Axon

duo for contrabass and flute

Taylor Brook

2017

about *Axon*

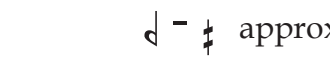
Axon was written for Marilène Provencher-Leduc (flute) and Gaspard Daigle (contrabass), commissioned by the Ensemble Contemporain de Montréal and Jeunesse Musicales in connection with the juried award from the ECM+ Generations tour 2016. This score was written during the Spring and Summer of 2017.

The title of *Axon* refers to the long, thread-like part of a nerve cell that transmits pulses of electricity as communication throughout the human body. This music considers harmonic relationships as a metaphor for neural connection and individual pitches as neural nodes, which together create a network of relationships that are explored in musical terms.

Contemporaneously to writing this piece, the idea of neural networks and deep learning being used to write music is in rapid development, with the first few companies advertising computer-generated commercial music solutions. This is a promising area of research, where algorithmic composition based on a model could iterate infinite variations in a similar style. In the case of this piece of music, the idea of a neural network is more of a metaphor and a strict algorithmic approach is not followed. Instead, I concieved of certain aspects of the pitch as a neural network, and considered the axon, the fragile strands connecting the nodes. The fragility became an important image for the piece, how tenuous the connections in the brain can be.

microtonal notation

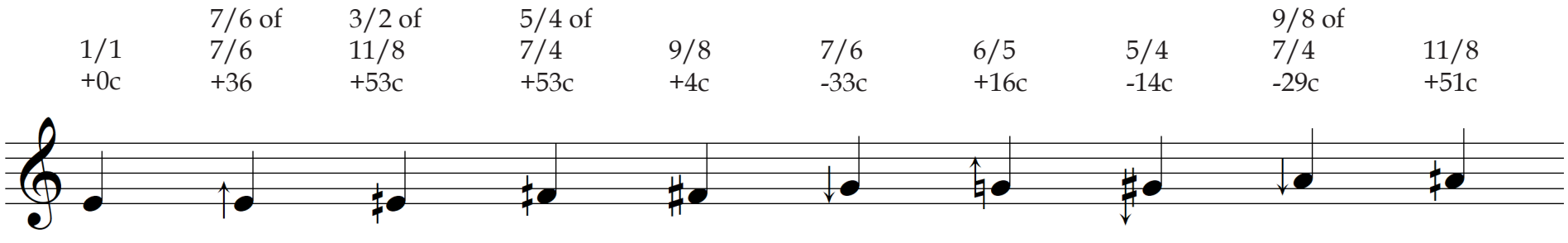
The following acccidental nomenclature is used:

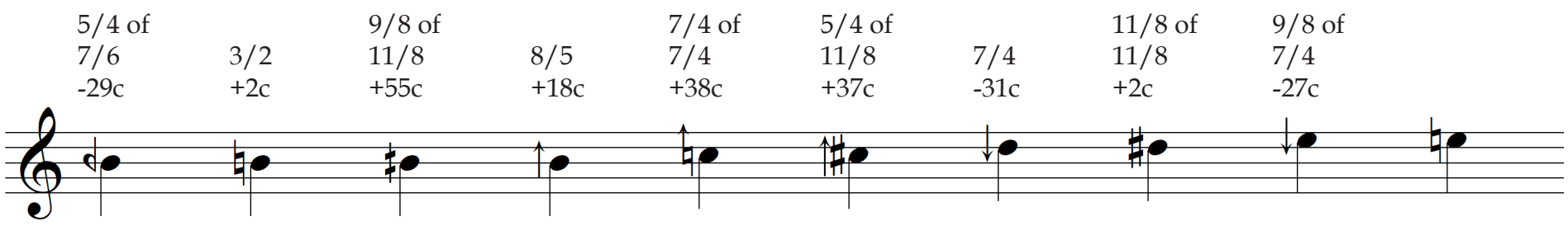

approximately 1/4 tone flat or sharp (50 cents)


approximately 1/6 tone flat or sharp (33 cents)

