Heptaktys

For flute, bass clarinet, trumpet, electric guitar, piano, percussion, violin, violoncello and contrabass

Juan Sebastián Lach Lau 2012

Written for and dedicated to Modelo62

Performance Notes

The first section of the piece is notated as available pitches to be played according to text instructions, entrance cues indicated by the conductor with the use of chronometer (which can also be of use to individual performers). The entrances should be flexible and do not have to be made exactly at the moment of the cues. Some indications require each player having an independent tempo from the others, some require measuring the lengths of sounds and silences in seconds.

The parts for this section are divided into two sub-ensembles (strings and the rest) and are to be printed on large format (A3 or double letter) paper. Sections **B** and **D** are similar to the beginning section but for a smaller number of players (B. Cl, Trp, Pno and Perc). The players play their parts from the score, which is also to be printed in large format (for readability). The score for these parts is written in C except for the bass clarinet, which is written transposed (a major 9th above sounding pitch).

Conventional notation is used for sections **A**, **C**, **E** and **F**. In these sections the bass clarinet is written in sounding pitch. Normal size paper (A4 or letter) is used for the parts of these sections. The page numbers for each part can be used as a guide for interspersing the large and normal size papers.

The accidentals used in the piece are based on the Helmholtz-Ellis notation (adagio.calarts.edu/~msabat/ms/pdfs/notation.pdf) with symbols for syntonic commas (small arrows indicating the difference between 3- and 5-based intervals) and septimal commas (for 7-based intervals, the symbol similar to a 7 and an inverted 7). Above or below each note is a small number in bold indicating the cent deviation from the closest equal tempered note (as indicated by common accidentals). Conventional quarter tone accidentals are also used.

Different kinds of pitch intervals are required:

Proportions obtained through scordatura and nodes: Strings, E. Guitar.

Proportions obtained through fingering: Flute. The table with suggested fingerings — obtained from The Virtual Flute http://www.phys.unsw.edu.au/music/flute/virtual/main.html — should be seen as a point of departure for the eventual fingerings, as they are calculated from a physical model and will vary depending on the flute and model. It is recommended to arrive at the fingerings with the aid of an electronic tuner.

Quarter tones: Bass Clarinet, Trumpet in sections **B** and **D**. Obtained through more or less conventional fingerings and embouchure.

Equal Temperament: Bass Clarinet, Trumpet, Piano.

Percussion

Instruments:

- A medium to large tam tam hanging from a base
- 8 small instruments to be chosen by the percussionist, placed in a table with a cloth. Two each of 4 kinds: skin, wood, muted and resonant metal.

They are to be played with different kinds of mallets and sound producing means (rattles, chains, and other ways of producing continuous textures). Notes without noteheads will refer to unspecified instruments, chosen by the player, perhaps with some extra textual indication as to what kind of timbre or instruments is sought.

Electric Guitar

Should use an amplifier with clean sound and not too much amplification so as to balance with the rest of the instruments. May need a sustain pedal to hold long notes.

Strings

Guide to the string position and scordatura charts below.

On the left of each double staff is the string number and its scordatura. One of each of the instruments' strings is detuned to some harmonic or subharmonic of **A** 440, the fundamental of the whole piece. All strings except the ones in **A** need scordatura, even though for some of them this difference is very small ($+4\phi$ for **G**, -2ϕ for **D**, $+2\phi$ for **E**). Even though this deviation might not be noticeable in itself, it adds up when reaching higher proportions upon each string and in relation to **A**, so it is recommended to tune them exactly with an electronic tuner. The strings to be detuned by more than 4ϕ are shown with a box around their label. The double bass' 4th string (**E**) is tuned up 114 cents to **F** +14 ϕ , the fifth subharmonic of **A**; the cello's fourth is moved down 112 ϕ to **B** +31 ϕ , the seventh subharmonic; the violin's third string is moved down 114 ϕ to C^{\sharp} -14 ϕ , the fifth harmonic.

Each double staff corresponds to a string and its natural harmonics, grouped according to their overtone number (2=octaves, 3=fifths, 5=major thirds, 7=natural sevenths). The lower staff shows how the notes are to be played, either lightly touched — producing natural harmonics — or fully stopped — producing precise harmonic ratios in relation to the string's fundamental. These ways of playing are labelled as 'touched' and 'stopped' node, respectively. In the latter case, the node and overtone number are also relevant, as each of the possible nodes produces a different pitch, in contrast to the touched versions, which are equivalent in pitch although each might sing a bit differently. In this table node numbers are indicated next to the diamond noteheads, while in the score stopped nodes are shown as two numbers that indicate the overtone and (in parenthesis) the node number, i.e., 5(3) means the third node of the fifth harmonic. Together with the fact that most of these strings are themselves harmonic ratios of A 440, it allows the playing of rather faraway ratios accurately with relatively low difficulty in finding their positions on the fingerboard.

