Marc Sabat

Swing in sweetest summer

for glissando flute and computer

PLAINSOUND MUSIC EDITION

Swing in sweetest summer (2013)

a chromatic ground for glissando-flute

commissioned by Erik Drescher

This work continues a cycle of instrumental solos whose harmonic forms derive from the instruments' physical designs. The glissando flute has a sequence of 15 fundamental pitches (B3 to C#5) making up an ascending chromatic scale of theoretically equal tempered semitones. The possibility of extending the length of sounding tube by sliding out the head-joint lowers each of these pitches by a different interval, which gradually increases as the fundamental rises and ranges from approximately a large major second (15/17) to a small fourth (10/13).

This sequence of intervals is particularly suggestive, embracing all of the 'seconds' and 'thirds' which fall just outside the critical band, from the large septimal wholetone 7/8, to the very small septimal minor third 6/7, all the way to the very large septimal major third 7/9. The fact that this beautiful family of microtonally varied intervals is so readily produced on the glissando-flute suggested to me the form of a chromatic ground.

The music is made from a cycle of five parts, beginning with the first two played simultaneously and ending after all five have sounded together.

1. The ascending chromatic scale (ground).
2. The ascending chromatic scale, with a downward glide to produce 15 intervals tuned to the ground: 15/17, 7/8, 13/15, 19/22, 6/7, 11/13, 16/19, 5/6, 14/17, 9/11, 13/16, 4/5, 11/14, 7/9, 10/13.
3. The ascending chromatic scale, delayed, with a similar downward glide to produce 14 intervals tuned to the *next* equal tempered pitch of the rising ground: 5/6, 14/17, 9/11, 13/16, 21/26, 4/5, 15/19, 11/14, 7/9, 10/13, 16/21, 3/4, 20/27, 11/15. A final interval, 12/7, is tuned above the initial B3, beginning the ground once again.
4. The summation tones of the interval progressions when 2. and 3. are combined forms a sequence of quarter-tone melodies in the second octave of the flute, which fall back to the lowest register to divide the intervals played in 3.
5. The second-order summation tones between 2., 3. and 4. form quarter-tone and eighth-tone melodies in the flute's highest octave, alternating with tones in the middle register, which augment the intervals in 2. and 3.

The music is for one solo performer and four computer parts, each of which are played back on one of four loudpeakers. The score may also be arranged for as many as five glissando flutes; each additional flute may replace one of the computer voices. Alternately, a purely electronic version is also possible, beginning in this case from letter B (bar 46) of the score.

Berlin, 25 May 2013

NOTES for the performer

The score is composed for a flute with B foot equipped with a moveable head joint, allowing for the amount of glissando specified in the score (a large wholetone down from the lowest B fundamental, increasing up to a small fourth down from the highest C#). Three staves are used: sounding pitches, fingered pitches generally written as natural harmonics over the fifteen fundamental fingerings and a graphic notation indicating approximate head-joint position. Intonation will also vary based on embouchure and air temperature, and especially in the highest octave there may be several variants possible depending on individual instruments and playing styles. If an alternate fingering allows a more accurate realisation of the sounding pitches, it may be substituted at the performer's pleasure.

In addition the composer has prepared a computer program to assist in rehearsing and performing the piece, in the form of a MaxMSP patch. Most of the pitches in the flute part are marked in the score with round identification numbers. When working with the patch in practice mode, these function as cues that may be triggered and stepped through by means of a foot pedal. Each of the four accompanying voices as well as a practice track doubling the flute part may be individually muted or sounded. In this manner it is possible to learn the harmonic context as well as the physical requirements to produce each pitch without concern for tempo. For this method of rehearsing I would like to acknowledge the helpful suggestions and experience of Wolfgang von Schweinitz, who has employed similar methods in his own works.

An informal introduction to the Helmholtz-Ellis Accidentals
by Marc Sabat

Berlin, April 2009

In learning to read HE accidentals, without having to rely on an electronic tuning device, it is important to be familiar with three things:

First, to keep in mind the natural tuning of intervals in a harmonic series, which deviate from the tempered system.

Second, to get to know how the accidentals refer to these overtone relationships.

