

gray codes
for orchestra

-michael winter (los angeles, 2009)

gray codes
for orchestra

in memoriam samuel beckett: a gray code of 8 bits or greater. ideally with long bit runs while being as balanced as possible. a run of ‘on’ bits indicates a sustained sound—a texture, a set of one or more pitched or unpitched tones, etc.—for a duration proportional to the length of the run. each bit position is assigned a unique sound distinct from the others.

a performance should last at the very least 30 minutes. preferably long.
individual sounds should enter and exit as imperceptibly as possible and should be as continuous as possible. throughout, a constant, global dynamic.
clear; not loud.

in memoriam györgy ligeti: all sounds are sustained pitched tones of the same pitch-class or of different pitches that comprise a chromatic cluster.

in memoriam james tenney: all sounds are sustained pitched tones of different pitches that comprise a subset of some harmonic series.

a gray code (after frank gray) is an enumeration through all binary words of a given size such that each word only differs by one bit.

```
0110011001100110  
0011110000111100  
0000111111000000  
0000000011111111
```

an example of a 4-bit gray code where the columns are the binary words.

this work is an exploration of all combinations of a set of sounds such that the conglomerate sound changes as *minimally* as possible over time. ideally, a particular type of gray code is desired to achieve this effect. that is, a gray code where the standard deviation of all run lengths plus the standard deviation of bit flips across the positions is as close to 0 as possible. in the example above, a run is a succession of 1s within a row and the number of bit flips within a position is the number of changes from 0 to 1 and 1 to 0 within a row.

samuel beckett, for his work *quad*, proposed a particular type of gray code where the position with the currently longest bit run will always be the next position to flip ‘off.’ he desired this so that all combinations of performers would be on stage throughout the work such that the one that has been on stage the longest will always be the next to exit. the beckett-gray code is a good solution to the problem posed for this piece. though it might not be the ideal solution, it has reasonably long run lengths and is quite balanced. for all of the above reasons, the piece is dedicated to beckett.

for a binary word of 4 bits, a beckett-gray code is impossible thus beckett was unable to implement his original idea. recently, an 8-bit beckett-gray code was found by brett stevens, et al.* this work would not be possible if it were not for brett’s generous help. another good solution is a long run gray code of 8 bits discovered by donald knuth.**

```
0123456070121324356576071021353462670153741236256701731426206570134214  
6560573102464537571020435376140736304642737035640271327505412102756415  
0240365425013602541615604312576032572043157624321760452041751635476703  
5647570625437242132624161523417514367143164314  
  
1062351742501635207145263150273514620517325016452371052631542705136205  
1742531605237145260153270514623517025316452071352601542735106235174250  
1635207145263150273514620517325016452371052631542705136205174253160523  
7145260153270514623517025316452071352601542735
```

the canonical transition sequence for the beckett-gray code found by stevens followed by the long run gray code found by knuth. each number represents the bit position where the bit flip occurs for each successive binary word.

the two subcases of this piece dedicated to györgy ligeti and james tenney (as well as beckett) are homages to orchestral pieces that seem to share a similar exploratory aesthetic. the particular orchestral works in mind are *lontano* and *atmosphères* as well as *diapason* and *panacousticon*, respectively. furthermore, these dedications intend to reflect the substantial influence these two composers have had on me.

* m. cooke, c. north, and b. stevens. ‘beckett-gray codes.’ 2007.

** donald knuth. stevens. ‘the art of computer programming.’ 2005.

gray code i is the first realization of the above meta-score and was written for the 2009 *ostrava new music days festival*. note that in this realization (presented in the following score), the order of entrances and exits of the individual instruments is designed to ensure a constant dynamic throughout. though all instruments within a run are not always playing at the same time, the gray code is still faithfully interpreted. it is my intent to compose several more realizations of the above meta-score especially if more ideal gray codes as per the specifications above are discovered or if other types of gray codes prove interesting to me in their own right. any new realizations will be added as they are finished.

gray code i — in memoriam samuel beckett, györgy ligeti, james tenney

for orchestra

2 or 4 flutes
2 or 4 oboes
2 or 4 clarinets
2 or 4 bassoons
2 or 4 horns
2 or 4 vibraphones
2, 4 or 8 violins
2, 4 or 8 violas
2, 4 or 8 cellos
2, 4 or 8 contrabasses

for each type of instrument, at least the first section (indicated by a roman numeral next to the instrument abbreviation in the score) is required. inclusion of the other sections is preferred.

