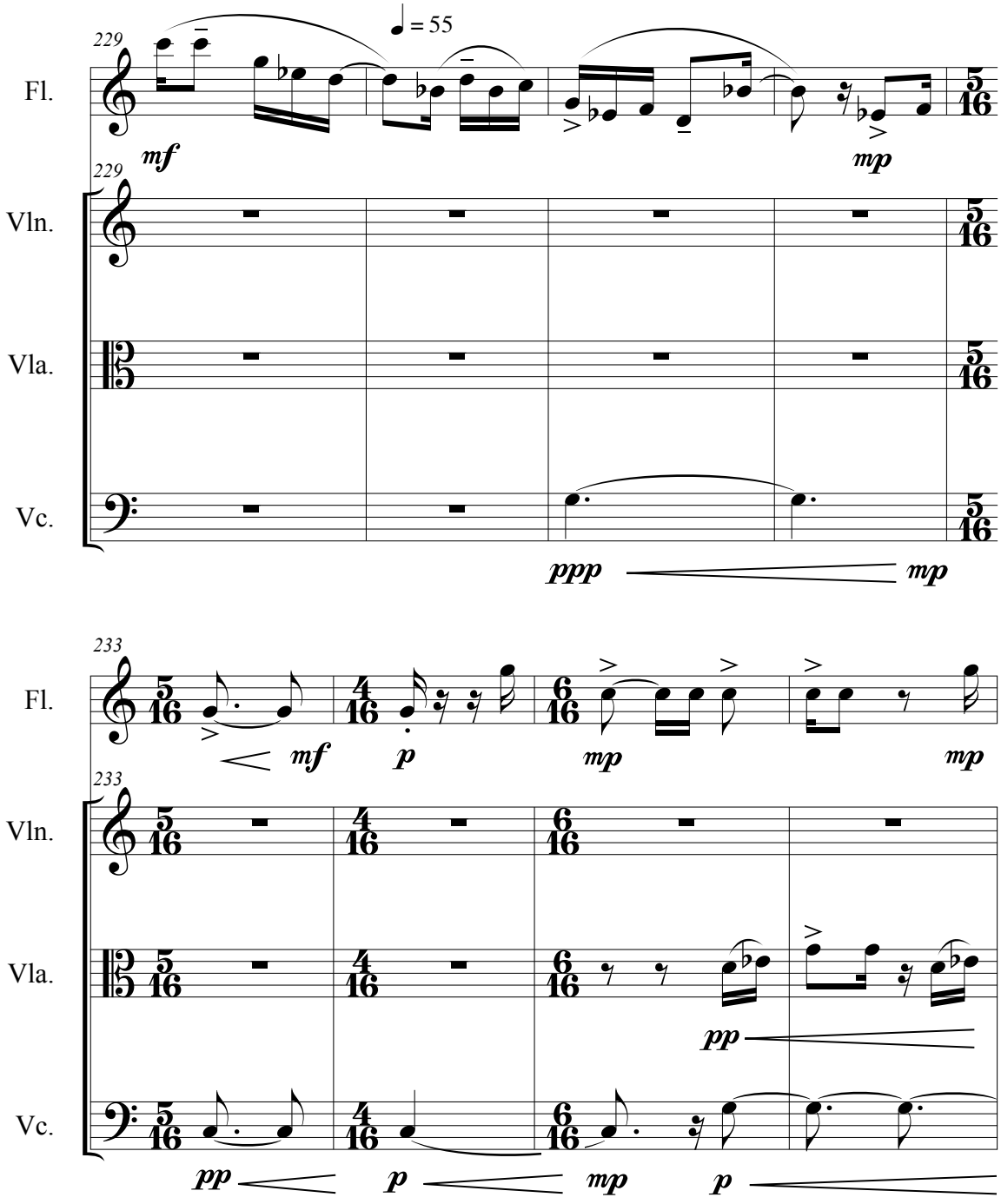
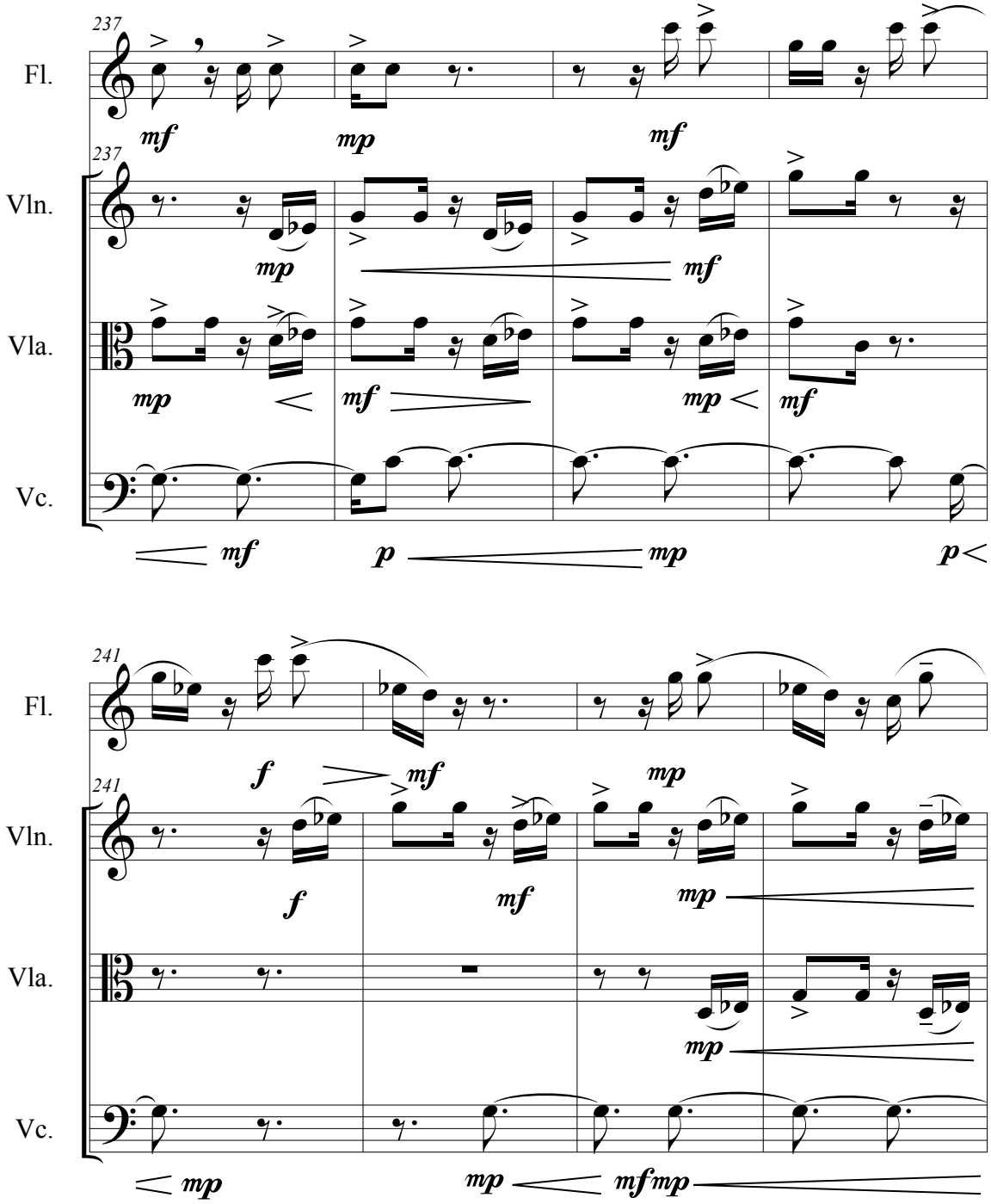
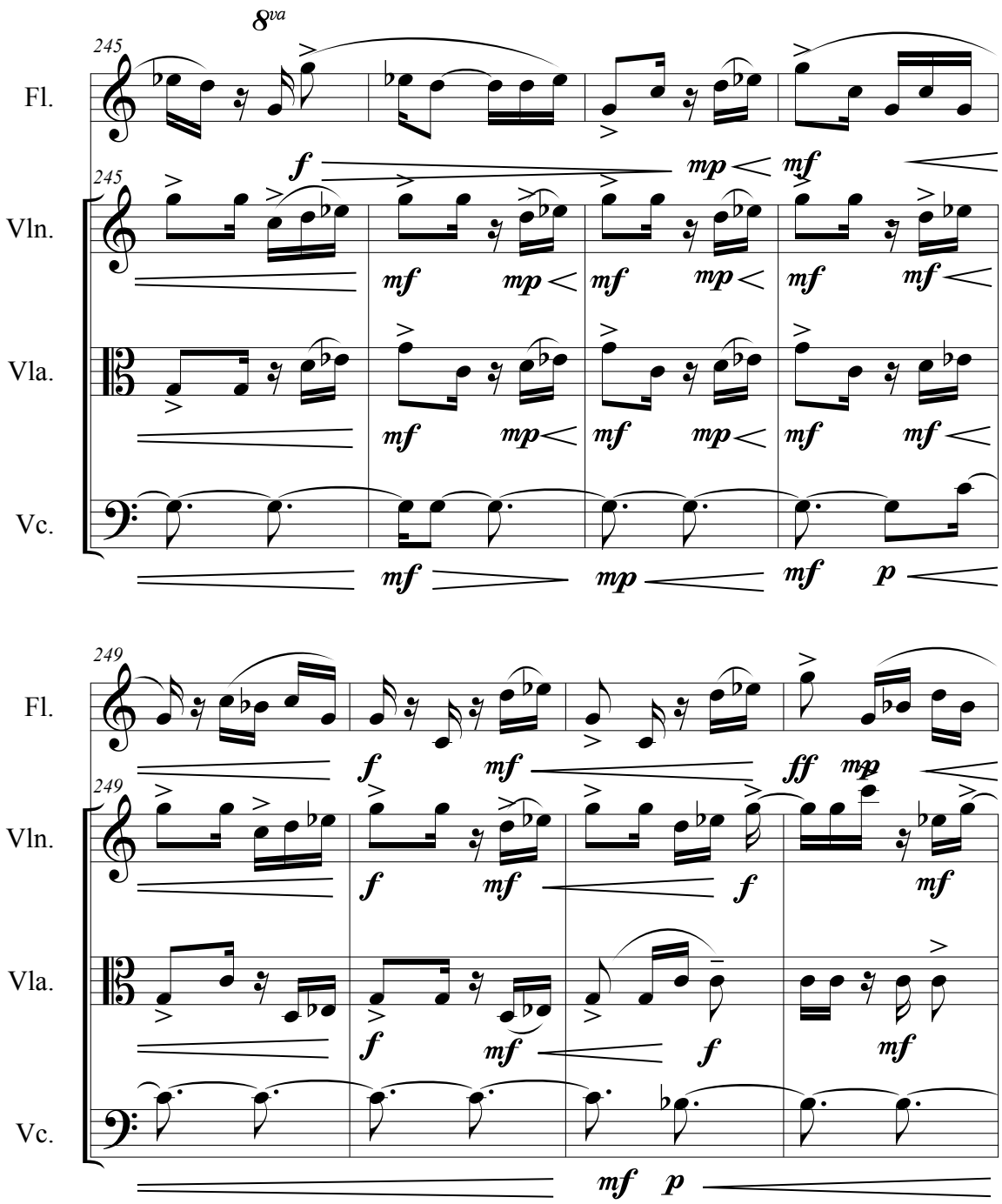
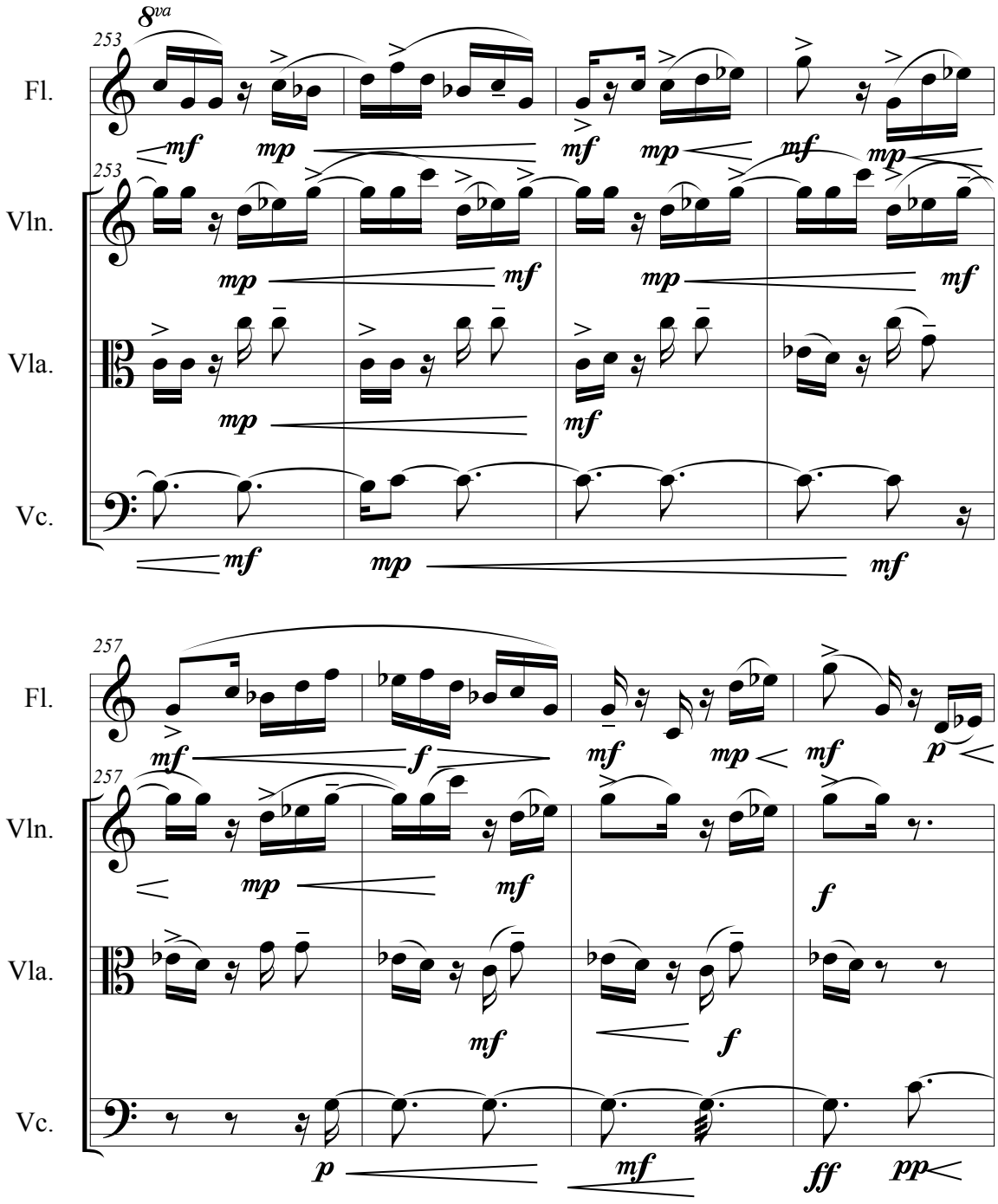
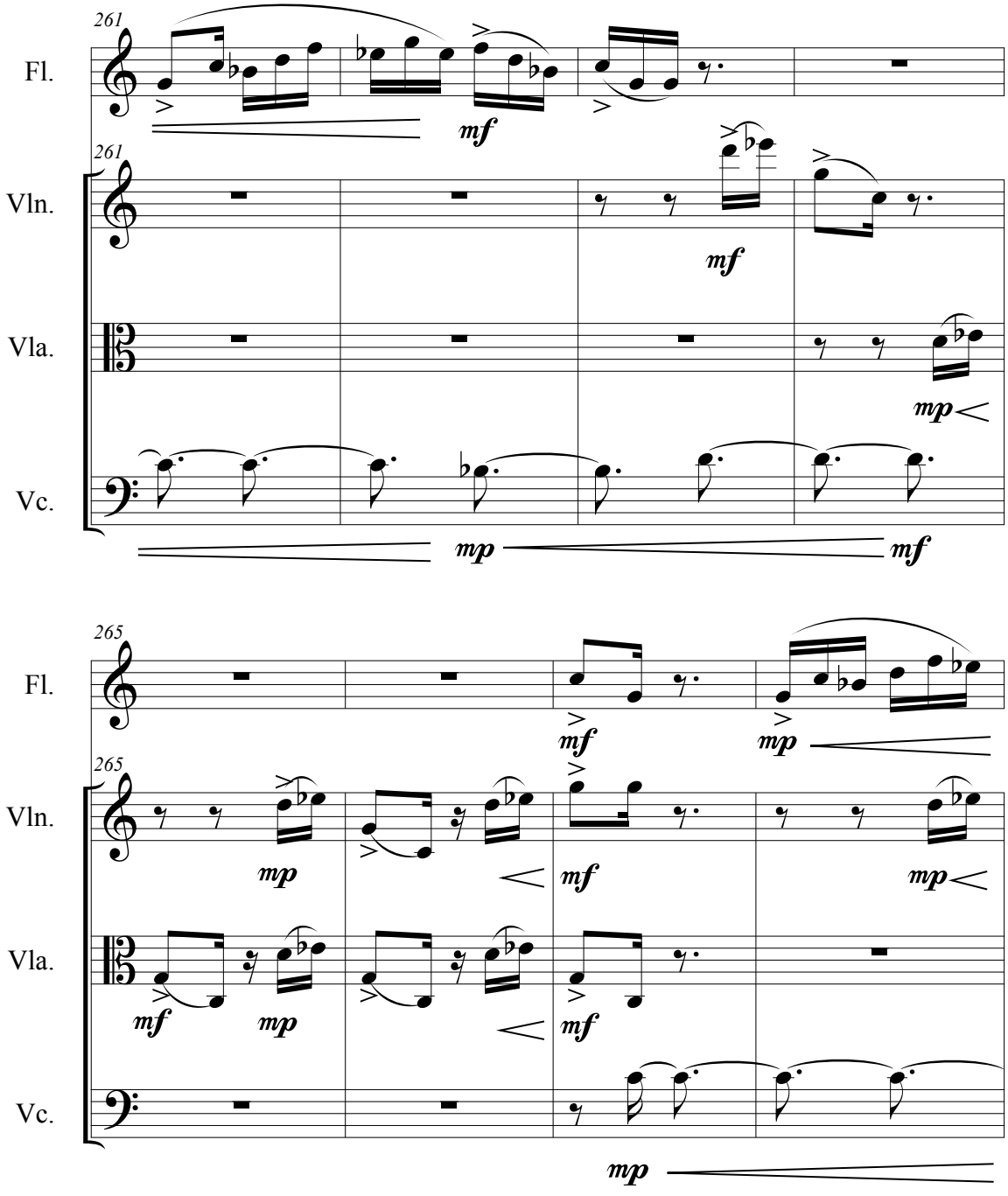
Vla.
Vc.
ord.
225
sul pont.
ord.
3
16
6
16