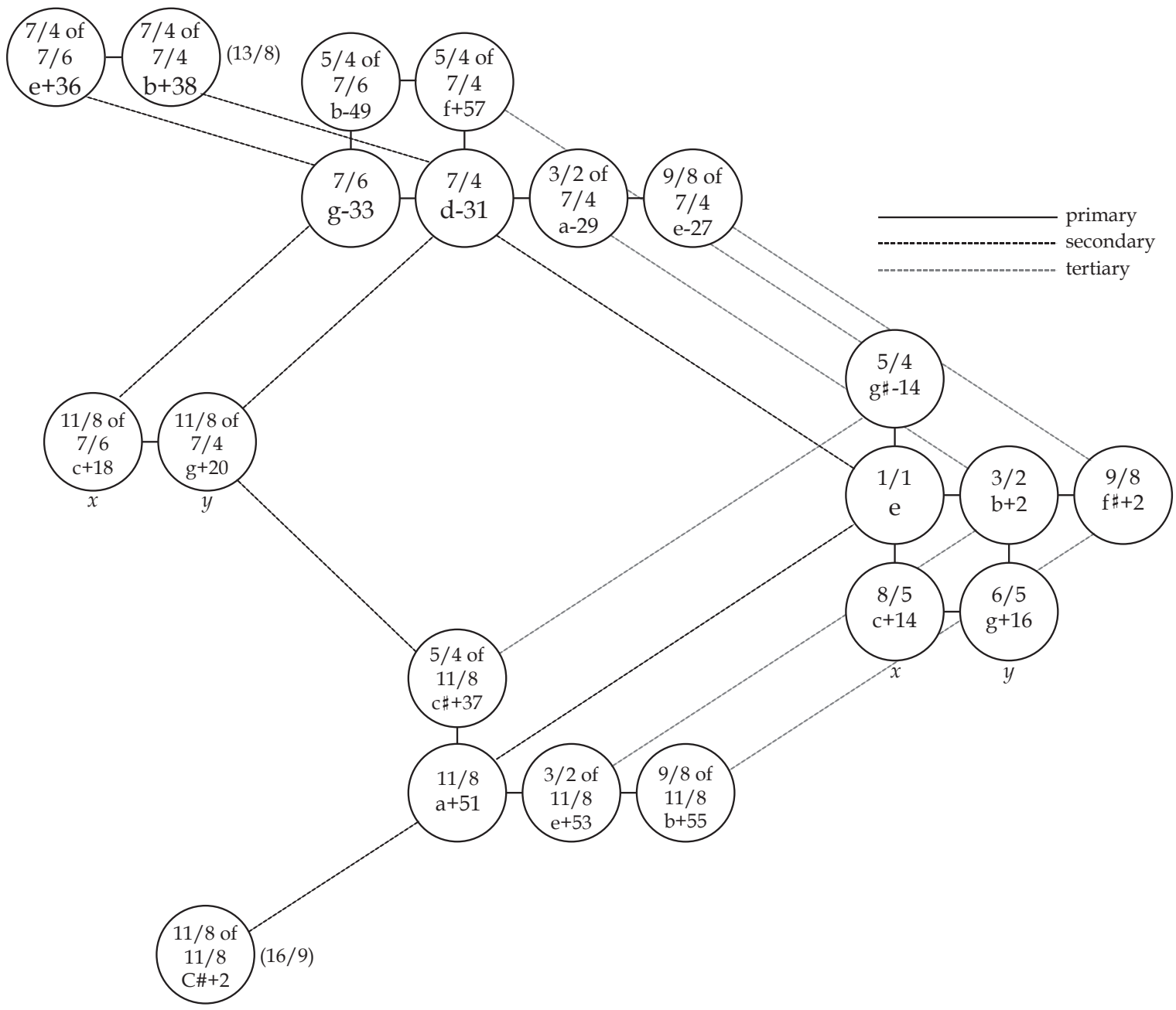

approximately 1/12 tone flat or sharp (17 cents)

The microtones in this piece of music are used to approximate the notes of the following scale, which is a collection of just intervals derived from the open strings of the retuned contrabass. The interval ratio in the key of E as well as the deviation in cents from equal temperament pitches is provided above each scale degree:



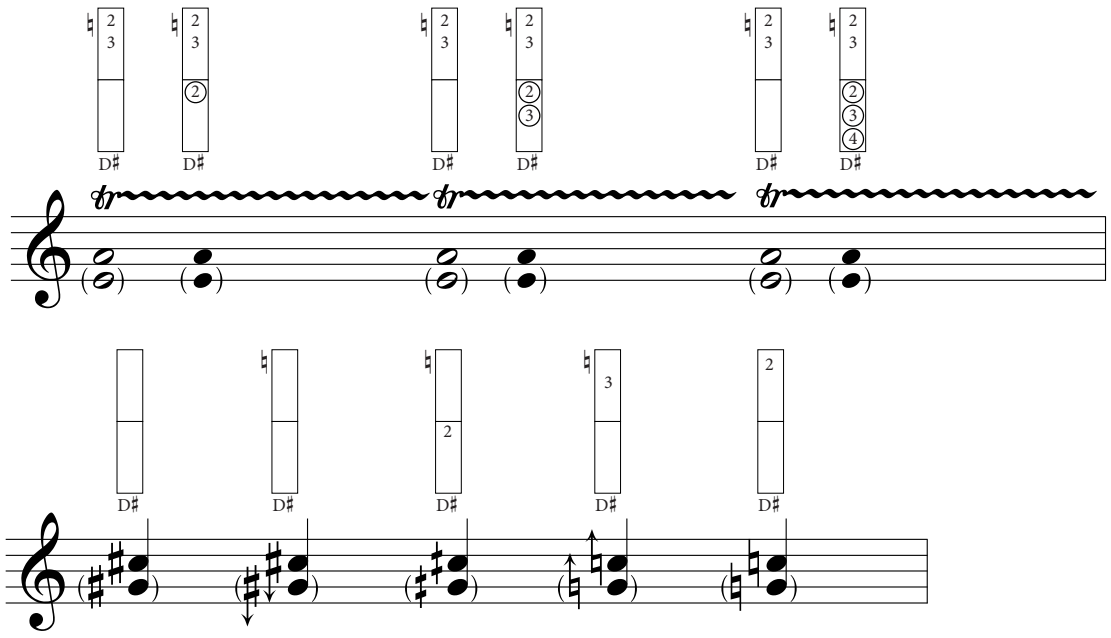


The harmonic relationships of the scale degrees can be understood using the chart below, which contains five dimensions: just major thirds (5/4) vertical, perfect fifths (3/2 horizontal), just sevenths (7/4) diagonal-left upwards, and just tritone (11/8) diagonal-left downwards. These relationships were represent clearly audible relationships between the pitches and was used extensively during the composition of the score.

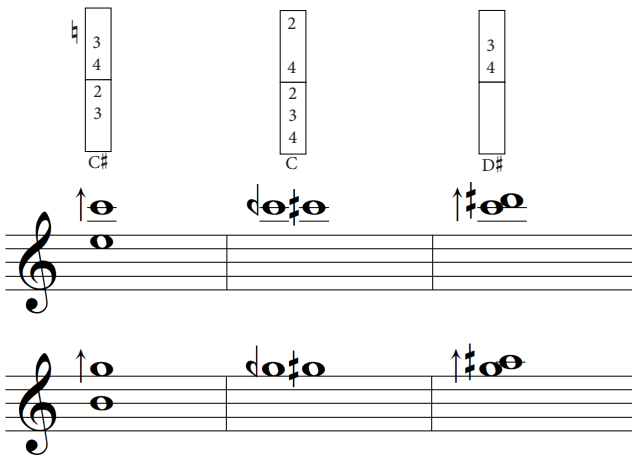


Alto Flute

Alto flute fingerings:
The combinations of fingering shown below should be possible on all alto flutes with or without a B extension. These fingerings were derived from *Techniques of Flute* by Carine Levine. If any of these fingerings are not possible on your flute, try to fing replacements that are as agile.