the dynamic of the piece should be as continuous and unchanging as possible. clear; not loud.

individual parts consist of dynamic swells with entrances and exits that should be as imperceptible as possible and need not be exactly executed as notated in time. for example, wind players may exit early and/or enter late in order to breath. every 4 beats is counted as one measure. for synchronization purposes, measures before the entrance of a group are divided and should be conducted as a measure of $\frac{3}{4}$ plus a measure of $\frac{1}{4}$. nonetheless, there should be no sense of beat or pulse.

the score is in c and written as sounds (including contrabass). at the top of a score is a guide. an arabic number indicates how many groups are sounding. a plus or a minus sign followed by instrument abbreviations indicate which instruments are entering (if preceded by a plus sign) or exiting (if preceded by a minus sign) over the course of that measure. a similar guide is provided in the parts with the additional information of exactly which instruments are sounding at a given time. these guides are given to aid in determining the proper maxima of each dynamic swell to ensure that all groups are sounding equally at any given time and that the overall dynamic is constant throughout. (dynamic destination markings have purposefully been omitted allowing for the necessary variability to ensure an overall constant dynamic.)

the bowed vibraphone parts are also written as sounds in that notes are given for the entire sounding duration including the decay of the vibraphone. the vibraphonists need only play from the onset of the dynamic swell to the maxima of the swell. then, the instrument should be allowed to ring and decay naturally till the onset of the next tone without further actuation. preferably one bow per tone.

ensembles are encouraged to experiment with the placement of performers within the performance space. for example, separating the groups or subsets of the groups throughout the space and perhaps allowing audience members to wander through the performers and the performance space.

written for the 2009 ostrava new music days festival.

of groups sounding

0	+vln, vla	1	+cl	2	+bsn	3	+fl	4	+vib	5	+vlc, cb	6	-vln, vla	5	+hn
	$\frac{3}{4}$	$\frac{1}{4}$	$\frac{3}{4}$												

fl. i

fl. ii

ob. i

ob. ii

cl. i

cl. ii

bsn. i

bsn. ii

hn. i

hn. ii

bowed throughout

vib. i

bowed throughout

vib. ii

on d string towards neck throughout

vln. i

on d string towards neck throughout

vln. ii

on d string towards neck throughout

vln. iii

on d string towards neck throughout

vla. i

on d string towards neck throughout

vla. ii

on d string towards neck throughout

vla. iii

on d string towards bridge throughout

vlc. i

on d string towards bridge throughout

vlc. ii

on d string towards bridge throughout

vlc. iii

on d string towards bridge throughout

cb. i

on d string towards bridge throughout

cb. ii

on d string towards bridge throughout

cb. iii

17

25

6 | +ob | 7 | -fl | 6 | -vlc, cb | 5 | -cl | 4 | +vln, vla | 5 | -bsn | 4 | -vib | 3 | +vlc, cb

$\frac{3}{4}$ 1 4 $\frac{4}{4}$ $\frac{3}{4}$ 1 4 $\frac{4}{4}$ $\frac{3}{4}$ 1 4 $\frac{4}{4}$ $\frac{3}{4}$ 1 4 $\frac{4}{4}$ $\frac{3}{4}$

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.
vln. iii.

vla. i.
vla. ii.
vla. iii.

vlc. i.
vlc. ii.
vlc. iii.

cb. i.
cb. ii.
cb. iii.

33

41

4 +fl 5 +cl 6 -hn 5 -vln, vla 4 -ob 3 -vlc, cb 2 -fl 1 +bsn

3 4 1 4 3 4 1 4 5 4 3 4 1 4 3 4

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.
vln. iii.

vla. i.
vla. ii.
vla. iii.

vlc. i.
vlc. ii.
vlc. iii.

cb. i.
cb. ii.
cb. iii.

49

57

#	2	+vib	3	+vln, vla	4	+vlc, cb	5	-cl	4	+fl	5	+hn	6	-vib	5	-vlc, cb
	$\frac{3}{4}$	$\frac{1}{4} \frac{4}{4}$	$\frac{3}{4}$	$\frac{1}{4} \frac{4}{4}$	$\frac{3}{4}$	$\frac{1}{4} \frac{4}{4}$			$\frac{3}{4}$	$\frac{1}{4} \frac{4}{4}$	$\frac{3}{4}$	$\frac{1}{4} \frac{4}{4}$				

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.

vln. iii.

vla. i.
vla. ii.

vla. iii.

vlc. i.
vlc. ii.

vlc. iii.

cb. i.
cb. ii.

cb. iii.