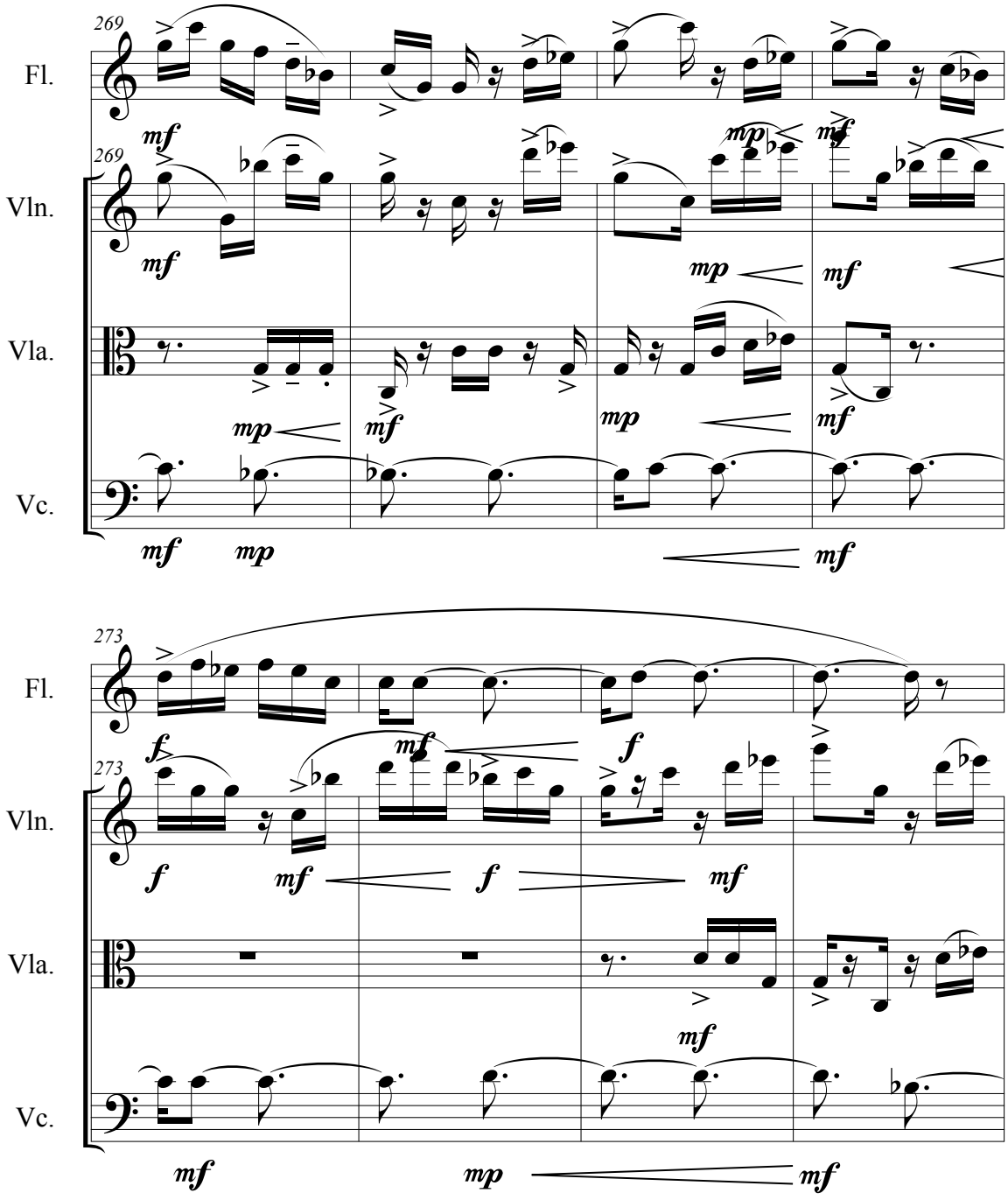

229
♩ = 55
Fl.
mf
mp
229
Vln.
Vla.
Vc.
ppp
mp
233
Fl.
mf
p
mp
mp
233
Vln.
Vla.
pp
Vc.
pp
p
mp
p