Third, to observe that each written pitch may be related to many other pitches by natural intervals, and to tune it accordingly.

In most cases, this approach will allow the player to quickly and intuitively play just intonation (JI) pitches quite accurately. Any remaining adjustments can be made by ear, based on the specific sound of JI intervals.

Just intervals are readily learned because they are built up from simple, tuneable harmonic relationships. These are generally based on eliminating beating between common partials, finding common fundamentals and audible combination tones, and establishing a resonant, stable sonority which maximizes clarity: both of consonance and of dissonance.

A well-focussed JI sound is completely distinct from the irregular, fuzzy beating of tempered sounds. Just consonances, when marginally out of tune, beat slowly and sweetly and may be corrected with the most subtle adjustments of bowing or breath. Just dissonances produce a sharply pulsing regular rhythm and have very clear, distinct colors.

To become familiar with the notation and sounds of JI, the fundamental building blocks are prime number overtones 3, 5, 7, 11 and 13, each of which is associated with a specific pair of accidentals and a basic musical interval.

3 is associated with the signs flat, natural, sharp and refers to the series of untempered perfect fifths (Pythagorean intonation). Generally, A is taken as the tuning reference, and the central pitches C-G-D-A-E can be imagined as the normal tuning of the orchestral string instruments. The just C is rather lower than tempered tuning because of the pure fifths. The further this series is extended, the greater the deviation from tempered tuning: the flats are lower, the sharps higher.

5 is associated with arrows attached to the flat, natural, sharp signs and refers to the pure major third. These arrows correct the Pythagorean intervals by a Syntonic Comma, which is approximately 1/9 of a wholetone or 22 cents. So, for example, the note E-flat arrow-up is a just major third below G, and the note F-sharp arrow-down is a major third above D. In most music, flats are often raised by a comma and sharps are lowered. Because of the open string tuning, it is common to sometimes raise F and C (to match A and E) and to sometimes lower A and E (to match F and C). Corrections by one Syntonic Comma have been used throughout Western music history and are relatively familiar to the ear. However, traditionally these corrections have been hidden by players, for example in Meantone Temperament where fifths are mistuned narrow by ¼ comma so that the third C-E ends up sounding pure. More recently, the currently prevailing Equal Temperament has made us accustomed to beating thirds, so at first the pure intervals may seem unfamiliar. To play the arrows accurately, one must carefully learn the sound of the consonant major and minor thirds and sixths, and learn to articulate comma differences clearly.

7 is associated with a Tartini sign resembling the numeral. It corrects the Pythagorean intervals by a Septimal Comma, which is approximately 1/7 of a wholetone or 27 cents. When the Pythagorean minor third is lowered by this amount, it becomes a noticeably low third often heard in Blues music.

11 is associated with the quartertone signs (cross and backwards flat). The accidental is used to raise the perfect fourth by 53 cents, producing the exact tuning of the 11th partial in a harmonic series. The sound is most easily learned by playing one octave plus one fourth and raising it by a quartertone.

13 is associated with the thirdtone signs (cross and backwards flat, each with 2 verticals). The accidental is used to lower the Pythagorean major sixth by 65 cents, producing the exact tuning of the 13th partial in a harmonic series. The sound is most easily learned as a neutral-sounding sixth, one-third of the way between the just minor and just major sixths (closer to minor than to major).

The following table presents the accidentals together with their associated ratios and cents deviations. To calculate the cents deviation from Equal Temperament of a specific written pitch (if desired) the following shortcut may be used:

1.) Find the cents deviation of the Pythagorean pitch, by calculating how many fifths it is away from A, multiplying by 2, and using a plus sign if it is on the sharp side and a minus if it is on the flat side.

2.) For each microtonal accidental, add or subtract its approximate cents value (as given above), keeping in mind whether the accidental is raising or lowering the pitch.

The resulting value should be a cents deviation within 1 or 2 cents accuracy, which is an acceptable starting point for fine-tuning by ear.