65

73

5 -vln, vla 3 +ob 4 -bsn 3 -fl 2 +cl 3 +vlc, cb 4 +vln, vla 5 -hn

$\frac{4}{4}$ $\frac{3}{4}$ $\frac{1}{4}$ $\frac{4}{4}$

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.
vln. iii.

vla. i.
vla. ii.
vla. iii.

vlc. i.
vlc. ii.
vlc. iii.

cb. i.
cb. ii.
cb. iii.

81

89

#	4	+vib	5	+fl	6	-vlc, cb	5	-cl	4	-vln, vla	3	+bsn	4	-ob	3	+vlc, cb
	$\frac{3}{4}$	$\frac{1}{4} \frac{4}{4}$	$\frac{3}{4}$	$\frac{1}{4} \frac{4}{4}$							$\frac{3}{4}$	$\frac{1}{4} \frac{4}{4}$			$\frac{3}{4}$	$\frac{1}{4} \frac{4}{4}$

Instrumental parts:

- fl. i.
- fl. ii.
- ob. i.
- ob. ii.
- cl. i.
- cl. ii.
- bsn. i.
- bsn. ii.
- hn. i.
- hn. ii.
- vib. i.
- vib. ii.
- vln. i.
- vln. ii.
- vln. iii.
- vla. i.
- vla. ii.
- vla. iii.
- vlc. i.
- vlc. ii.
- vlc. iii.
- cb. i.
- cb. ii.
- cb. iii.

97

105

113

121

4 | +vib | 5 | -vln, vla | 4 | +vlc, cb | 5 | +ob | 6 | -fl | 5 | -hn | 4 | -cl | 3 | -vlc, cb | 3 | 4

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.

vln. iii.

vla. i.
vla. ii.

vla. iii.

vlc. i.
vlc. ii.

vlc. iii.

cb. i.
cb. ii.

cb. iii.

129

2 +vln, vla 3 -vb 2 +bsn 3 +fl 4 +cl 5 +vlc, cb 6 -vln, vla 5 +hn
 $\frac{3}{4}$ $\frac{1}{4} \frac{4}{4}$ $\frac{3}{4} \frac{1}{4} \frac{4}{4}$

fl. i.
fl. ii.

ob. i
ob. ii

cl. i
cl. ii

bsn. i
bsn. ii

hn. i
hn. ii

vib. i
vib. ii

vln. i
vln. ii

vln. iii

vla. i
vla. ii

vla. iii

vlc. i
vlc. ii

vlc. iii

cb. i
cb. ii

cb. iii

137

145

153

6 -ob 5 -fl 4 -vlc, cb 3 +vib 4 +vln, vla 5 -bsn 4 -cl 3 +vlc, cb

$\frac{4}{4}$ $\frac{3}{4}$ $\frac{1}{4}$ $\frac{4}{4}$ $\frac{3}{4}$ $\frac{1}{4}$ $\frac{4}{4}$ $\frac{3}{4}$ $\frac{1}{4}$ $\frac{4}{4}$ $\frac{3}{4}$

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.
vln. iii.

vla. i.
vla. ii.
vla. iii.

vlc. i.
vlc. ii.
vlc. iii.

cb. i.
cb. ii.
cb. iii.

161

169

4 +fl 5 -vib 4 -hn 3 -vln, vla 2 +ob 3 -vlc, cb 2 -fl 1 +bsn

3 4 1 4 4 3 4 1 4 4 3 4 1 4 4 3 4

fl. i fl. ii ob. i ob. ii cl. i cl. ii bsn. i bsn. ii hn. i hn. ii vib. i vib. ii vln. i vln. ii vln. iii vla. i vla. ii vla. iii vlc. i vlc. ii vlc. iii cb. i cb. ii cb. iii

177

185

2 | +cl | 3 | +vln, vla | 4 | +vlc, cb | 5 | +vib | 6 | +fl | 7 | +hn | 8 | -cl | 7 | -vlc, cb

$\frac{3}{4} \quad \frac{1}{4} \quad \frac{3}{4} \quad \frac{1}{4}$

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.

vln. iii.

vla. i.
vla. ii.

vla. iii.

vlc. i.
vlc. ii.

vlc. iii.

cb. i.
cb. ii.

cb. iii.