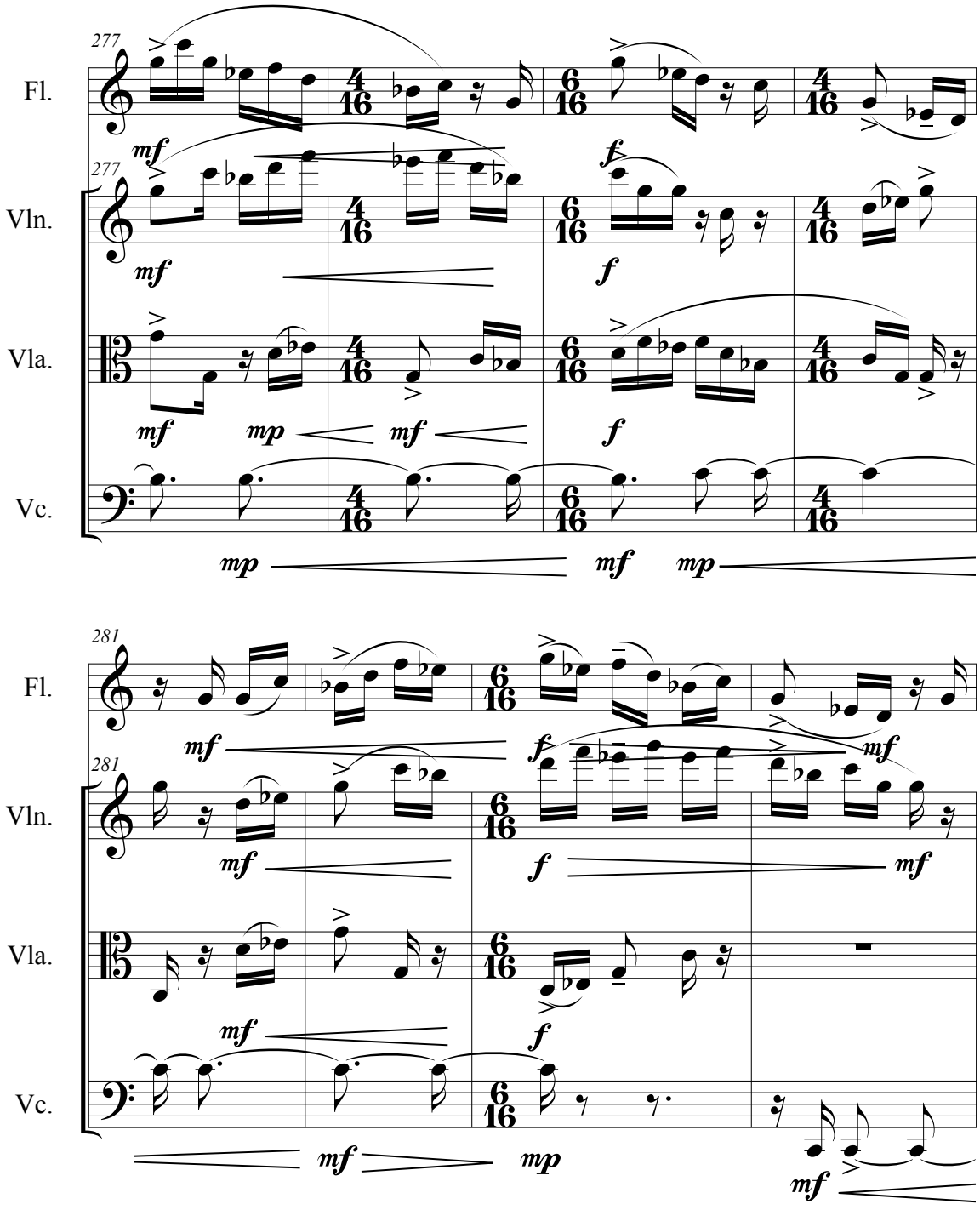

237
Fl.
mf
mp
mf
237
Vln.
mp
mf
Vla.
mp
mf
mp
mf
Vc.
mf
p
mp
p
241
Fl.
f
mf
mp
241
Vln.
f
mf
mp
Vla.
mp
Vc.
mp
mp
mf mp

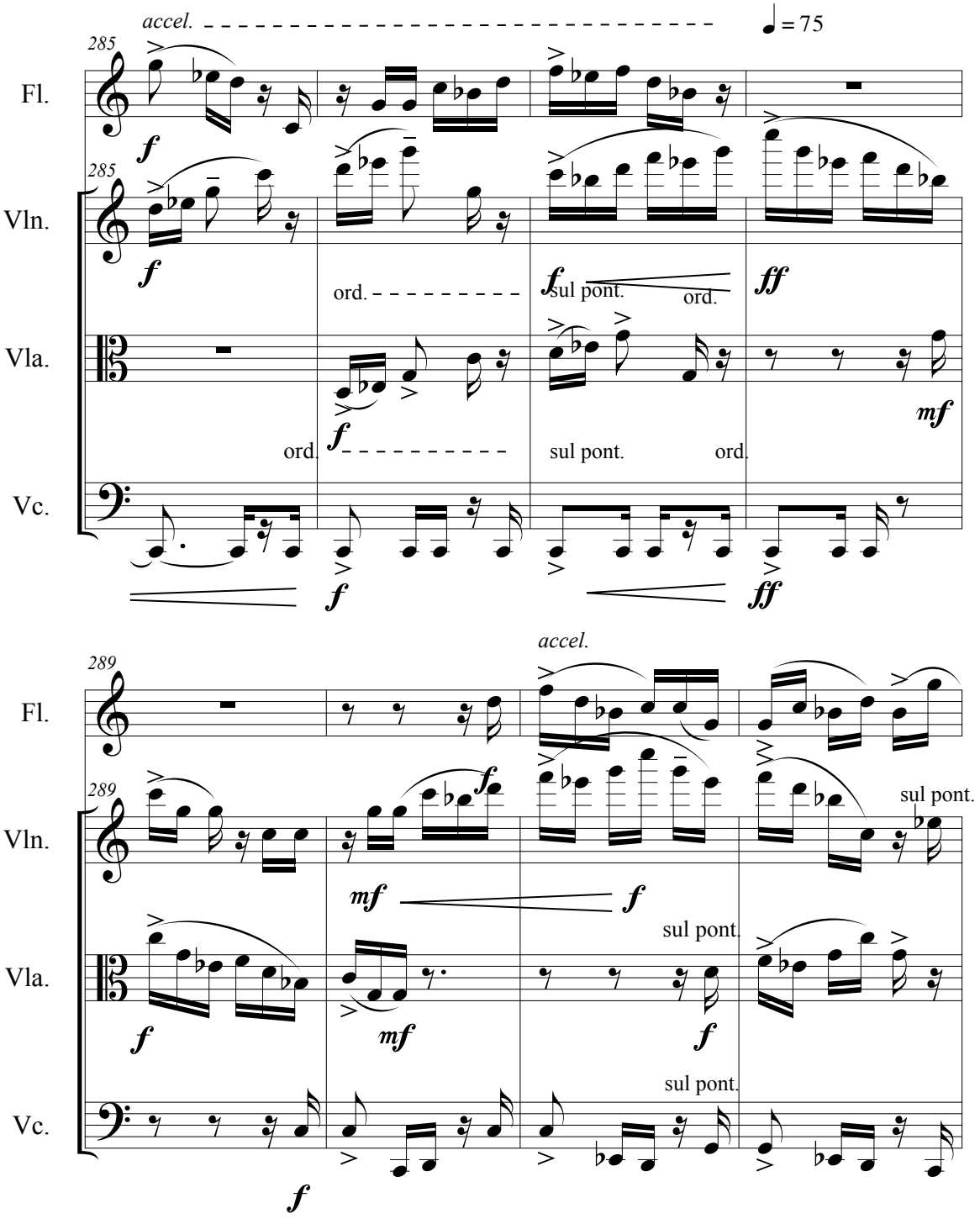

8va
245
Fl.
Vln.
Vla.
Vc.
249

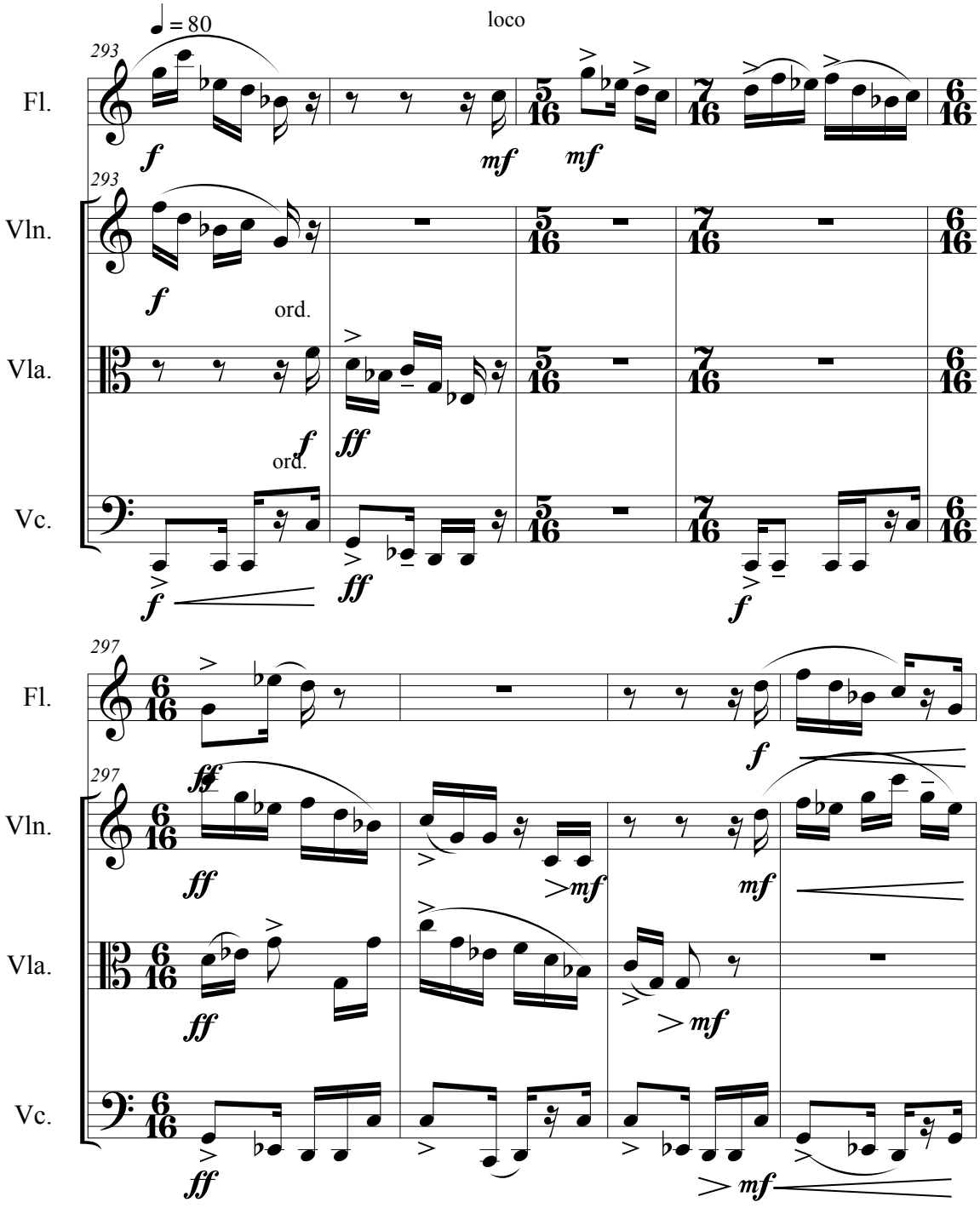

8va
253
Fl.
Vln.
Vla.
Vc.
mf
mp
257
f
p
ff
pp

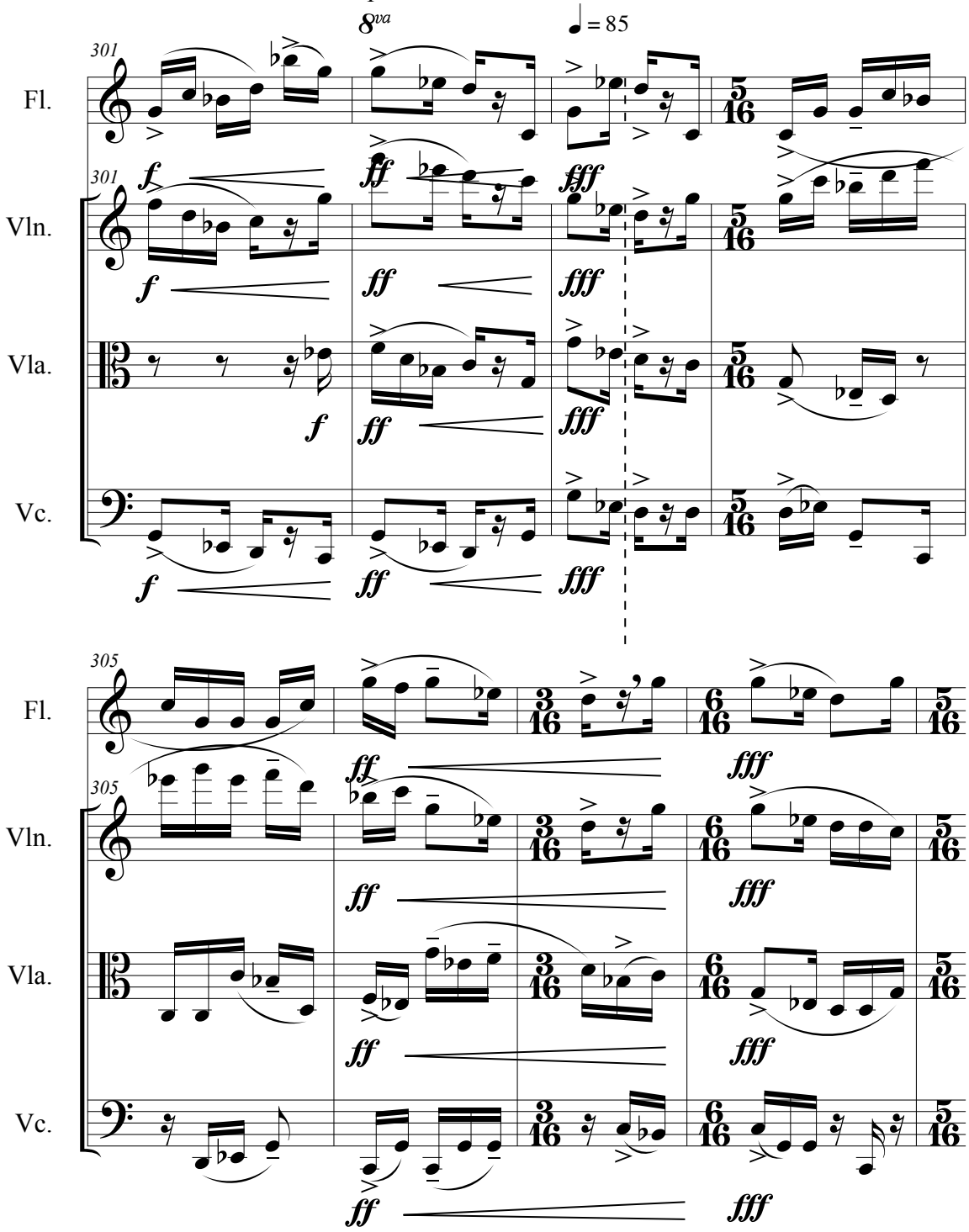

261
Fl.
Vln.
Vla.
Vc.
mf
mp