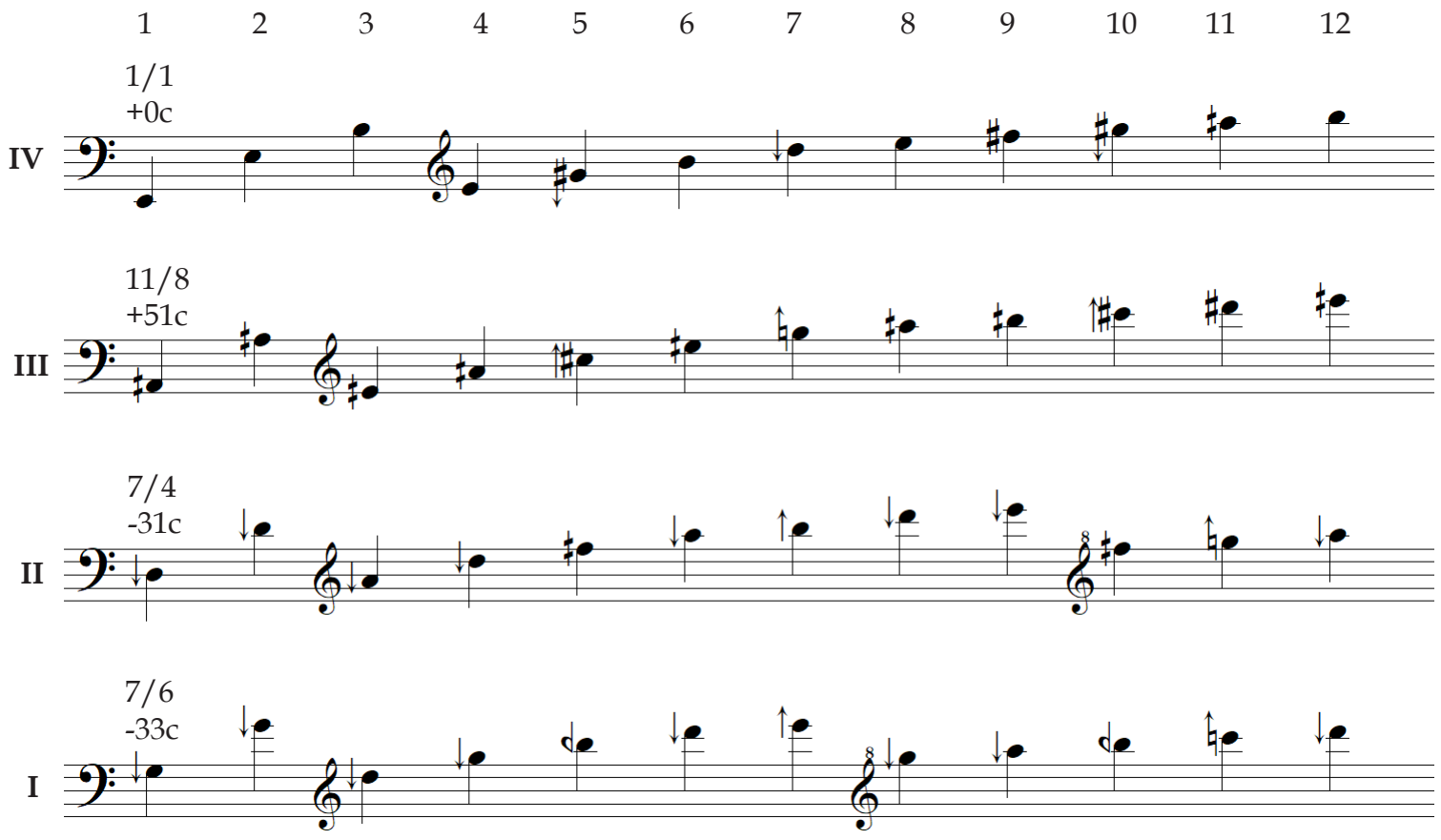


Alto flute multiphonics:
The following three multiphonics are used in the piece:



Bass

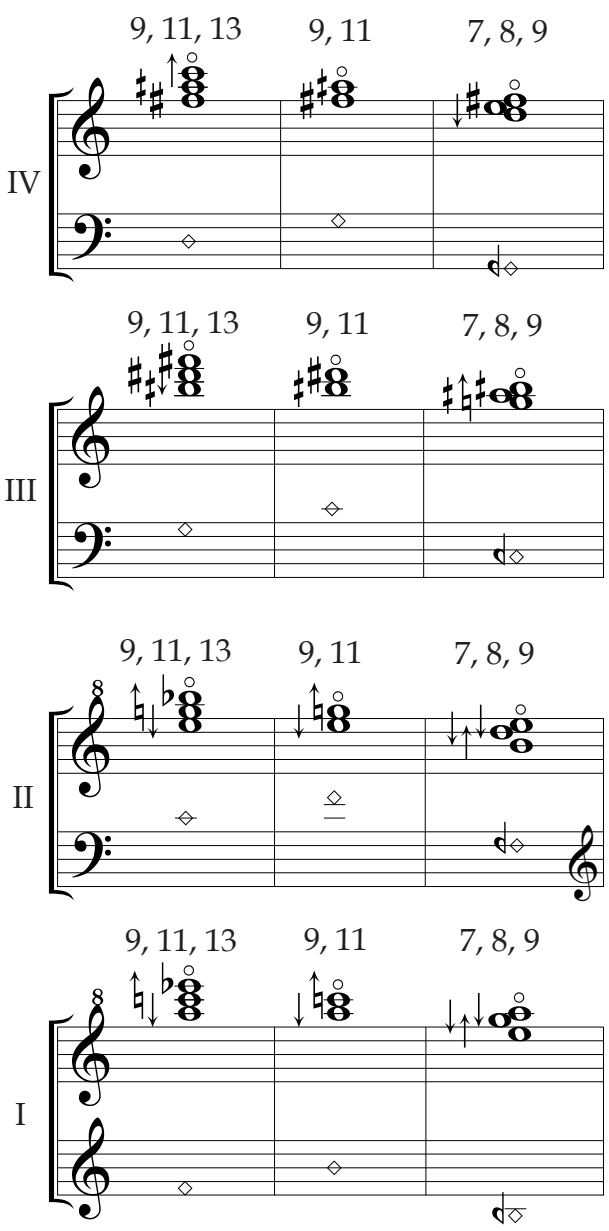
scordatura:
The strings of the bass are retuned. The low E string maintains the normal tuning, while the three other strings are returned to microtonal pitches with a close harmonic relationship to the low E. I would suggest obtaining a tuner that is able to tune to cents to check the tuning. More importantly, the strings chould be checked by ear between one another using the natural harmonics. A chart of the fundamental and first 12 overtones is provided below. The scale on the previous page was derived from these pitches. While the precise pitch of these overtones in a real world setting will not be absolutely precise, this is an understood reality and part of the compositional idea.



The score is written as sounding pitch – because the music is relatively slow and emphasizes pitch relationships, this should be a simpler solution than using a tablature staff.

multiphonics:
The following multiphonics are used in the score. This technique involves the performer touching the node on the string as indicated, like playing a harmonic, but with a specific bow placement and pressure that brings out the multiphonic chord. These multiphonics may seem unreliable at first, but with some practice they should become comfortable to play.

The same three multiphonics are used on each string:



Transposing Score

Axon

duo for contrabass and alto flute

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♩ = 58 con tempo rubato

Alto Flute

Contrabass

7

A. Fl.

CB.

sing encircled noteheads (transposing, sing interval (unison))

13

A. Fl.

sing encircled noteheads (transposing, sing interval (unison))

CB.

(normal fingerings with low embechure)

20

flz. → norm.

A. Fl.

(multiphonic)

retake bow as needed

CB.

28

A. Fl.

CB.

♩ = 76 with energy

34

rit.

A. Fl.

gradually release harmonic to open string

molto sul pont.

ord.

CB.

= 58 con tempo rubato

38

A. Fl.

CB.

flz. norm.

III8 III12 III6 II

42

bisb.

47

accel. = 76 with energy

III4 III8

52

= 58 con tempo rubato

III2 III8 III12 III7 III7 III8 IV10 IV9 III7 III8 IV10 IV9

58

flz.

bisb. (3)

(reartic. quarters)

(high as possible)

III7 II5 I6 I9 I10 I11

molto sul pont.

I3 II

67

= 76 with energy

flz.

bisb.

(8va)

ord.

sul pont.