6 -vln, vla 5 -ob 4 -bsn 3 -fl 2 -vib 1 +vlc, cb 2 +vln, vla 3 -hn

$\frac{4}{4}$ $\frac{3}{4}$ $\frac{4}{4}$ $\frac{3}{4}$ $\frac{4}{4}$ $\frac{4}{4}$

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.
vln. iii.

vla. i.
vla. ii.
vla. iii.

vlc. i.
vlc. ii.
vlc. iii.

cb. i.
cb. ii.
cb. iii.

2 | +cl | 3 | +fl | 4 | -vlc, cb | 3 | +vib | 4 | -vln, vla | 3 | +bsn | 4 | +ob | 5 | +vlc, cb

$\frac{3}{4}$ 1 4 4 4 4 4 3 1 4 4 3 1 4 4 3 1 4 4 3 1 4 4 3 1 4 4 3 1 4 4

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.

vln. iii.

vla. i.
vla. ii.

vla. iii.

vlc. i.
vlc. ii.

vlc. iii.

cb. i.
cb. ii.

cb. iii.

225

6 -fl 5 -cl 4 +hn 5 +vln, vla 6 -vib 5 -vlc, cb 4 +fl 5 -bsn

4 4 3 4 4 3 4 4 3 4 4 3 4 4 3 4

fl. i.

fl. ii.

ob. i.

ob. ii.

cl. i.

cl. ii.

bsn. i.

bsn. ii.

hn. i.

hn. ii.

vib. i.

vib. ii.

vln. i.

vln. ii.

vln. iii.

vla. i.

vla. ii.

vla. iii.

vlc. i.

vlc. ii.

vlc. iii.

cb. i.

cb. ii.

cb. iii.

233

241

249

4 | +cl | 5 | -vln, vla | 4 | +vlc, cb | 5 | -ob | 4 | -fl | 3 | -hn | 2 | +vib | 3 | -vlc, cb | 3 | 4

$\frac{3}{4}$ 1 4 | $\frac{3}{4}$

fl. i. | fl. ii. | ob. i. | ob. ii. | cl. i. | cl. ii. | bsn. i. | bsn. ii. | hn. i. | hn. ii. | vib. i. | vib. ii. | vln. i. | vln. ii. | vln. iii. | vla. i. | vla. ii. | vla. iii. | vlc. i. | vlc. ii. | vlc. iii. | cb. i. | cb. ii. | cb. iii.

257

265

2 | +vln, vla 3 | -cl 2 | +bsn 3 | +fl 4 | -vib 3 | +vlc, cb 4 | -vln, vla 3 | +hn

$\frac{3}{4}$ $\frac{1}{4}$ $\frac{3}{4}$ $\frac{1}{4}$ $\frac{3}{4}$ $\frac{1}{4}$ $\frac{3}{4}$ $\frac{1}{4}$ $\frac{3}{4}$ $\frac{1}{4}$ $\frac{3}{4}$

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.

vln. iii.

vla. i.
vla. ii.

vla. iii.

vlc. i.
vlc. ii.

vlc. iii.

cb. i.
cb. ii.

cb. iii.

273

281

4 | +ob | 5 | -fl | 4 | -vlc, cb | 3 | +cl | 4 | +vln, cb | 5 | -bsn | 4 | +vib | 5 | +vlc, cb |

3 4 1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 3

fl. i. fl. ii. ob. i. ob. ii. cl. i. cl. ii. bsn. i. bsn. ii. hn. i. hn. ii. vib. i. vib. ii. vln. i. vln. ii. vln. iii. vla. i. vla. ii. vla. iii. vlc. i. vlc. ii. vlc. iii. cb. i. cb. ii. cb. iii.

6 +fl 7 -cl 6 -hn 5 -vln, vla 4 -ob 3 -vlc, cb 2 -fl 1 +bsn

$\frac{3}{4}$ $\frac{1}{4}$ $\frac{4}{4}$

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.
vln. iii.

vla. i.
vla. ii.
vla. iii.

vlc. i.
vlc. ii.
vlc. iii.

cb. i.
cb. ii.
cb. iii.