265

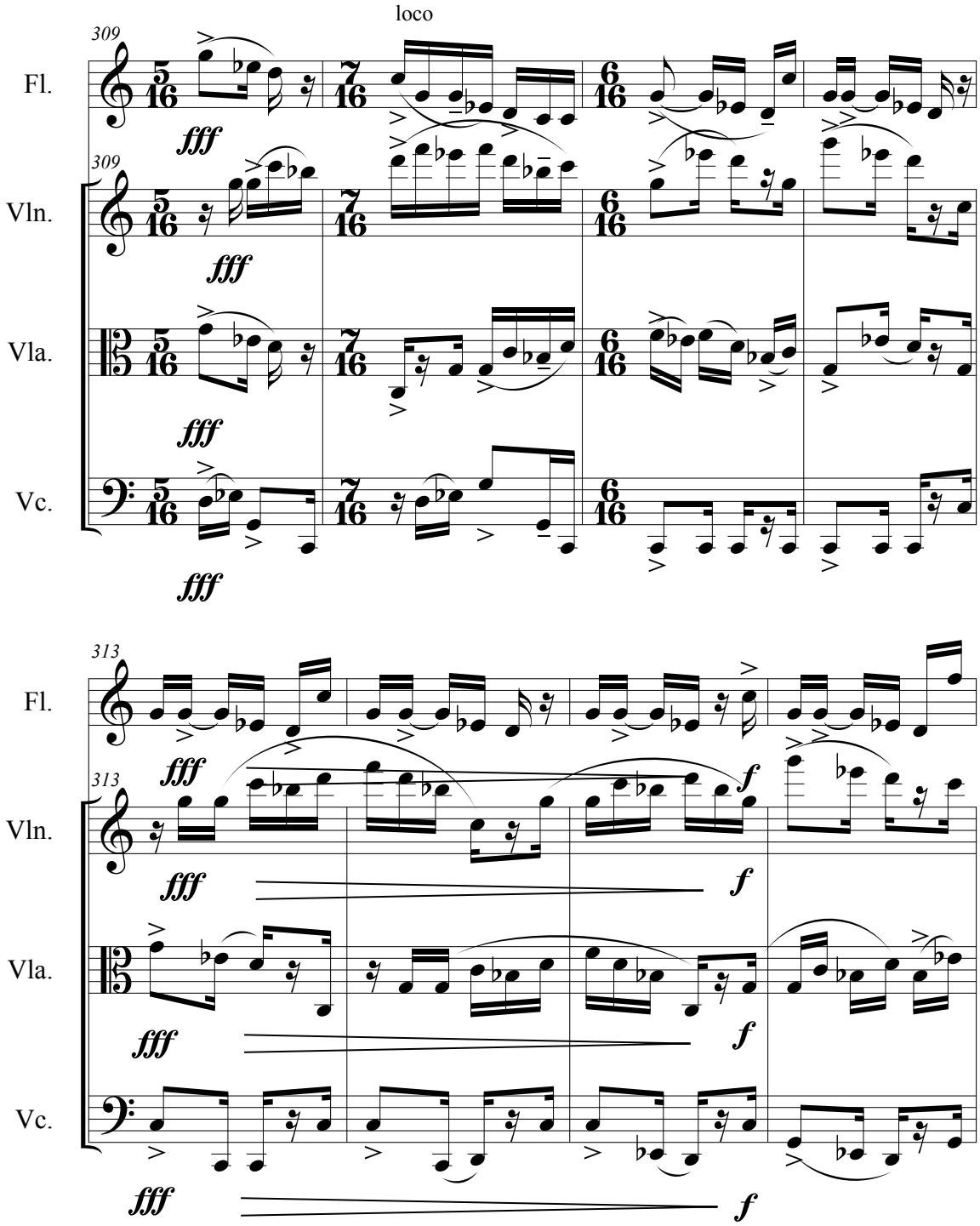

269
Fl.
Vln.
Vla.
Vc.
273
Fl.
Vln.
Vla.
Vc.

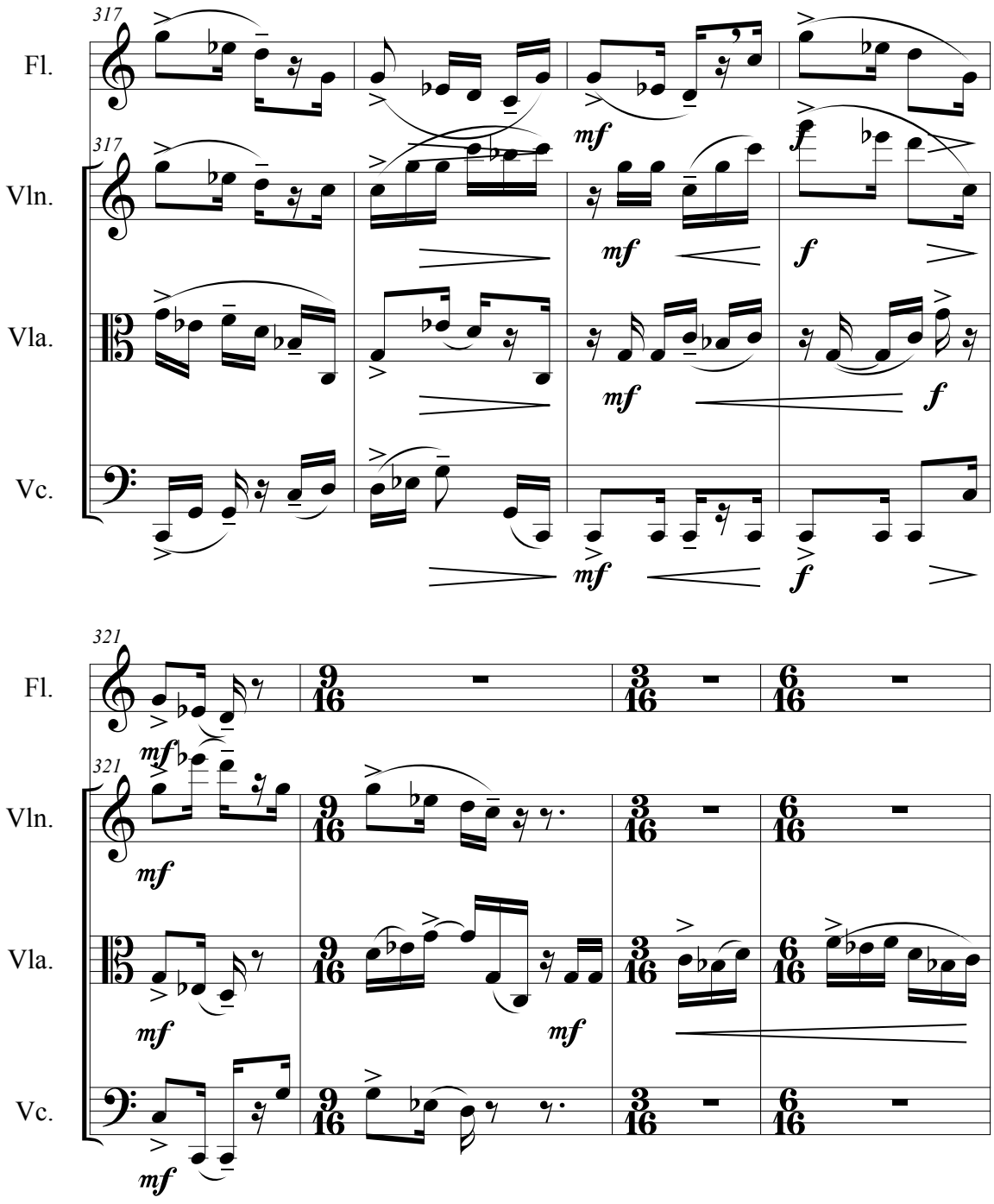

277
Fl.
Vln.
Vla.
Vc.
mf
mp
f
281

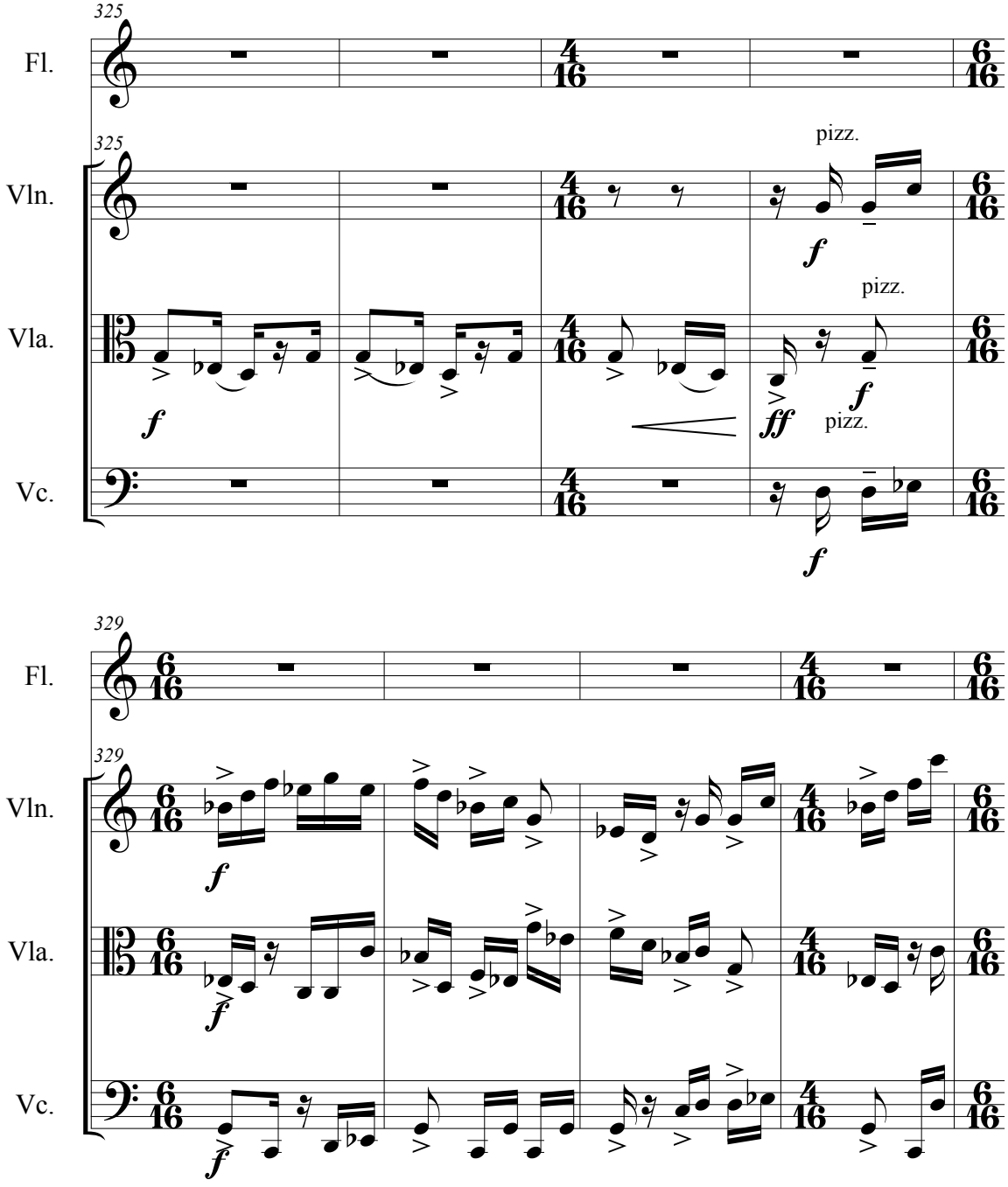

accel.
♩= 75
285
Fl.
Vln.
Vla.
Vc.
f
ord.
sul pont.
ff
mf
289
accel.
sul pont.

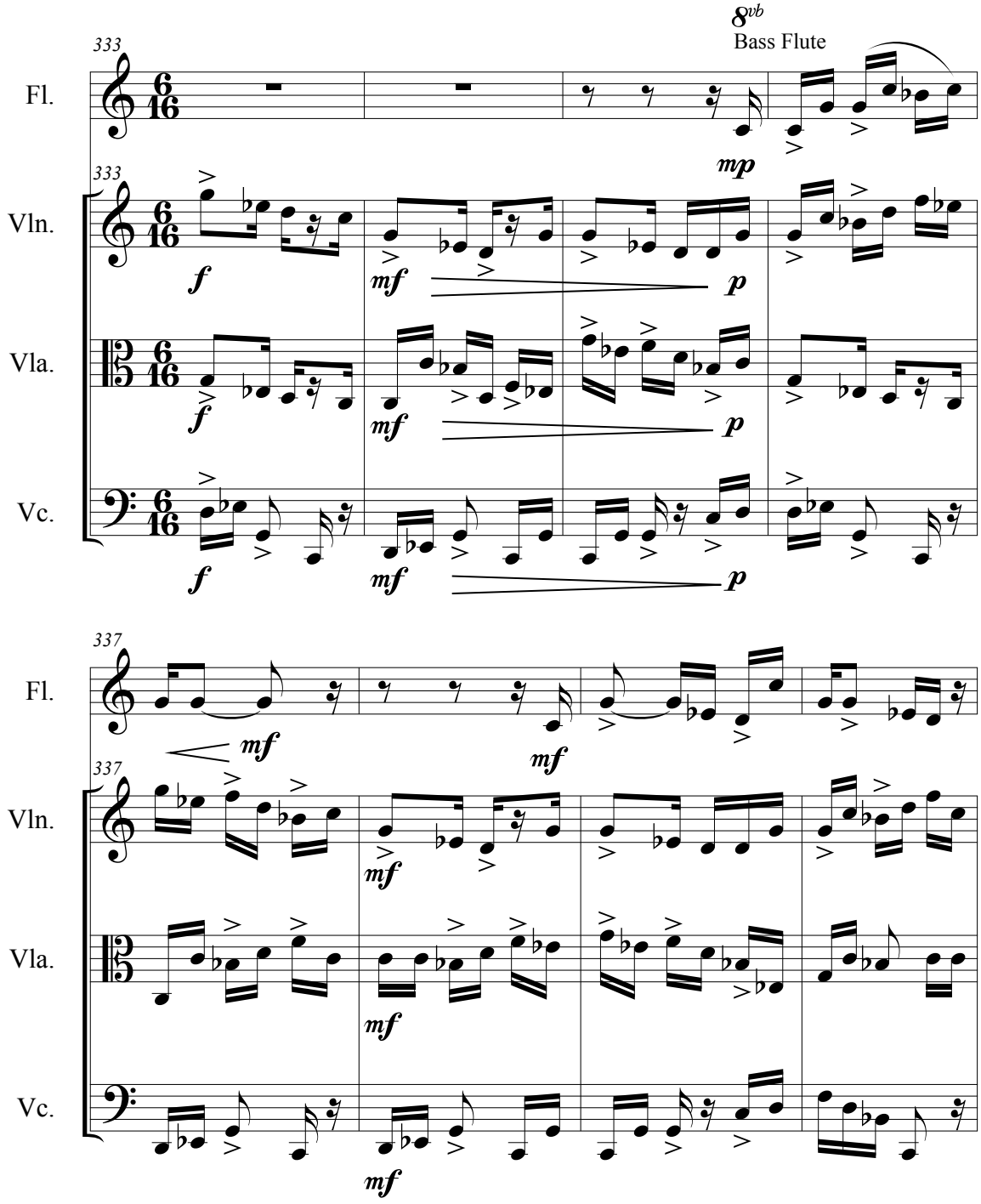

loco
293
Fl.
Vln.
Vla.
Vc.
ord.
ord.
297
Fl.
Vln.
Vla.
Vc.