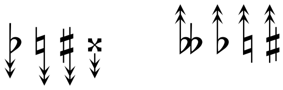
ACCIDENTALS **EXTENDED HELMHOLTZ-ELLIS JI PITCH NOTATION**

for Just Intonation
designed by Marc Sabat and Wolfgang von Schweinitz

The exact intonation of each pitch may be written out by means of the following harmonically-defined signs:

Pythagorean series of fifths – the open strings
(… c g d a e …)

lowers / raises by a syntonic comma
81 : 80 = ***circa 21.5 cents***



lowers / raises by two syntonic commas
circa 43 cents

lowers / raises by a septimal comma
64 : 63 = ***circa 27.3 cents***

lowers / raises by two septimal commas
circa 54.5 cents

raises / lowers by an 11-limit undecimal quarter-tone
33 : 32 = ***circa 53.3 cents***

lowers / raises by a 13-limit tridecimal third-tone
27 : 26 = ***circa 65.3 cents***

lowers / raises by a 17-limit schisma
256 : 255 = ***circa 6.8 cents***

raises / lowerss by a 19-limit schisma
513 : 512 = ***circa 3.4 cents***

raises / lowers by a 23-limit comma
736 : 729 = ***circa 16.5 cents***

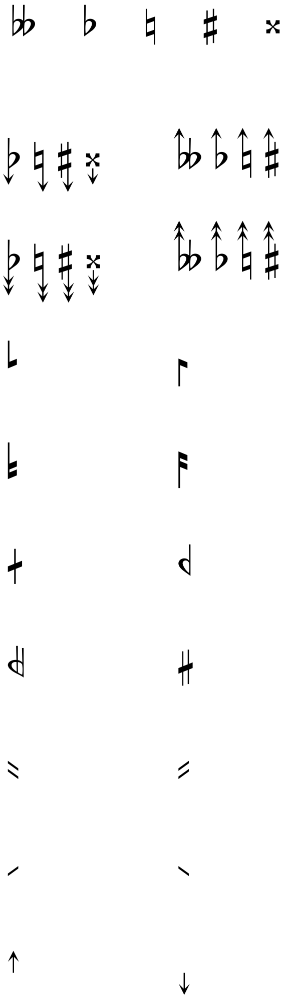
In addition to the harmonic definition of a pitch by means of its accidentals, it is also possible to indicate its absolute pitch-height as a cents-deviation from the respectively indicated chromatic pitch in the 12-tone system of Equal Temperament.

The attached arrows for alteration by a syntonic comma are transcriptions of the notation that Hermann von Helmholtz used in his book "Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik" (1863). The annotated English translation "On the Sensations of Tone as a Physiological Basis for the Theory of Music" (1875/1885) is by Alexander J. Ellis, who refined the definition of pitch within the 12-tone system of Equal Temperament by introducing a division of the octave into 1200 cents. The sign for a septimal comma was devised by Giuseppe Tartini (1692-1770) – the composer, violinist and researcher who first studied the production of difference tones by means of double stops.

VORZEICHEN **EXTENDED HELMHOLTZ-ELLIS JI PITCH NOTATION**

für die natürliche Stimmung
konzipiert von Marc Sabat und Wolfgang von Schweinitz

Die Stimmung jedes Tons ist mit folgenden harmonisch definierten Vorzeichen ausnotiert:



Pythagoreische Quintenreihe der leeren Streicher-Saiten
(… c g d a e …)

Erniedrigung / Erhöhung um ein Syntonisches Terzkomma
81 : 80 = ***circa 21.5 cents***

Erniedrigung / Erhöhung um zwei Syntonische Terzkommas
circa 43 cents

Erniedrigung / Erhöhung um ein Septimenkomma
64 : 63 = ***circa 27.3 cents***

Erniedrigung / Erhöhung um zwei Septimenkommas
circa 54.5 cents

Erhöhung / Erniedrigung um den undezimalen Viertelton der 11er-Relation
33 : 32 = ***circa 53.3 cents***

Erniedrigung / Erhöhung um den tridezimalen Drittelton der 13er-Relation
27 : 26 = ***circa 65.3 cents***

Erniedrigung / Erhöhung um ein Siebzehner-Schisma
256 : 255 = ***circa 6.8 cents***

Erhöhung / Erniedrigung um ein Neunzehner-Schisma
513 : 512 = ***circa 3.4 cents***

Erhöhung / Erniedrigung um ein Dreiundzwanziger-Komma
736 : 729 = ***circa 16.5 cents***

Zusätzlich zu der harmonischen Definition der Tonhöhe durch das Vorzeichen für jeden Ton ist auch der Cents-Wert der Abweichung der gewünschten Stimmung von der Tonhöhe des jeweils bezeichneten chromatischen Tons der gleichstufig temperierten Zwölfton-Skala angegeben.