3 $\frac{1}{4}$ $\frac{4}{4}$

305

313

#	2	-vib	1	+vln, vla	2	+vlc, cb	3	+cl	4	+fl	5	+hn	6	+vib	7	-vlc, cb
	4	4	3	4	4	3	4	4	3	4	4	3	4	4	3	4
fl. i.																
fl. ii.																
ob. i.																
ob. ii.																
cl. i.																
cl. ii.																
bsn. i.	1		2		1		2		1		2		1		2	
bsn. ii.	1		2		1		2		1		2		1		2	
hn. i.	1		2		1		2		1		2		1		2	
hn. ii.	1		2		1		2		1		2		1		2	
vib. i.	1		2		1		2		1		2		1		2	
vib. ii.	1		2		1		2		1		2		1		2	
vln. i.	1		2		1		2		1		2		1		2	
vln. ii.	1		2		1		2		1		2		1		2	
vln. iii.	1		2		1		2		1		2		1		2	
vla. i.	1		2		1		2		1		2		1		2	
vla. ii.	1		2		1		2		1		2		1		2	
vla. iii.	1		2		1		2		1		2		1		2	
vlc. i.	1		2		1		2		1		2		1		2	
vlc. ii.	1		2		1		2		1		2		1		2	
vlc. iii.	1		2		1		2		1		2		1		2	
cb. i.	1		2		1		2		1		2		1		2	
cb. ii.	1		2		1		2		1		2		1		2	
cb. iii.	1		2		1		2		1		2		1		2	

321

329

6 -vln, vla 5 | +ob 6 -bsn 5 -fl 4 -cl 3 +vlc, cb 4 +vln, vla 5 -hn

$\frac{4}{4}$ 3 1 4 $\frac{4}{4}$

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.
vln. iii.

vla. i.
vla. ii.
vla. iii.

vlc. i.
vlc. ii.
vlc. iii.

cb. i.
cb. ii.
cb. iii.

337

345

4 -vib 3 +fl 4 -vlc, cb 3 +cl 4 -vln, vla 3 +bsn 4 -ob 3 +vlc, cb

$\frac{4}{4}$ 3 $\frac{4}{4}$ 4 $\frac{3}{4}$ $\frac{4}{4}$ 3 $\frac{4}{4}$ 4 $\frac{3}{4}$ $\frac{4}{4}$ 3 $\frac{4}{4}$ 4 $\frac{3}{4}$ $\frac{4}{4}$ 3 $\frac{4}{4}$ 4

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.
vln. iii.

vla. i.
vla. ii.
vla. iii.

vlc. i.
vlc. ii.
vlc. iii.

cb. i.
cb. ii.
cb. iii.

353

361

4 -fl 3 +vib 4 +hn 5 +vln, vla 6 -cl 5 -vlc, cb 4 +fl 5 -bsn

4 4 3 4 4 4 4 4 3 4 4 3 4 4 3 4 4 3 4 4

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.
vln. iii.

vla. i.
vla. ii.
vla. iii.

vlc. i.
vlc. ii.
vlc. iii.

cb. i.
cb. ii.
cb. iii.

369

377

4 -vib 3 -vln, vla 2 +vlc, cb 3 +ob 4 -fl 3 -hn 2 +cl 3 -vlc, cb

$\frac{4}{4}$ $\frac{3}{4}$ $\frac{1}{4}$ $\frac{4}{4}$ $\frac{3}{4}$ $\frac{1}{4}$ $\frac{4}{4}$ $\frac{3}{4}$ $\frac{1}{4}$ $\frac{4}{4}$ $\frac{3}{4}$

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.

vln. iii.

vla. i.
vla. ii.

vla. iii.

vlc. i.
vlc. ii.

vlc. iii.

cb. i.
cb. ii.

cb. iii.

385

393

2 | +vln, vla 3 | +vib 4 | +bsn 5 | +fl 6 | -cl 5 | +vlc, cb 6 | -vln, vla 5 | +hn

$\frac{3}{4}$ $\frac{1}{4} \frac{4}{4}$ $\frac{3}{4} \frac{1}{4} \frac{4}{4}$

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.

vln. iii.

vla. i.
vla. ii.
vla. iii.

vlc. i.
vlc. ii.
vlc. iii.

cb. i.
cb. ii.
cb. iii.