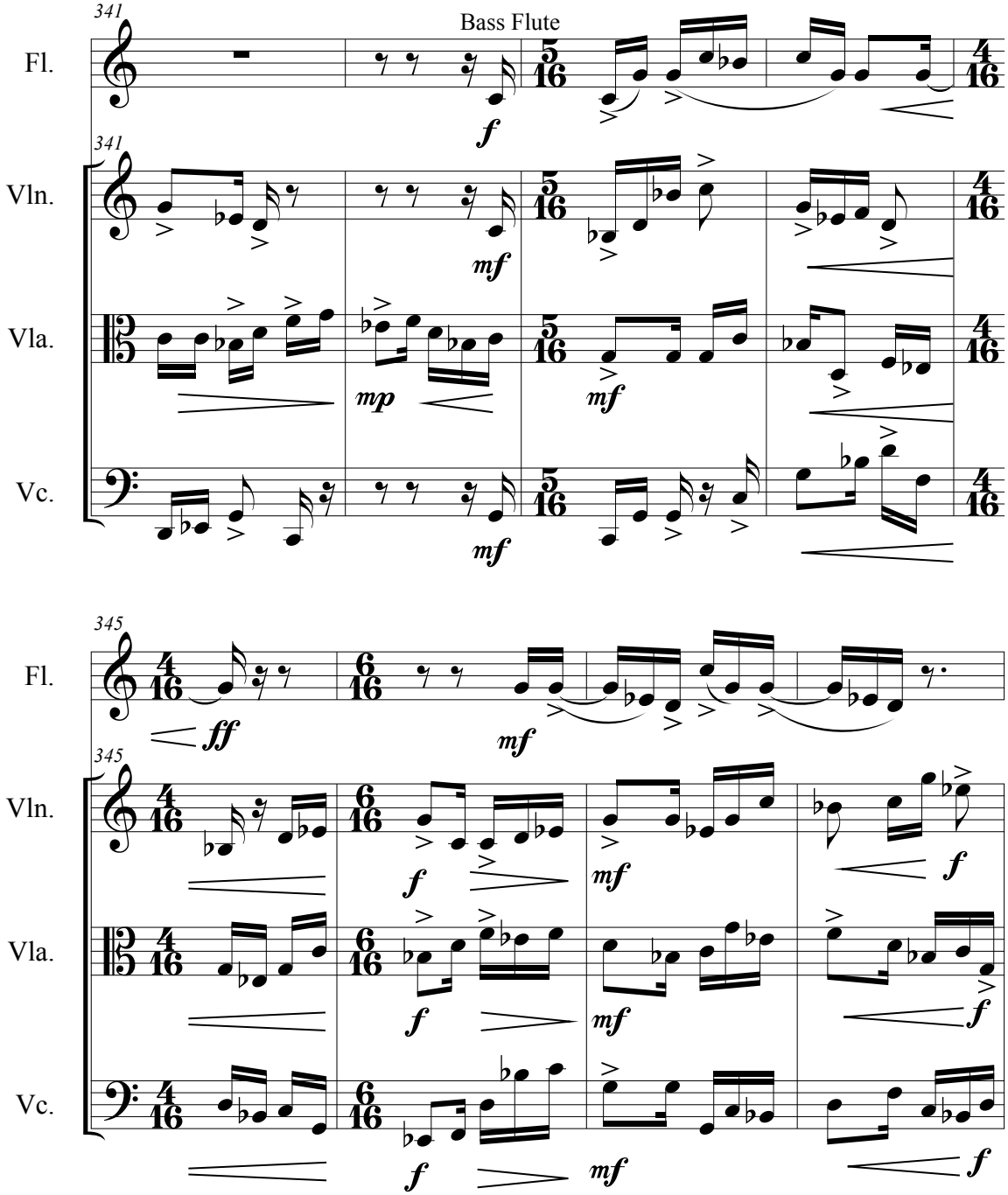

8va
♩ = 85
301
Fl.
Vln.
Vla.
Vc.
f
ff
fff
305
Fl.
Vln.
Vla.
Vc.
ff
fff

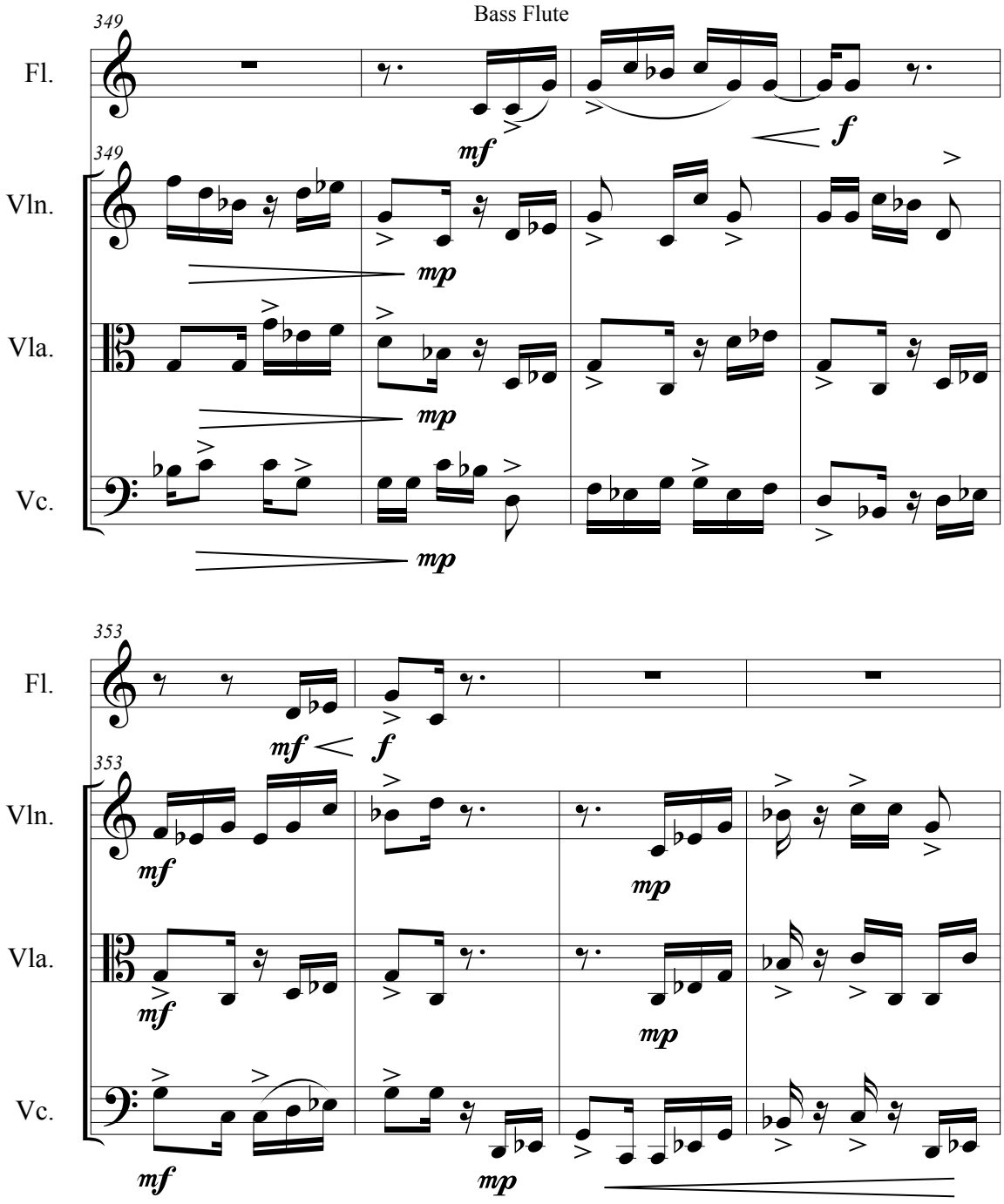

loco
309
Fl.
Vln.
Vla.
Vc.
fff
313
f

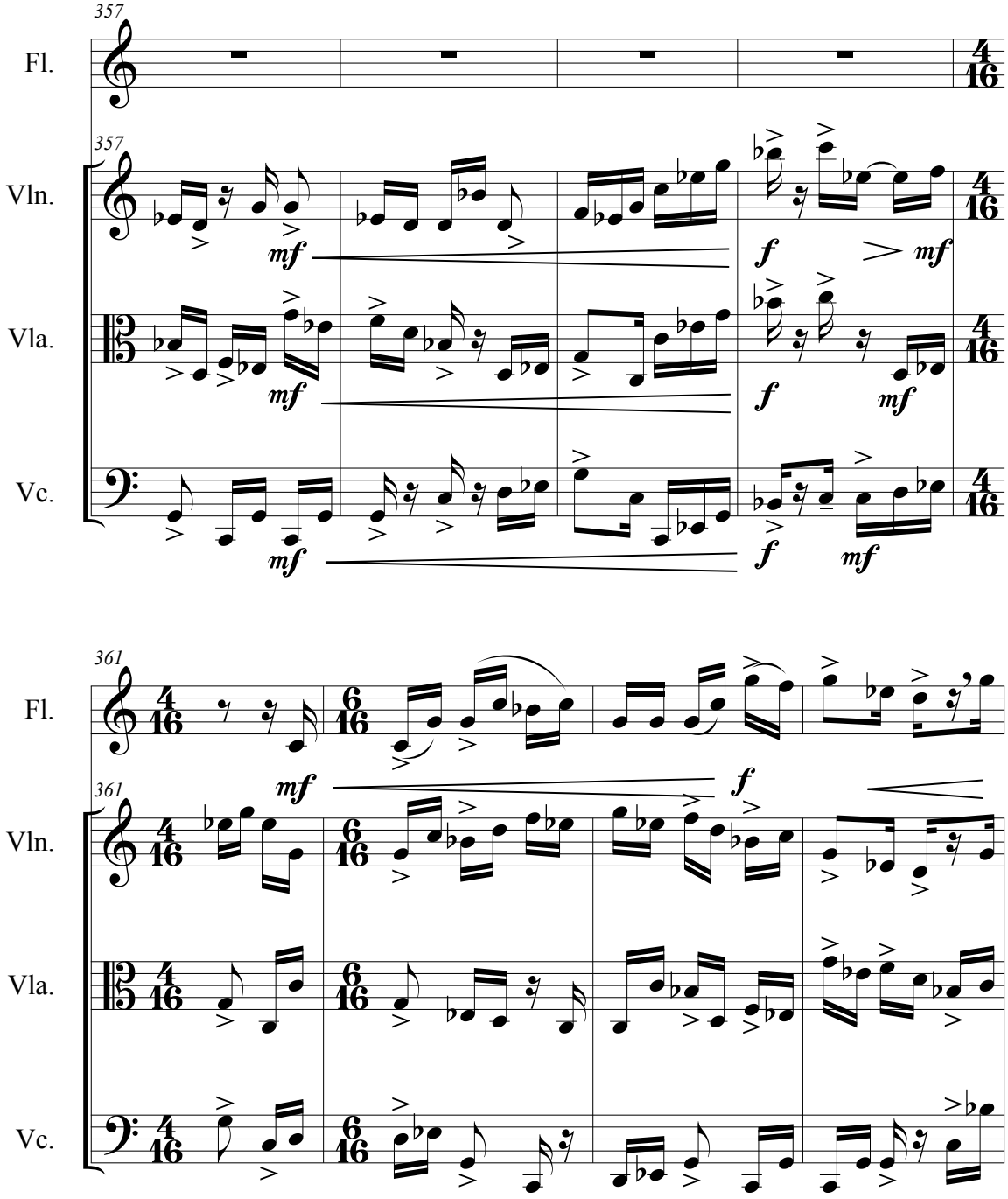

317
Fl.
Vln.
Vla.
Vc.
mf
f
321
9/16
3/16
6/16

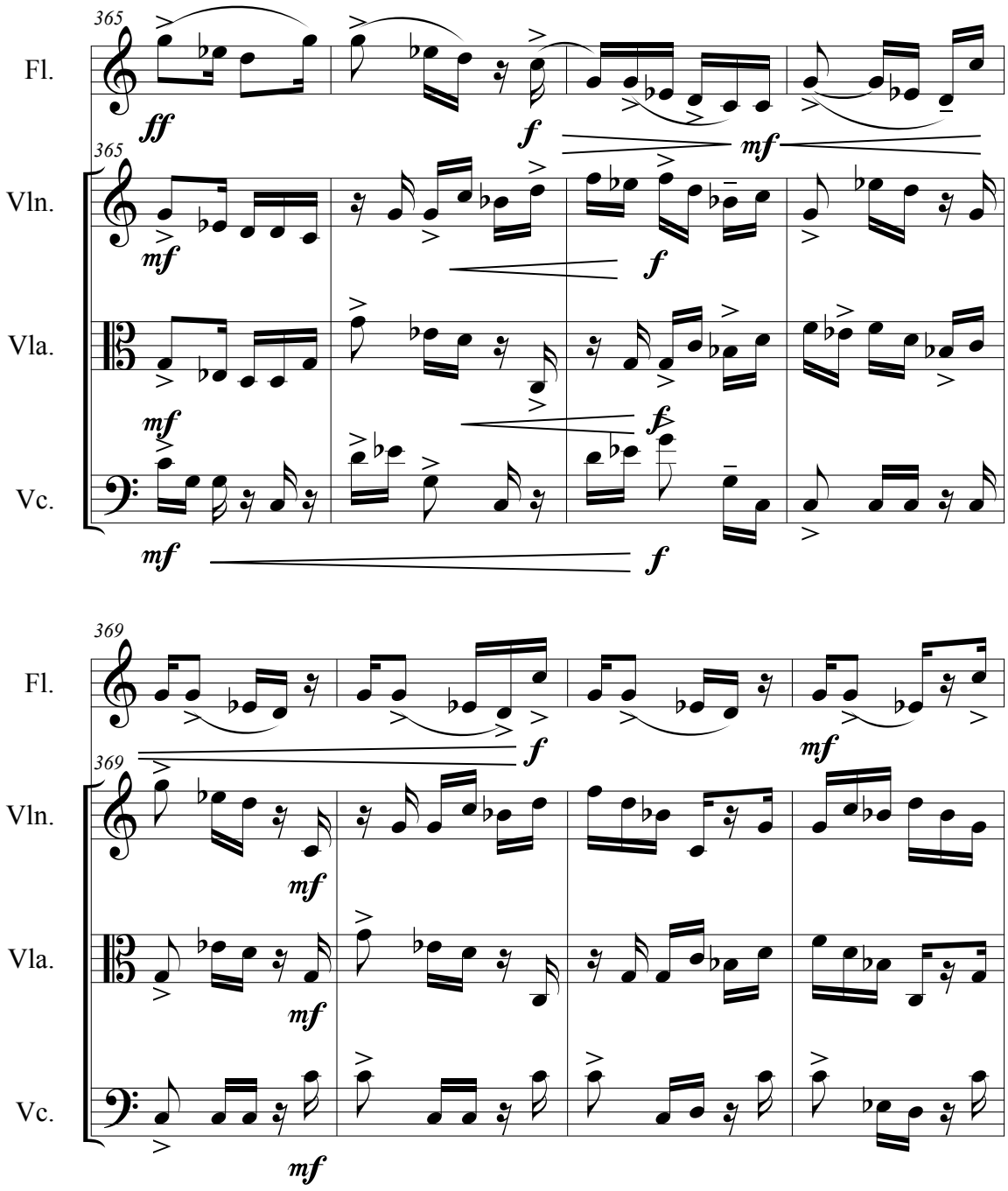

325
Fl.
Vln.
Vla.
Vc.
pizz.
pizz.
pizz.
329
Fl.
Vln.
Vla.
Vc.

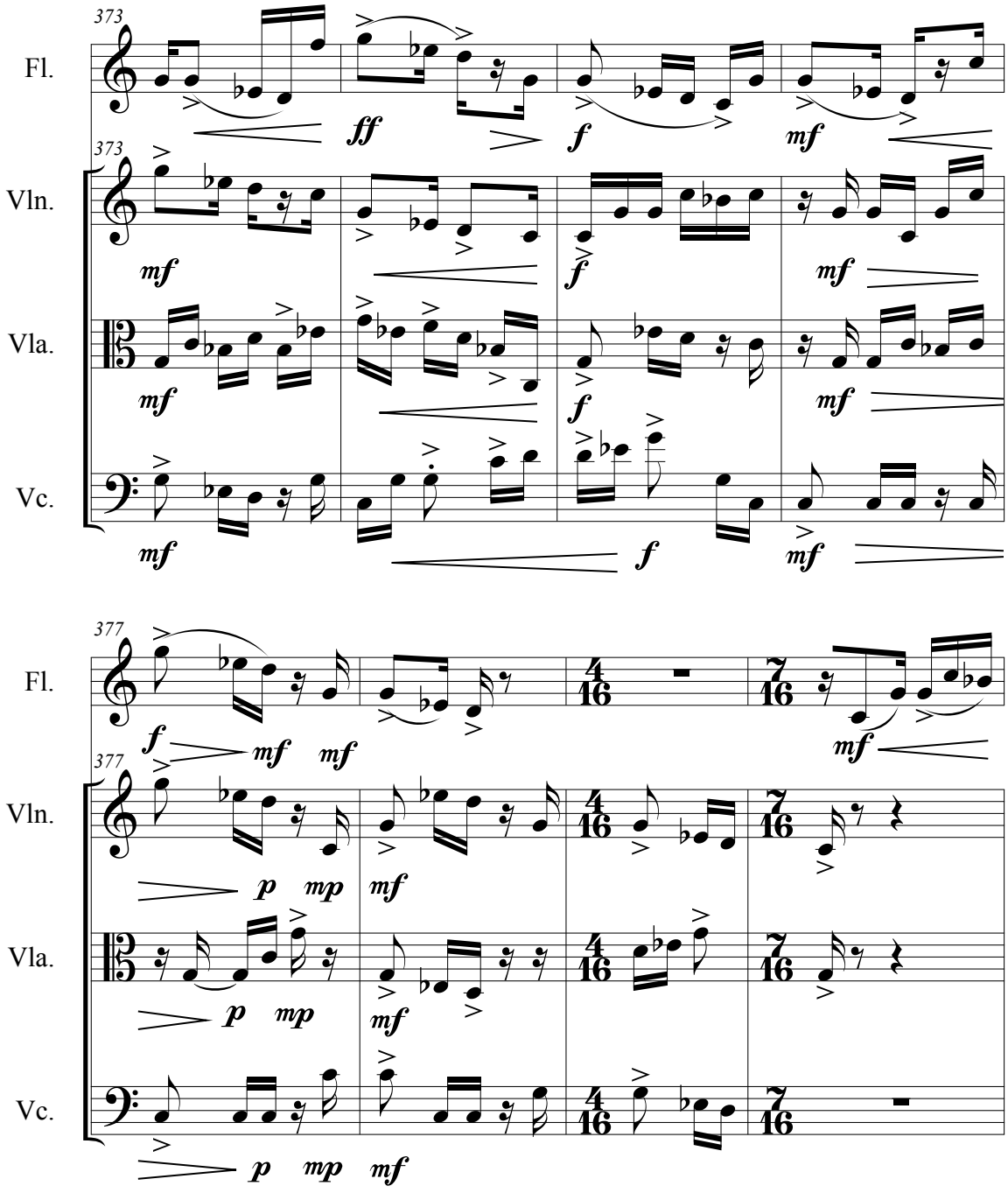

8vb
Bass Flute
333
Fl.
Vln.
Vla.
Vc.
mp
f
mf
p
337

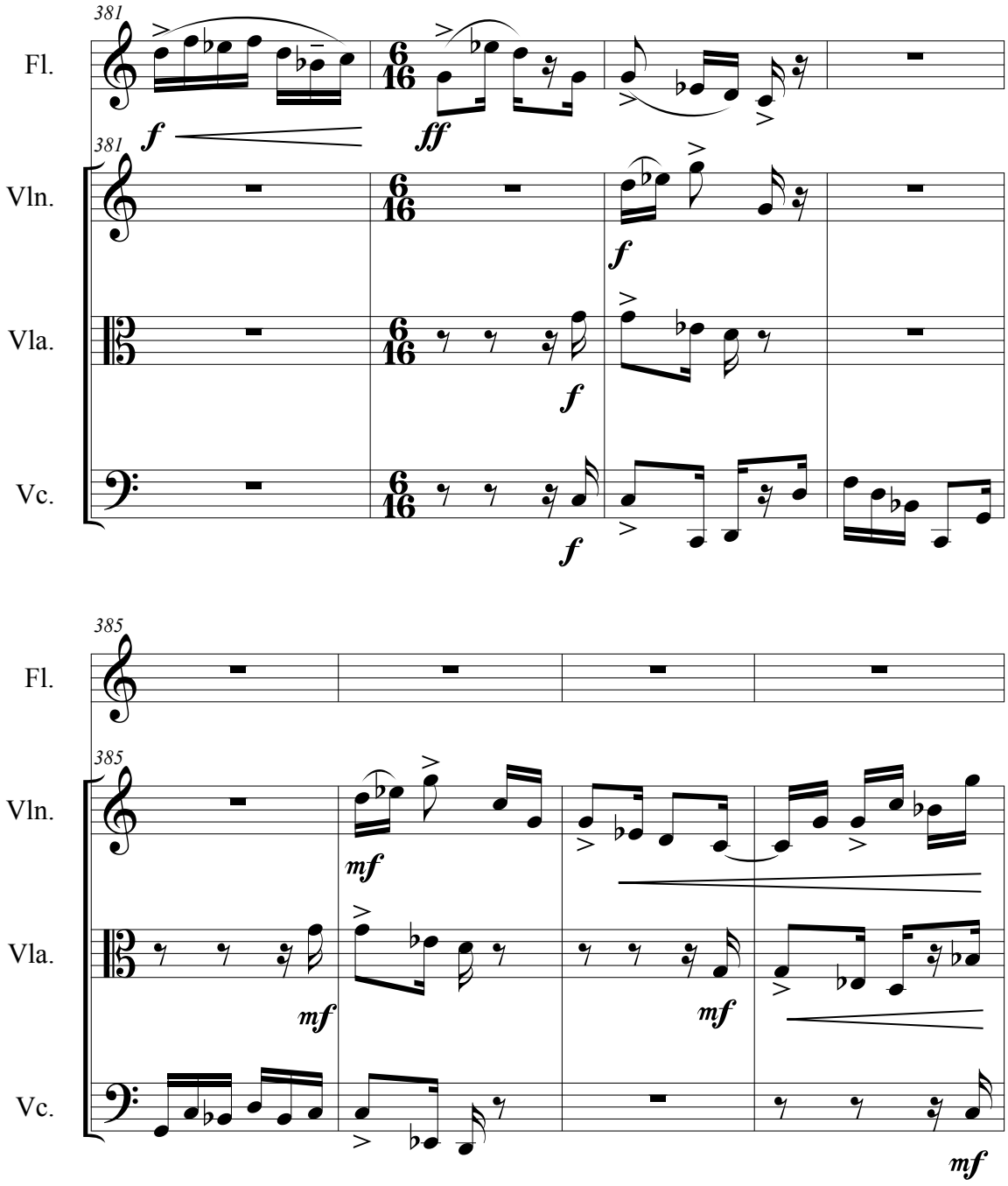

341
Bass Flute
Fl.
Vln.
Vla.
Vc.
f
mf
mp
mf
mf
345
Fl.
Vln.
Vla.
Vc.
ff
mf
f
mf
f
f
mf
f
f
mf
f