Die attachierten Pfeile für die Alteration um ein Syntonisches Terzkomma sind eine bloße Transkription der Notation, die Hermann von Helmholtz in seinem Buch "Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik" (1863) verwendet hat. Die kommentierte englische Übersetzung "On the Sensations of Tone as a Physiological Basis for the Theory of Music" (1875/1885) stammt von Alexander J. Ellis, der auch eine enorme Verfeinerung der Tonhöhendefinition innerhalb des Zwölftonsystems der gleichstufig temperierten Stimmung durch die Unterteilung der Oktave in 1200 Cents eingeführt hat. – Das Vorzeichen für die Alteration um ein Septimenkomma wurde von Giuseppe Tartini (1692-1770) erfunden, der als Komponist, Geiger und Wissenschaftler die durch Doppelgriffe erzeugten Differenztöne untersucht hat.

Swing in sweetest summer

a chromatic ground for glissando-flute

Marc Sabat


continue with similar phrasing and dynamics
Fl
Gl
Comp
7 : 6 = -267¢
6/7
+33
13 : 11 = -289¢
11/13
C# +11
19 : 16 = -298¢
16/19
+2
6 : 5 = -316¢
5/6
-16
17 : 14 = -336¢
14/17
-36
11 : 9 = -347¢
9/11
-47
16 : 13 = -359¢
13/16
F +41


37
38
39
40
41
5 : 4 =
-386¢
+14
4/5
14 : 11 =
-418¢
G -18
11/14
Fl
23
24
25
26
Gl
Comp
B
42
43
44
45
46
9 : 7 =
-435¢
7/9
-35
13 : 10 =
-454¢
10/13
+46
3/2
+2
27
28
29
30
31
47
48
49
50
51
6 : 5 =
-316¢
5/4
-14
-216¢
5/6
-16
in one breath, as before
32
33
34
15/17
-17


52
53
54
55
56
continue similar phrasing and dynamics
-236¢
14/17
-36
-247¢
Fl
35
36
37
Gl
7/8
-31
13/15
-48
Comp
57
58
59
60
61
9/11
-47
-259¢
13/16
B +41
38
39
40
19/22
B +46
62
63
64
65
66
21/26
+30
41
42
43
6/7
+33
11/13
C# +11