401

409

6 -ob 5 -fl 4 -vlc, cb 3 -vib 2 3 +vln, cb 3 -bsn 2 3 +cl 3 3 +vlc, cb

$\frac{4}{4}$ $\frac{3}{4}$ $\frac{4}{4}$ $\frac{4}{4}$ $\frac{3}{4}$ $\frac{4}{4}$ $\frac{3}{4}$ $\frac{4}{4}$ $\frac{3}{4}$ $\frac{4}{4}$

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.

vln. iii.

vla. i.
vla. ii.

vla. iii.

vlc. i.
vlc. ii.

vlc. iii.

cb. i.
cb. ii.

cb. iii.

417

4 +fl 5 +vib 6 -hn 5 -vln, vla 4 +ob 5 -vlc, cb 4 -fl 3 +bsn
 $\frac{3}{4}$ $\frac{1}{4}$ 4 4 3 4 4 4 3 4 4 3 4 4 3 4 4 3 4 4

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.

vln. iii.

vla. i.
vla. ii.

vla. iii.

vlc. i.
vlc. ii.

vlc. iii.

cb. i.
cb. ii.

cb. iii.

425

449

#	6	-vln, vla	5	-ob	4	-bsn	3	-fl	2	+vib	3	+vlc, cb	4	+vln, vla	5	-hn	
	4	4							3	4	4	3	4	4	3	4	4

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.

vln. iii.

vla. i.
vla. ii.

vla. iii.

vlc. i.

vlc. ii.

vlc. iii.

cb. i.
cb. ii.

cb. iii.

457

3	4	4	3	4	4	3	4	4
---	---	---	---	---	---	---	---	---

465

473

4 -cl 3 +fl 4 -vlc, cb 3 -vib 2 -vln, vla 1 +bsn 2 +ob 3 +vlc, cb

$\frac{4}{4}$ 3 $\frac{4}{4}$ 4 $\frac{4}{4}$

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.
vln. iii.

vla. i.
vla. ii.
vla. iii.

vlc. i.
vlc. ii.
vlc. iii.

cb. i.
cb. ii.
cb. iii.

481

489

4 -fl 3 +cl 4 +hn 5 +vln, vla 6 +vib 7 -vlc, cb 6 +fl 7 -bsn

$\frac{4}{4}$ 3 $\frac{1}{4}$ 4 3 $\frac{1}{4}$ 4

fl. i.
fl. ii.

ob. i.
ob. ii.

cl. i.
cl. ii.

bsn. i.
bsn. ii.

hn. i.
hn. ii.

vib. i.
vib. ii.

vln. i.
vln. ii.
vln. iii.

vla. i.
vla. ii.
vla. iii.

vlc. i.
vlc. ii.
vlc. iii.

cb. i.
cb. ii.
cb. iii.

497

505

6 -cl 5 -vln, vla 4 | +vlc, cb 5 -ob 4 -fl 3 -hn 2 -vib 1 -vlc, cb

$\frac{4}{4}$ $\frac{3}{4}$ $\frac{1}{4}$ $\frac{4}{4}$

fl. i
fl. ii
ob. i
ob. ii
cl. i
cl. ii
bsn. i
bsn. ii
hn. i
hn. ii
vib. i
vib. ii
vln. i
vln. ii
vln. iii
vla. i
vla. ii
vla. iii
vlc. i
vlc. ii
vlc. iii
cb. i
cb. ii
cb. iii

513

0

4

fl. i. [1. 2.]

fl. ii. [1. 2.]

ob. i. [1. 2.]

ob. ii. [1. 2.]

cl. i. [1. 2.]

cl. ii. [1. 2.]

bsn. i. [1. 2.]

bsn. ii. [1. 2.]

hn. i. [1. 2.]

hn. ii. [1. 2.]

vib. i. [1. 2.]

vib. ii. [1. 2.]

vln. i. [1. 2.]

vln. ii. [1. 2.]

vln. iii. [1. 2. 3. 4.]

vla. i. [1. 2.]

vla. ii. [1. 2.]

vla. iii. [1. 2. 3. 4.]

vlc. i. [1. 2.]

vlc. ii. [1. 2.]

vlc. iii. [1. 2. 3. 4.]

cb. i. [1. 2.]

cb. ii. [1. 2.]

cb. iii. [1. 2. 3. 4.]

more realizations to come.