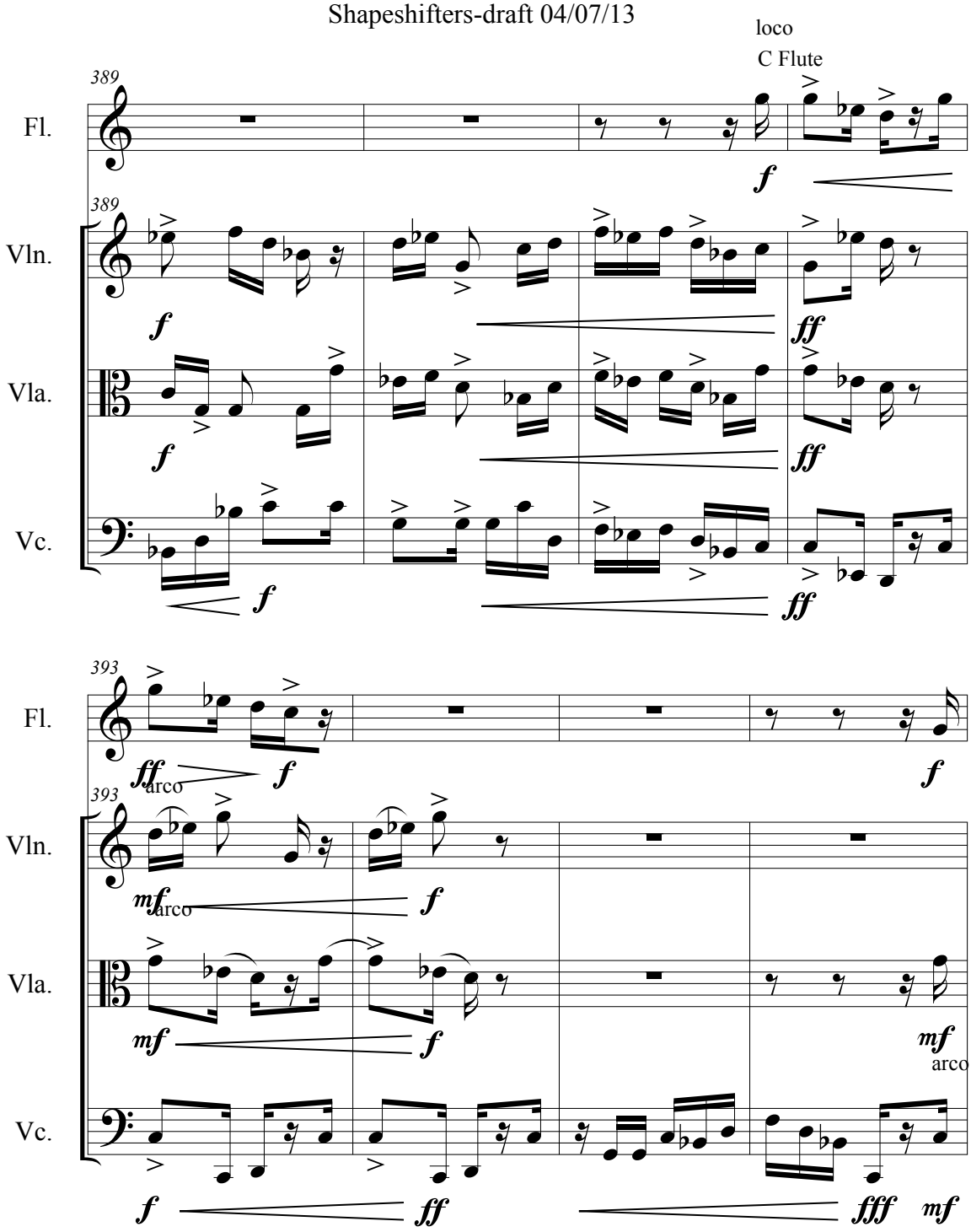

Bass Flute
349
Fl.
Vln.
Vla.
Vc.
mf
f
mp
353
Fl.
Vln.
Vla.
Vc.
mf
f
mp

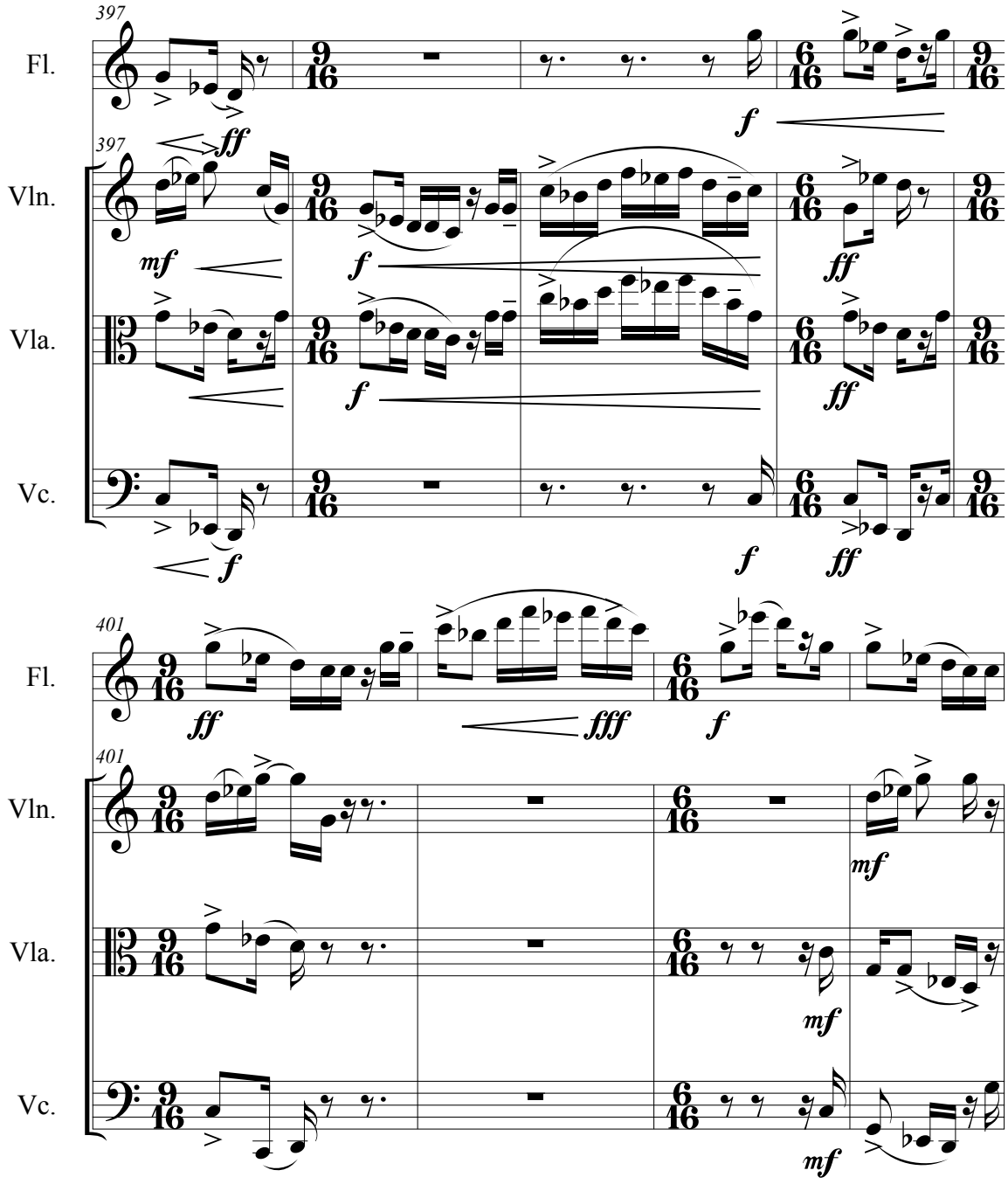

357
Fl.
Vln.
Vla.
Vc.
mf
f
361

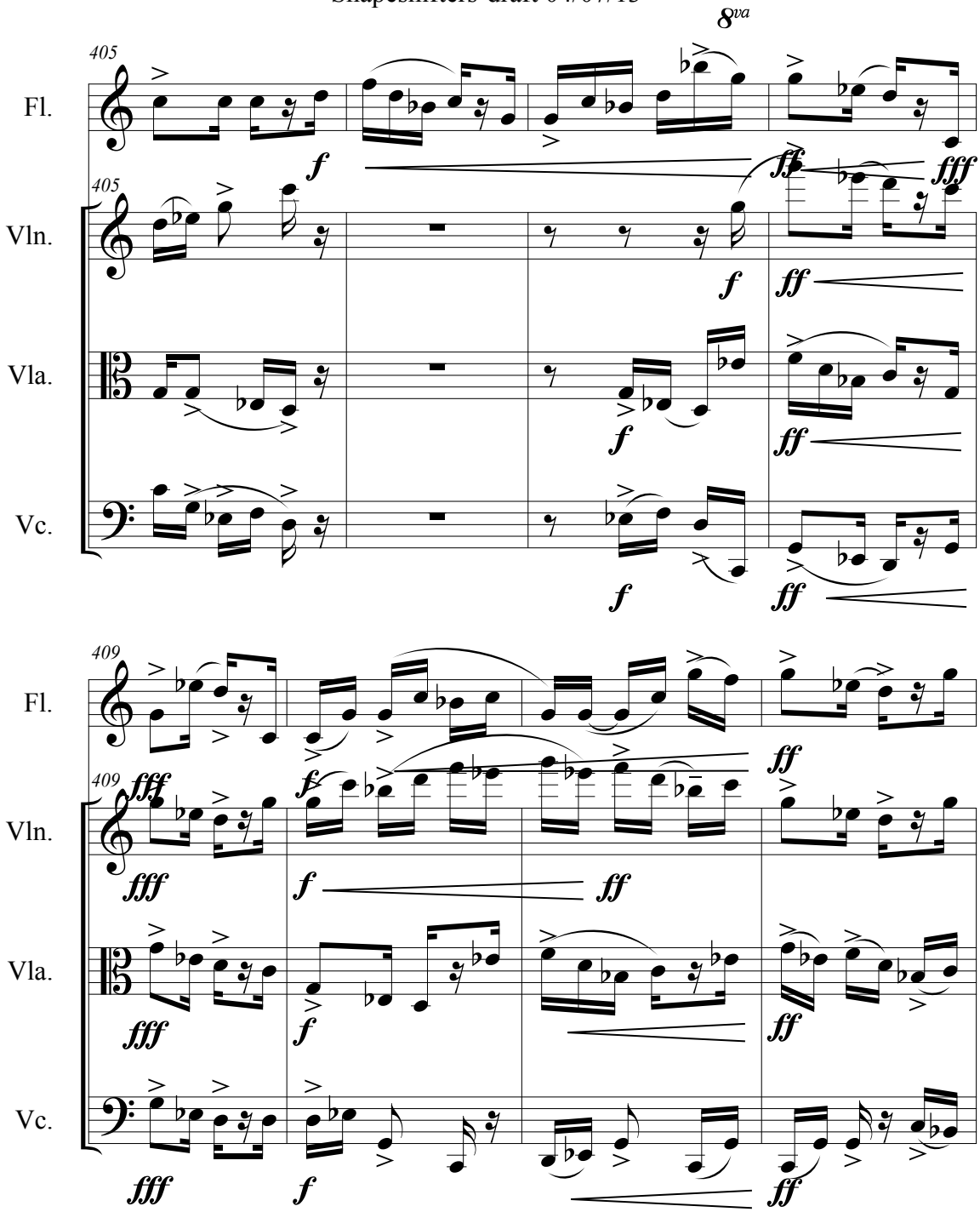

365
Fl.
ff
f
mf
365
Vln.
mf
f
Vla.
mf
f
Vc.
mf
f
369
Fl.
f
mf
369
Vln.
mf
Vla.
mf
Vc.
mf

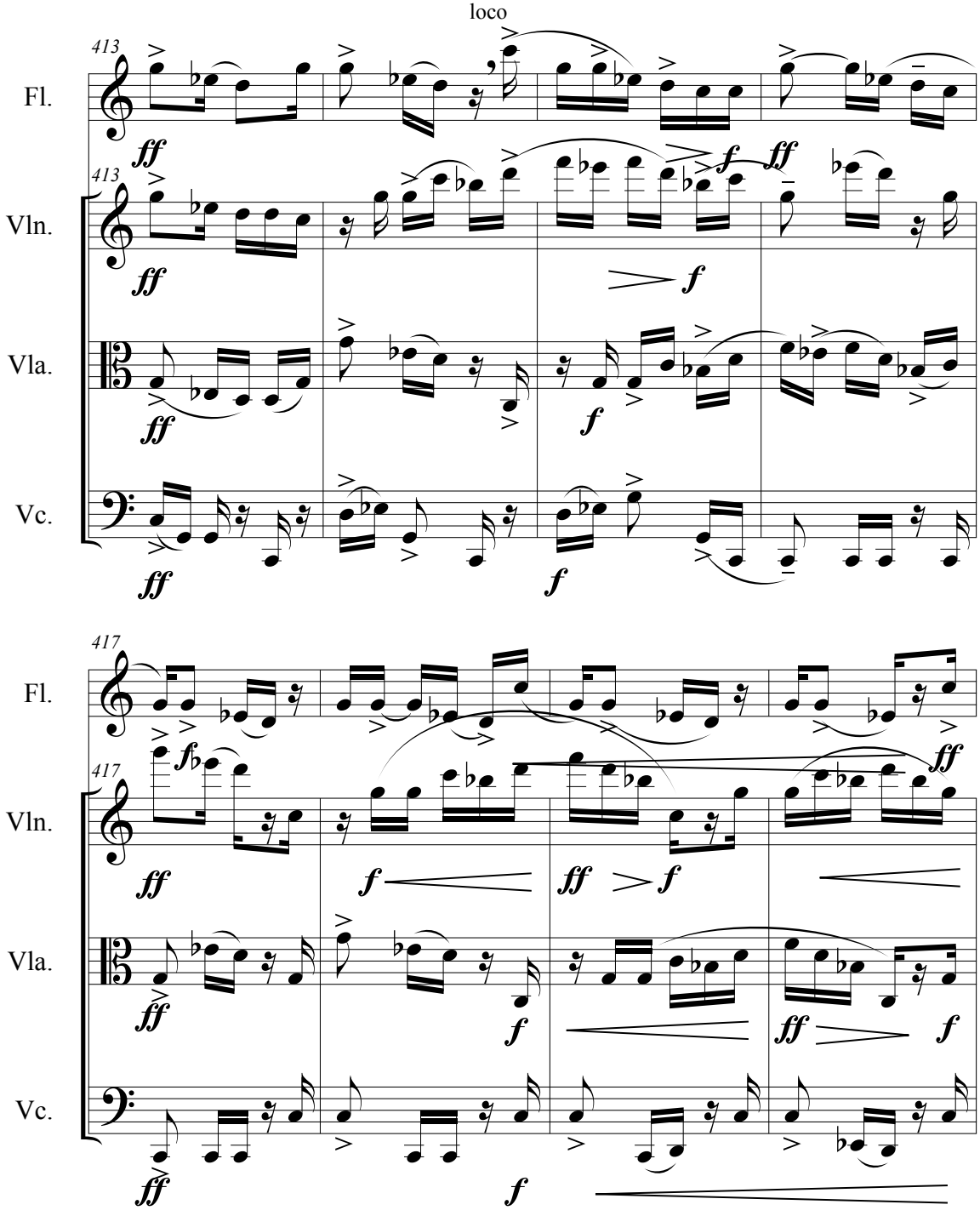

373
Fl.
Vln.
Vla.
Vc.
ff
f
mf
377
4/16
7/16
p
mp

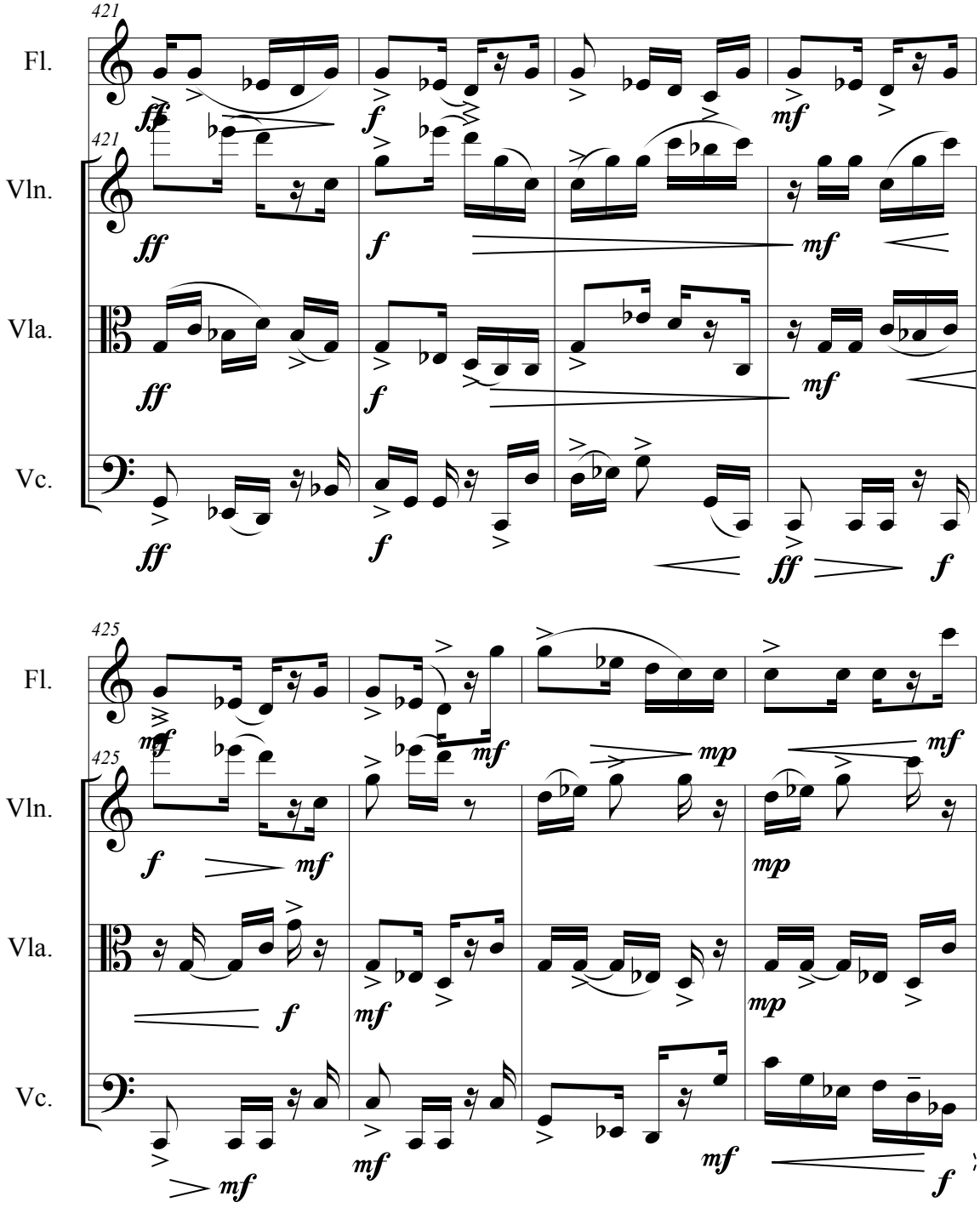

381
Fl.
f
ff
381
Vln.
f
Vla.
f
Vc.
f
385
Fl.
385
Vln.
mf
Vla.
mf
mf
Vc.
mf

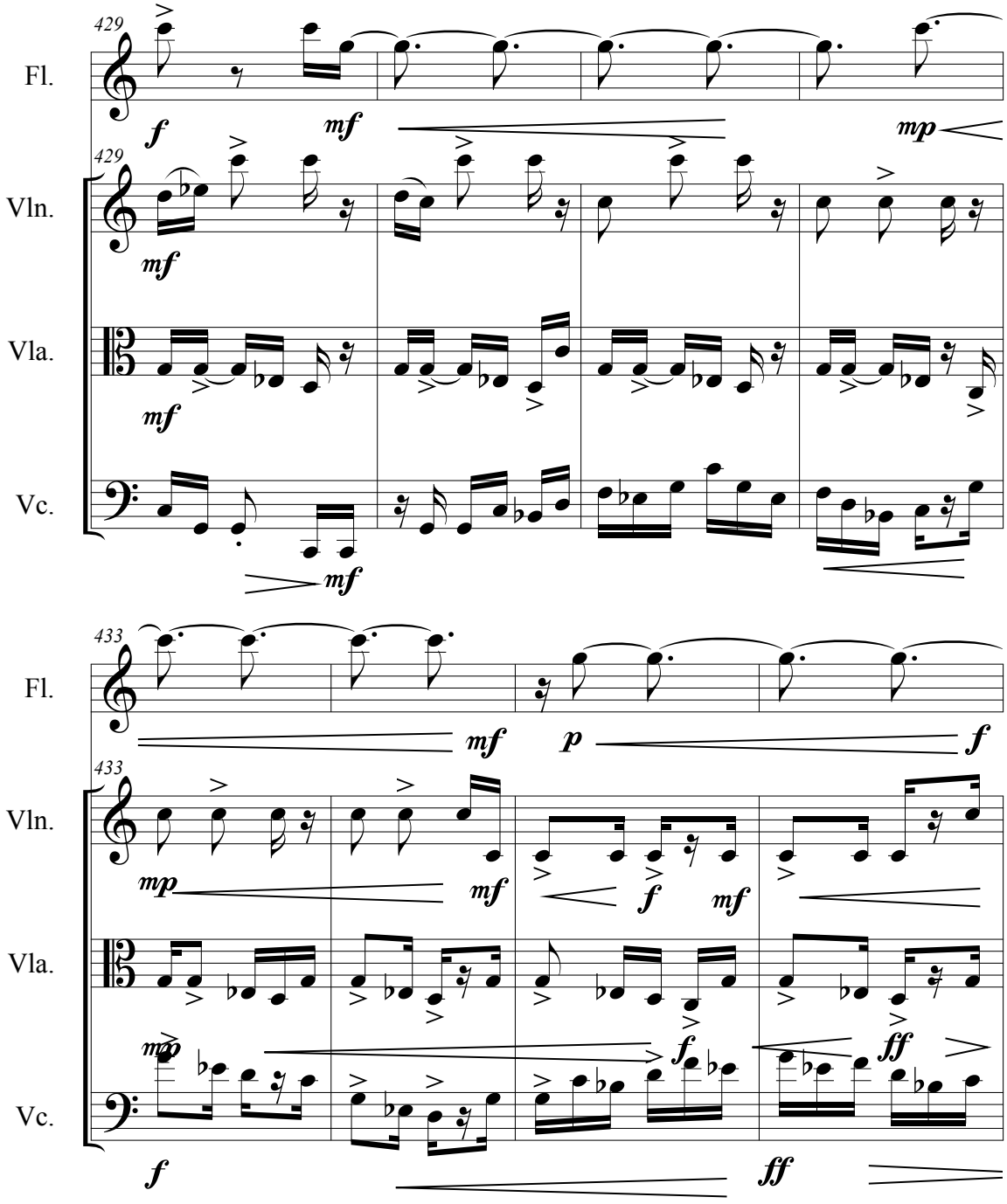

loco
C Flute
389
Fl.
Vln.
Vla.
Vc.
f
ff
393
arco
mf
fff