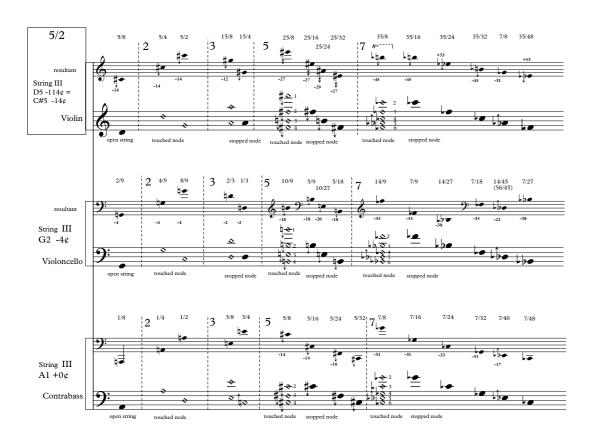
Each staff has an upper *ossia* that shows the resulting sound as well as the harmonic proportion in relation to A 440.

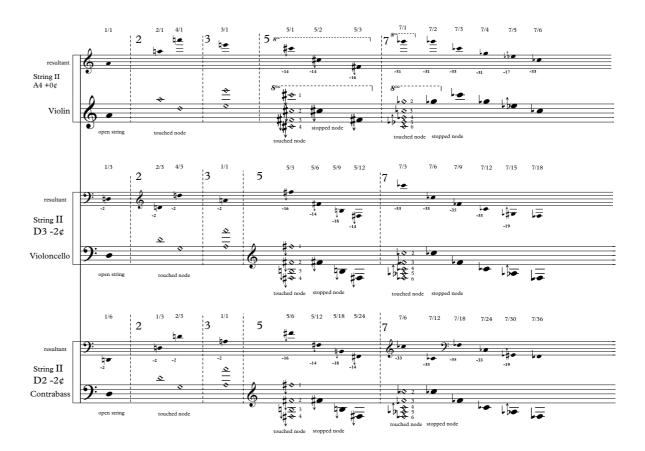
This table was used for composing the piece as well as for rehearing how to play these notes. Not all of the possibilities will be used, but most of them will. In two cases (the Vlc and CB 4th string), overtones go up to the 9th.

String position and scordatura charts

Cent deviations and ratios are related to the A4, 440 Hz





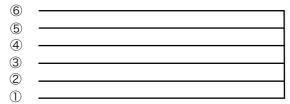




Guitar Scordatura

Tuning

string + detuning = ratio (octave reduced ratio) = resultant note +



E2 +2¢ = 3/16 (3/2) = E2 + 2¢ A2 +112¢ = 4/15 (16/15) = B \flat 2 +12¢ D3 -114¢ = 5/16 (5/4) = C \sharp 3 -14¢ G3 +18¢ = 9/20 (9/5) = G3 +18¢ B3 -18¢ = 5/9 (10/9) = B3 -18¢ E4 +2¢ = 3/4 (3/2) = E4 +2¢

Use an electronic tuner to retune the strings.

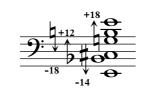
Ratios are relative to A 440

Written

Sounding



string



Intervallic possibilities (octave reduced, i.e., disregarding register) correspond to fret positions of octaves, fifths-fourths, seconds-sevenths, and rarely to minor thirds-major sixths, in addition to their harmonics:

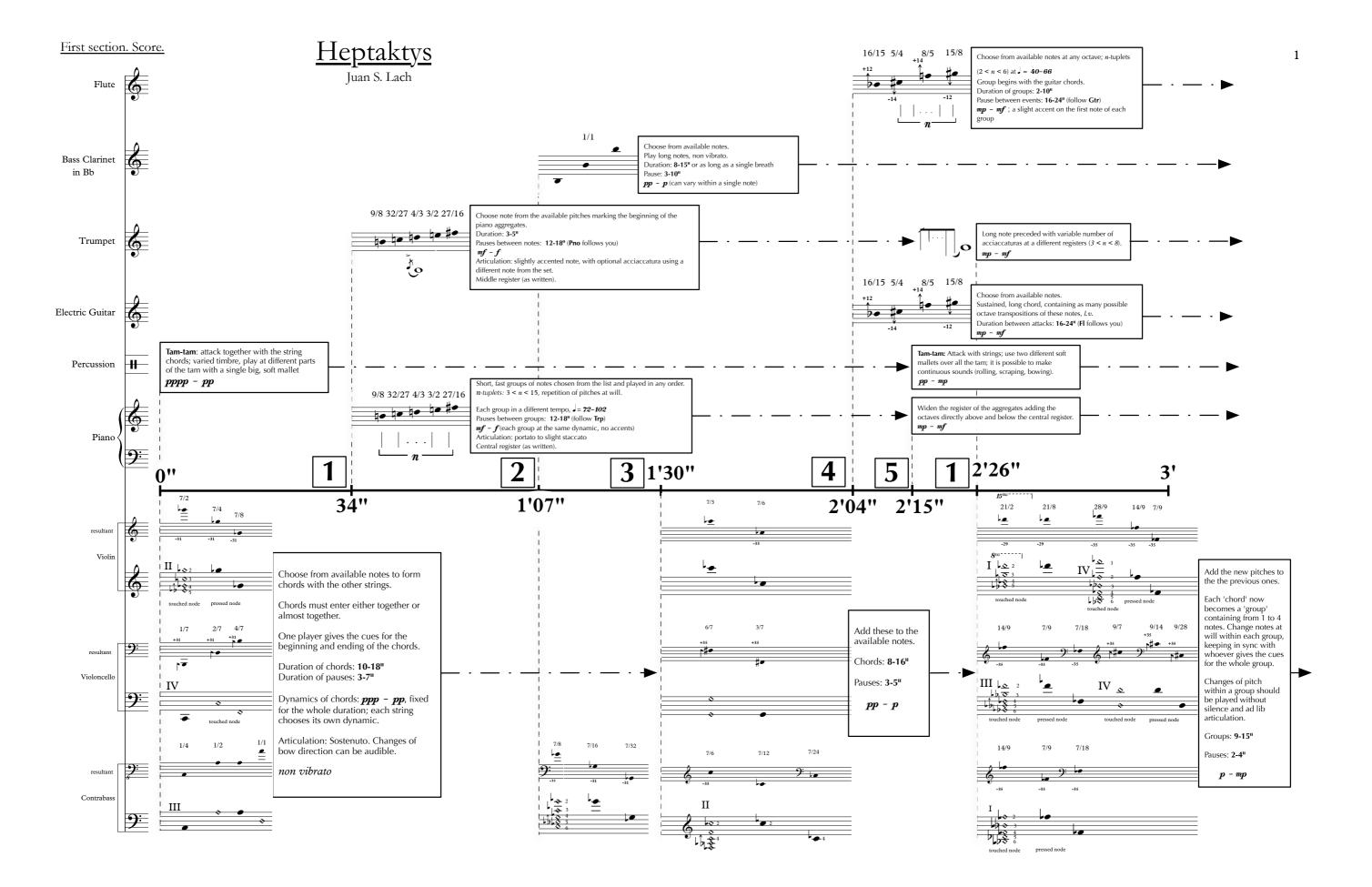
	II XIV	VII XIX	0 XII	V XVII	X	III XV	VIII XX
6	27/16	9/8	3/2	1/1	4/3	16/9	32/27
(5)	6/5	8/5	16/15	64/45	128/135	256/405	
4	45/32	15/8	5/4	5/3	10/9	40/27	160/81
3	81/80	27/20	9/5	6/5	8/5	16/15	64/45
2	5/4	5/3	10/9	40/27	160/81	320/243	
1	27/16	9/8	3/2	1/1	4/3	16/9	32/27