71

A. Fl.

bisb. (3)

bisb. (3)

bisb. (3)

mf p mf p mf p mp pp

CB.

molto sul pont. ord.

5th harmonic and open string

sul pont. ord.

mf p mf p p mf p

76

= 58 con tempo rubato

A. Fl.

4:3

poco

p f p mf p pp mp pp

CB.

molto sul pont. ord.

I

f mp

81

= 76 with energy

A. Fl.

bisb.

bisb. (3)

bisb. (3)

mp f mp pp p mp mp p mf p mp

CB.

I10 I5 IV6

mf mp p

86

A. Fl.

poco

p mp p mp mp

CB.

IV10 IV9 IV12 IV8

poco

89

A. Fl.

p mf p mp pp pp mp pp p

CB.

IV10 IV11 IV9 IV6

sul tasto ord.

p mf p mf p

92

= 58

A. Fl.

flz. norm.

flz. norm.

air norm.

ppp ff ppp ppp p

CB.

III4

ff pp

99

A. Fl.

CB.

flz. norm.

mp

pp

mp

II8 III10

II9 III10

II9 III10

II8 III10

II9 III10

II8 III10

IV6

IV7

mp

108

A. Fl.

CB.

bisb. → flz. → norm.

pp mp p

IV8 IV9

IV10 3

II4 II12 II6 II8 II4

p mf p mf p mp pp

balance and blend with bass

115

A. Fl.

CB.

mf

II4 II6 I6

IV8 IV12

mf

118

A. Fl.

CB.

IV9 III9 III8 III6

II6 II4 II9 I4 I5 I6

121

A. Fl.

CB.

flz.

f mp fp fp ff

II8 I8 I9 I6 I5 I4 II8 IV5 IV12 IV8 III8 II8 I8

f mp

wild gestural runs in the direction of the wavy line

125

A. Fl.

CB.

overblow for sweeping harmonics (high note not important)

bisb.

flz.

f ff fp ff pp mp

wild, pitches approximate

I II III IV

f ff p

IV5 III5 II5 I5 IV5 IV12 IV8 III8

129

A. Fl.

flz.

fp ff

bisb.

mf ff

flz.

fp mf pp

bisb.

pp

CB.

II8 I8

wild, pitches approximate

I II III IV

f

ff

IV5 III5 II5 I5

I4 II4 III4

133

A. Fl.

ff pp

bisb.

p ff

CB.

IV4

mf p f p f

IV5 III5 II5 I5

IV4 III4 II4 I4

137

A. Fl.

pp

p fp fp ff

flz.

bisb.

mf ff

CB.

sul tasto

ord.

IV5 IV12 IV8 III8

II8 I8

wild, pitches approximate

I II III IV

p f

141

A. Fl.

flz.

norm.

mp < f > p pp p

bisb. (3)

rit.

CB.

sul tasto

ord.

IV4 III4 II4 I4

IV5 III5 II5 I5

IV4 III4 II4 I4

IV4 III4 II4 I3 II3 III3

IV3

ff

pp f p

145

♩ = 58

A. Fl.

bisb.

pp mp pp

bisb.

pp mp pp

flz.

pp mp pp

pp p pp

CB.

III4 III5

sempre p

mf

149

A. Fl.

breathy, half aeolian

ppp p ppp ppp p ppp

(sing)

p

CB.

molto sul pont. ord. sul pont. ord.

p

8va

154

A. Fl.

mp

(match bass harmonic)

CB.

8va I9

8va

III7

(8va)–1

160

A. Fl.

CB.

III8 III7 III9

167

A. Fl.

CB.

IV8 IV9 IV10 IV11

175

A. Fl.

molto rit.

a tempo

mp

flz. norm.

CB.

II4 II5 II6 II7

III10 II8

III10 II9

III10 II9 III10 II8 III10 II9

182

A. Fl.

non-flz (repeat as fast as possible)

p < mf > p < mf > p

mf > p mf > p

mp > pp

mp > pp p

CB.

III10 II8

III9 IV10

III9 IV9

III8 IV9

III7 IV8

pizz.

II I

188

A. Fl.

CB.

arco
I
II
III
IV
sul tasto
193
199
206
bisb.
sul pont.
ord.
8va
III7
III8