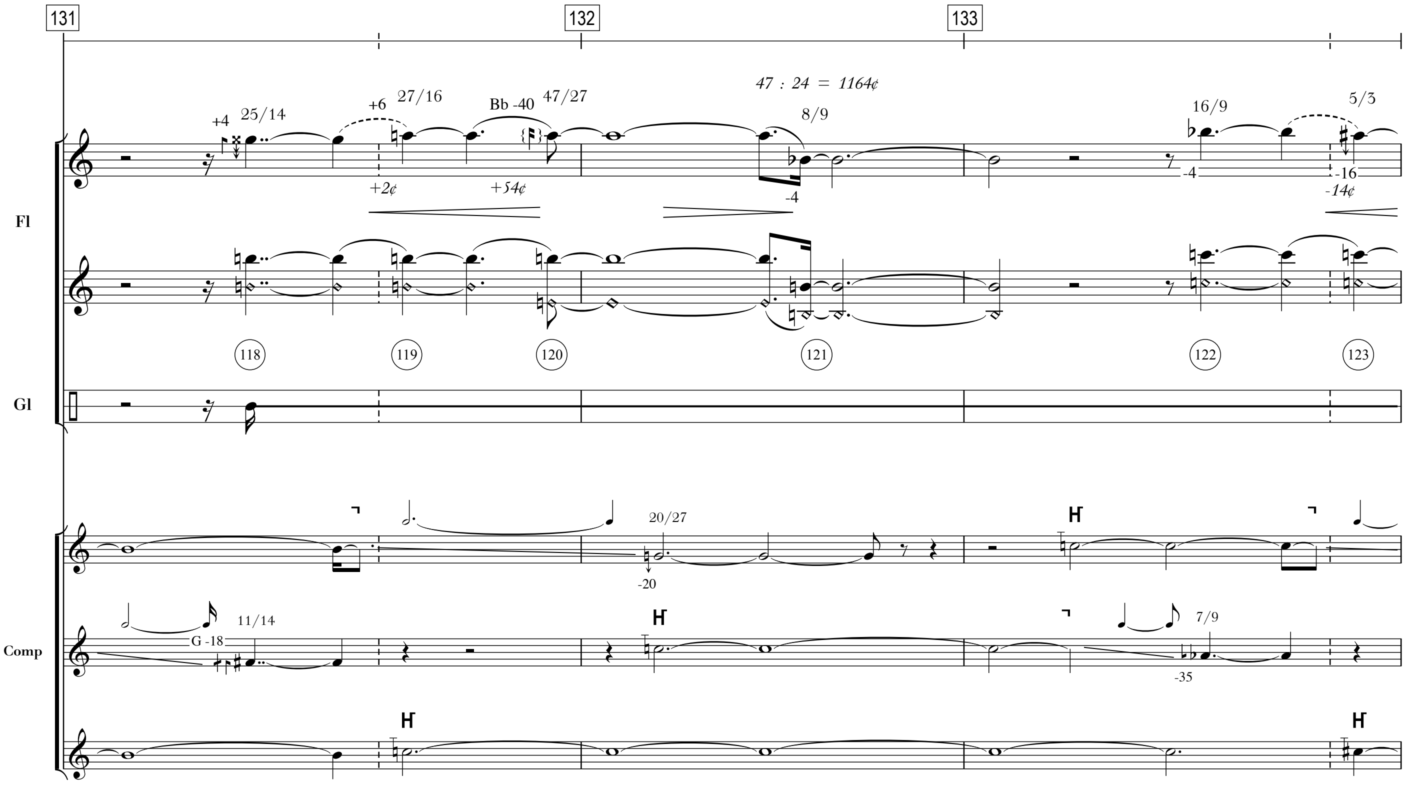

67
68
69
70
71
-286¢
4/5
+14
-309¢
15/19
-9
Fl
44
45
46
Gl
16/19
+2
Comp
72
73
74
75
76
-318¢
11/14
D# -18
-335¢
7/9
-35
47
48
49
50
5/6
-16
14/17
-36
77
78
79
80
-354¢
10/13
+46
51
52
53
9/11
-47