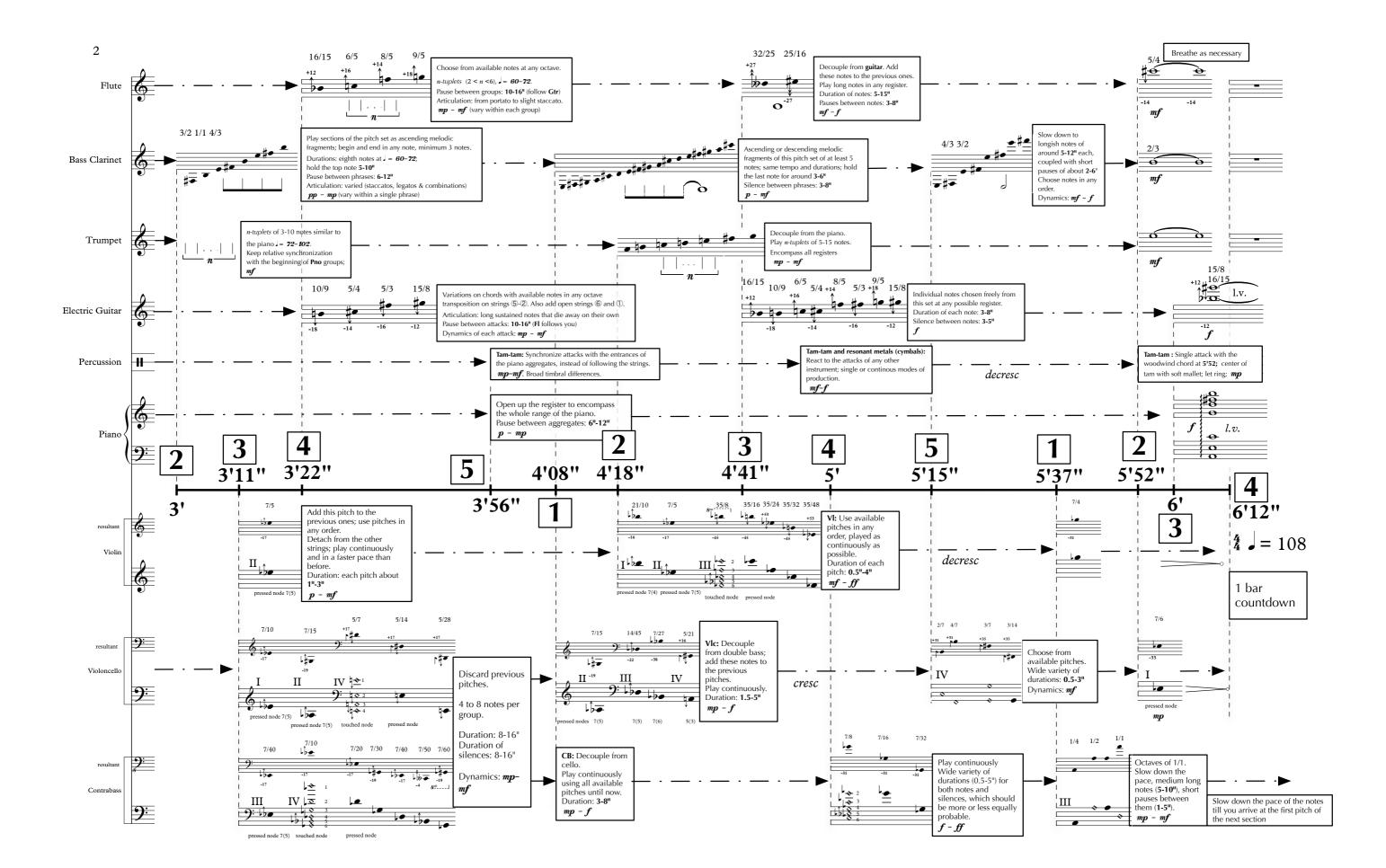
Ratios in gray are not used in the piece.

Flute fingerings

Ratios are relative to A 440 = A4 = A above middle C

Fingering	Octave reduced Ratio	Note
Th 1 3 G# 1 2 3 C Th 2 1 tr1 tr2 C#	16/15 16/15	Bb5 plus 10 cents Bb6 plus 10 cents
Th 2 3 1 2	10/9	B4 minus 20 cents
Th 2 1 2 3 C (split E)	10/9	B5 minus 20 cents
Th 1 2 3 1 2 3 C	6/5	C5 plus 15 cents
1 2 3 1 3	6/5	C6 plus 15 cents
Th 1 2 3 tr1 D#	5/4	C#5 minus 15 cents
Th 2 3 1 C#	5/4	C#6 minus 15 cents
Th 1 2 3 1 tr1 C	8/5	F5 plus 15 cents
Th 1 3 1 3 C#	8/5	F6 plus 15 cents
Th 1 2 3 2	5/3	F#5 minus 15 cents
Th 1 $\qquad \qquad$ 2 3 C B (split E)	5/3	F#6 minus 15 cents
Th 2 3 2 tr2 C	9/5	G5 plus 15 cents
Th 3 2 3 C B	9/5	G6 plus 20 cents
Th 1 2 3 G# 1 2 3 C B	15/8	G#5 minus 15 cents
3 2 3	15/8	G#6 minus 15 cents
Th 1 2 3 G# 2 D#	15/16	G#4 minus 10 cents
Th 1 G# 1 3	15/14	A#5 plus 15 cents (30/14)
Th 2 3 1 2 3 D#	15/14	A#4 plus 15 cents
Th 1 2 3 G# 1 3 D#	14/15	G#4 minus 20 cents
Th 1 2 $ $ 1 2 3 (split E)	64/63	A5 plus 30 cents (128/63)
Th 1 3 1 2 3 C	64/63	A4 plus 20 cents
Th 1 3 G# 1 3 C B	21/20	A#4 minus 15 cents
Th 1 2 3 1 3 C#	25/16	F5 minus 30 cents
Th 1 2 3 1 2 C#	25/16	F6 minus 25 cents
G# D#	32/25	C#5 plus 25 cents
Th 1 3 G# 2 tr1	32/25	C#6 plus 25 cents
Th 1 2 3 G# 1 2 3 D#	64/35	G5 plus 35 cents
Th 2 3 1 2 tr2 D#	32/21	E5 plus 30 cents









p sempre