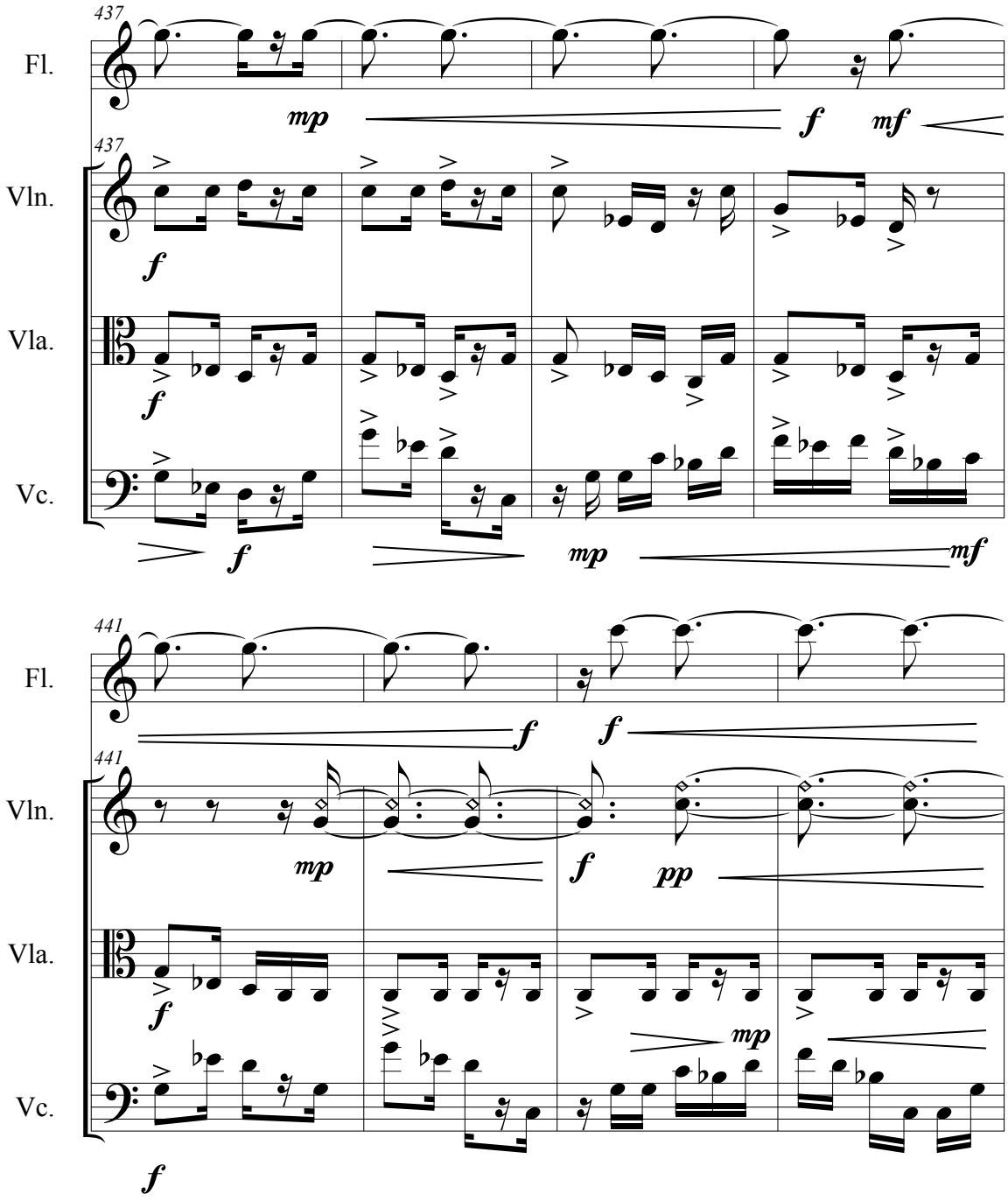

397
Fl.
Vln.
Vla.
Vc.
401
Fl.
Vln.
Vla.
Vc.

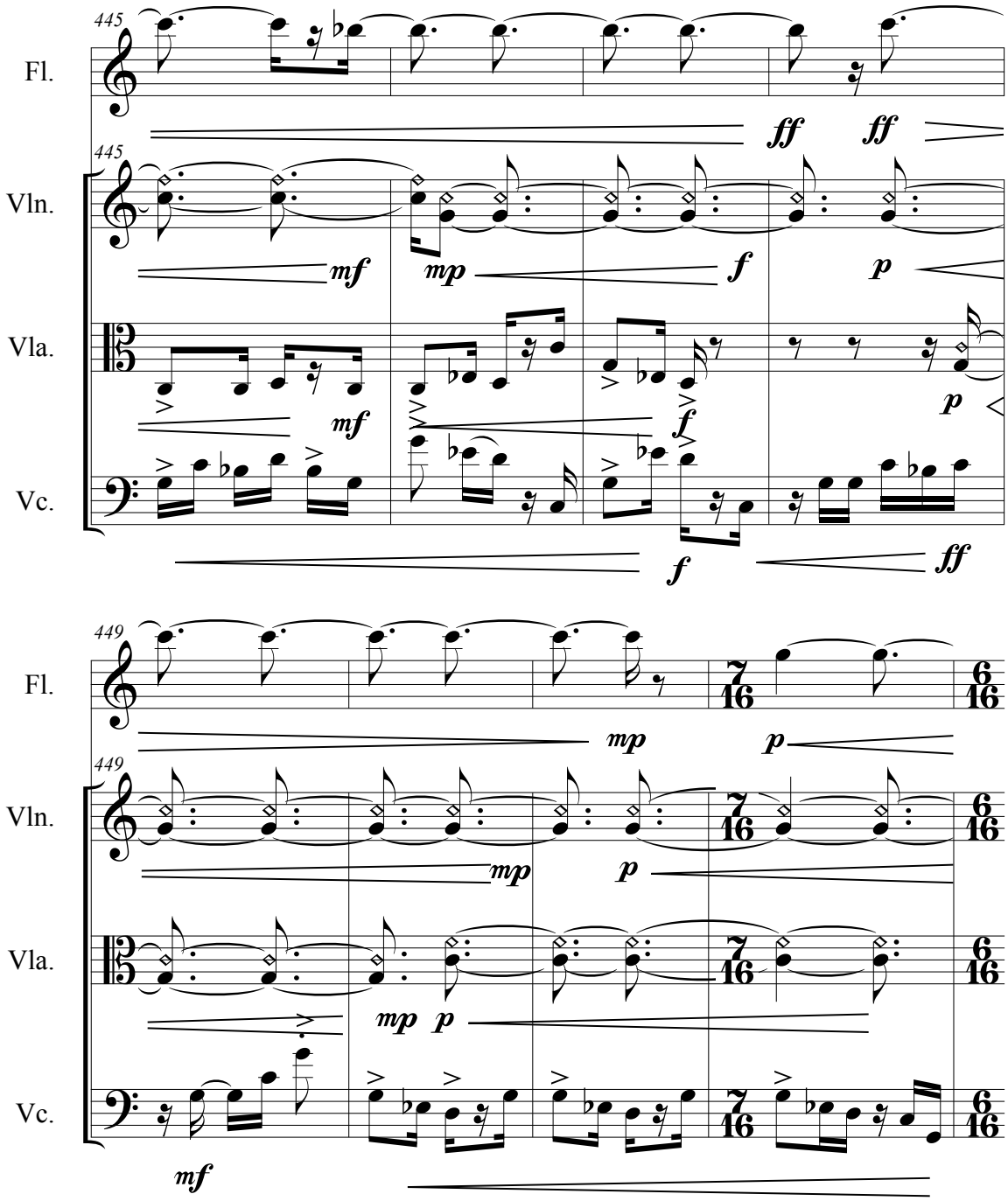

8va
405
Fl.
Vln.
Vla.
Vc.
f
ff
fff
409
fff

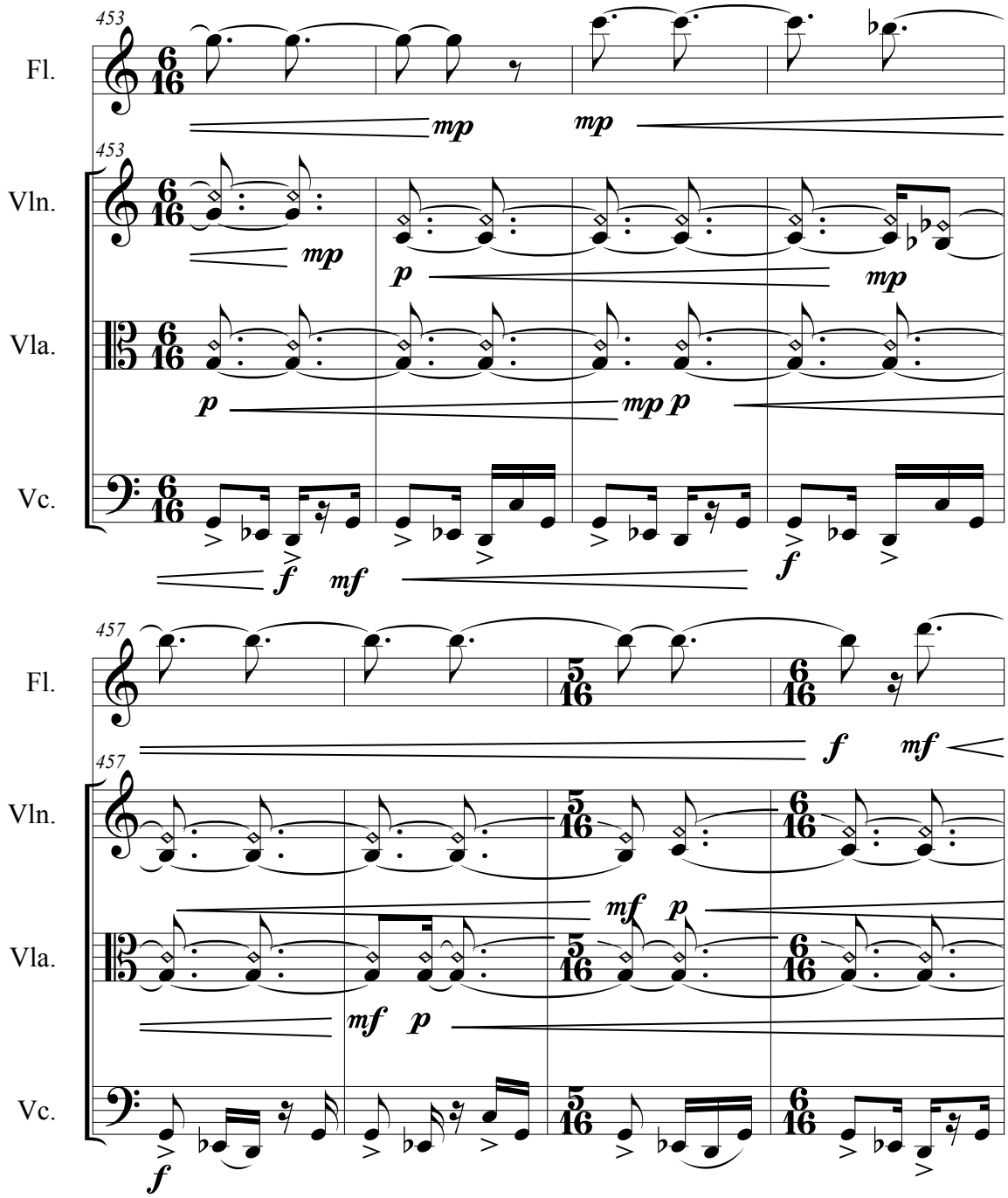

loco
413
Fl.
Vln.
Vla.
Vc.
ff
f
417
Fl.
Vln.
Vla.
Vc.
ff
f

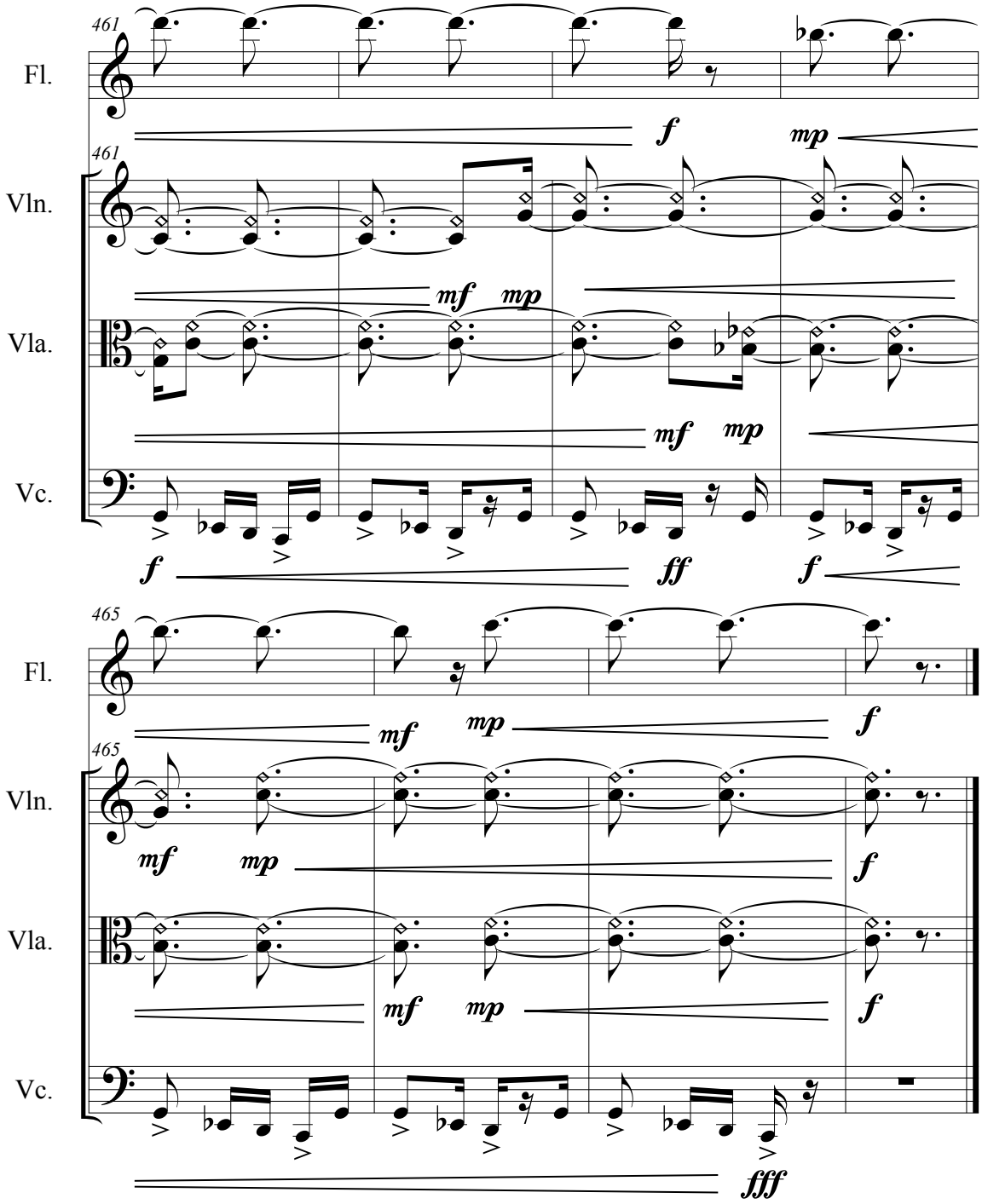

421
Fl.
Vln.
Vla.
Vc.
ff
f
mf
425
mp


429
Fl.
Vln.
Vla.
Vc.
433
Fl.
Vln.
Vla.
Vc.


437
Fl.
mp
f
mf
437
Vln.
f
Vla.
f
Vc.
f
mp
mf
441
Fl.
f
f
441
Vln.
mp
f
pp
Vla.
f
mp
Vc.
f


445
Fl.
Vln.
Vla.
Vc.
ff
ff
mf
mp
f
p
mf
f
p
f
ff
449
Fl.
Vln.
Vla.
Vc.
mp
p
mp
p
mp
p
mf
7/16
6/16


453
Fl.
Vln.
Vla.
Vc.
mp
mp
mp
p
mp
p
mp p
f
mf
f
457
Fl.
Vln.
Vla.
Vc.
f
mf
mf
p
mf
p
f


461
Fl.
f
mp
461
Vln.
mf
mp
Vla.
mf
mp
Vc.
f
ff
f
465
Fl.
mf
mp
f
465
Vln.
mf
mp
f
Vla.
mf
mp
f
Vc.
fff

C. Media and Software Package

The accompanying Media and Software Package contains:

i. Score and Parts

   a) Transposed score

   b) Parts

ii. Software

   a) Max patches

      1. *cosFlute.maxpat*

      2. *cosClarinet.maxpat*

      3. *cosKeyboard.maxpat*

      4. *cosStrings.maxpat*

      5. *cosMainMixPanel.maxpat*

   b) Software Documentation

iii. Audio Files

   a) ghostFlute.wav

   b) deepWater.wav

iv. Video of first performance (5/23/14)