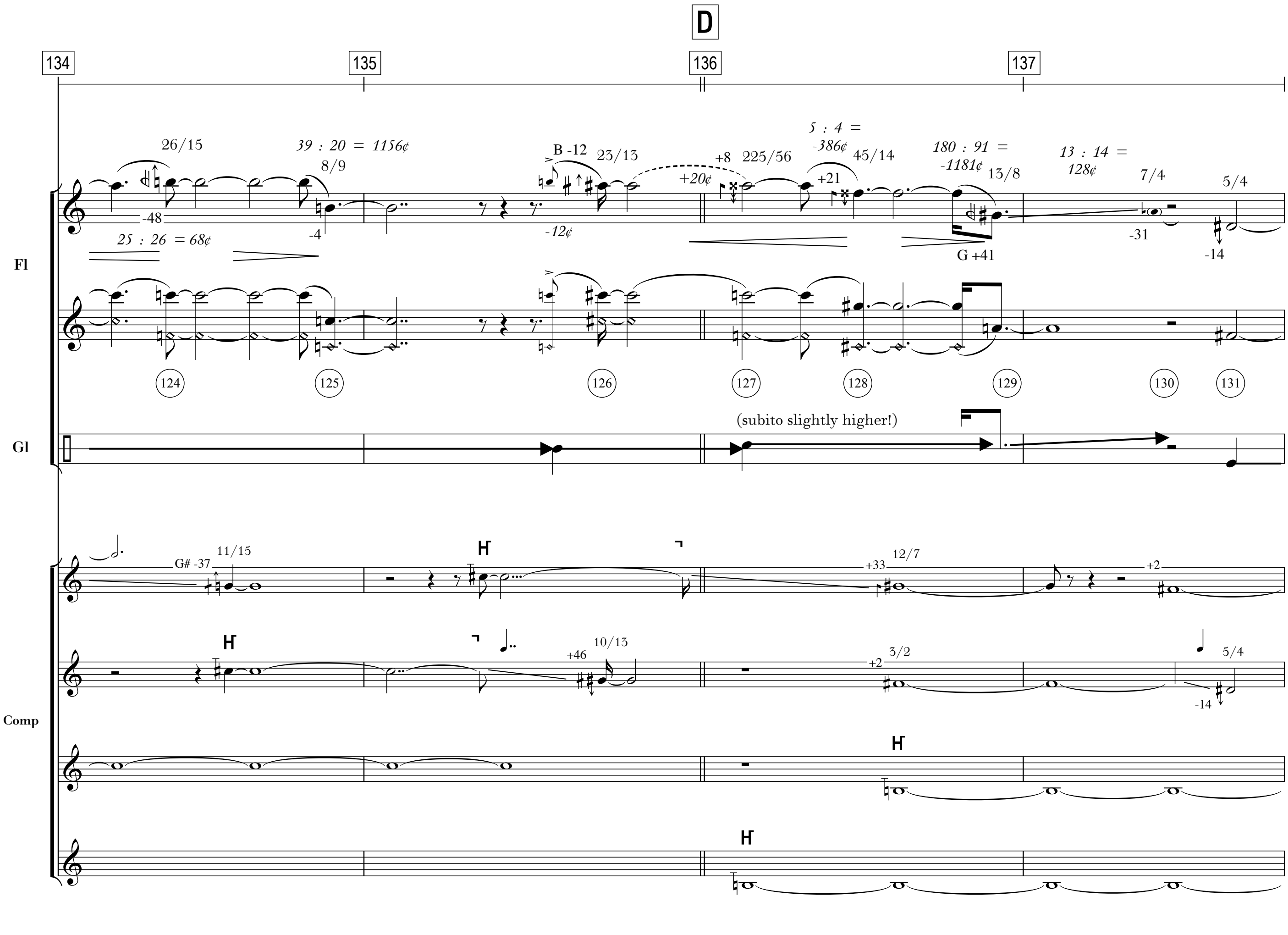

Fl
Gl
Comp
C
(1/4 lowered position) *
* from here onward, the indicated positions are approximatations which will require slight embouchure and slide adjustments for each new pitch : play the harmonies, finding a stable, resonant sonority with as little (or as slow) beating as possible!


Fl
Gl
Comp
phrase with top
computer voice
mezza voce
sotto voce
come
prima
32 : 33 = 53¢
22 : 45 = 1239¢
30 : 31 =
57¢
33 : 34 =
52¢
20 : 41 = 1243¢
28 : 29 = 61¢
+1241¢
+1242¢
Cb +40
C +35
B +41
B +46
(the normal fingerings in this register are written out as 2nd partial harmonics for consistency!)
(1/2 lowered position)
(slowly rising by about a quarter-tone)


108
109
110
111
Fl
13/7
-28
-3¢ 7/4
-31
91 : 94 = 56¢
D +25 47/26
D +25 47/52
47 : 96 = 1236¢
D# -39 24/13
81
82
83
84
85
Gl
Comp
21/26
+30
6/7
+33
11/13
C# +11
112
113
114
115
-3¢ 7/4
-31
35 : 36 = 49¢
+18 9/5
+18 9/10
+1240¢
35/19
-42
E -44 33/19
-2¢
33 : 34 = 52¢
86
87
88
89
90
+14 4/5
16/19
+2
116
117
118
119
+7 34/19
17/19
+7
+1242¢
+49 11/6
26/15
-48
+3¢
+4 25/14
+52¢
13/15
E +47
+52¢
+4 25/28
91
92
93
94
95
96
97
(rising by about a quarter-tone
to match harmony)
15/19
-9
11/14
D# -18
5/6
-16


120
121
122
123
124
125
126
127
128
129
130
Fl
Gl
Comp
+1236¢
31/17
F +40
27 : 28 =
63¢
+33
12/7
16/9
-7¢
-4
6/7
8/9
+1239¢
20/11
Gb +35
98
99
100
101
102
103
7/9
-35
14/17
-36
9/11
-47
G -12
23/13
-2¢
+55¢
23/26
+1242¢
+30
29/16
+3¢
104
105
106
107
108
109
10/13
+46
13/16
F +41
G# -19
37/21
36 : 37 = 47¢
37/42
+1237¢
+18
9/5
+19
17/10
34 : 35 =
50¢
7/4
+1¢
-31
17/20
7/8
49 : 100 =
1235¢
110
111
112
113
114
115
116
117
16/21
+29
3/4
+2
+14
4/5


131
132
133
47 : 24 = 1164¢
+4 25/14
+6 27/16
Bb -40 47/27
8/9
16/9
5/3
+2¢
+54¢
-4
-16
-14¢
118
119
120
121
122
123
Fl
Gl
20/27
-20
11/14
G -18
7/9
-35
Comp


D
134
135
136
137
26/15
39 : 20 = 1156¢
8/9
-48
-4
25 : 26 = 68¢
B -12
23/13
-12¢
+8 225/56
+20¢
5 : 4 =
-386¢
+21 45/14
180 : 91 =
-1181¢
13/8
G +41
13 : 14 =
128¢
7/4
-31
5/4
-14
124
125
126
127
128
129
130
131
Fl
(subito slightly higher!)
Gl
G# -37
11/15
+33 12/7
+2
+46 10/13
+2 3/2
5/4
-14
Comp


138
139
140
141
85 : 84 = -20¢
(gradually lip pitch slightly down)
21/17
+48
66/17
34/9
+1
68 : 69 = 25¢
23/6
+26
+53¢
-34
-2
16 : 15 = -112¢
5/4
-14
Fl
132
133
134
135
136
137
Gl
poco portamento ad lib.
(ma non glissando)
+17
10/7
32/17
16/9
+49
11/6
11/12
-5
-4
5/6
-16
Comp
15/17
-17
142
143
144
31/8
+50¢
64/17
64 : 65 = 27¢
65/17
23/17
23 : 22 = -77¢
B +45
-5
C +22
+23
138
139
140
141
15/8
30/17
31/17
31/34
-12
-17
Cb +40
Cb +40
14/17
-36
7/8
-31


145
146
147
148
149
Fl
Gl
Comp
22/17
19/15
58/15
64/17
42/11
15/11
14/11
15 : 14 =
-119¢
+54¢
G +37
Gb +18
28/15
30/17
20/11
10/11
C +35
9/11
13/15
150
151
152
153
154
85/22
15/4
60 : 61 =
29¢
61/16
11/8
55 : 52 = -97¢
13/10
91 : 90 = -19¢
9/7
27/7
65 : 66 =
26¢
11 : 4
99/26
18/13
+48¢
+51¢
normal
fingering
41/22
7/4
29/16
29/32
13/7
13/16
B +41
21/26
19/22
B +46
6/7


155
156
157
158
159
Fl
come prima
Gl
Comp
160
161
162
163
164
normal fingering
+ thumb


165
166
167
168
Fl
come prima
(lip slightly high)
Gl
Comp
169
170
171
172
Fl
norm. fing.
come prima
Gl
Comp


173
174
175
176
50 : 49 = -35¢
74 : 75 = 23¢
36 : 35 = -49¢
49 : 48 = -36¢
poco gliss. up ca. 25¢
(normal fingering)
Fl
Gl
Comp
177
178
179
180
41 : 39 = -87¢
55 : 56 = 31¢
Gb +37


E
Comp
Fl
(pause long enough between notes to breathe as needed)
poco f
(play in normal tuning position until end)
come prima


193
194
195
196
197
Comp
Fl
216
198
199
200
201
217
202
203
204
205
218
219


206
207
208
209
Comp
Fl
220
210
211
212
213
221
214
215
216
217
222
223


Comp
Fl
gliss. up
ca. 25¢
remain still until computer ends
sotto voce