Warren Burt: *18 New Fuguing Tunes for Henry Cowell* 2005
The Details of Each Movement

Here, in list form, are the details of each movement. Included are
- a description of some salient aspects of the movement
- sequence used
- scale used
- scaling used for pitch
- scaling used for durations - durations in 24/quarter-note ticks
- scaling used for dynamics
- tempo
- timbres used
- delay for each voice (in 32nd notes)
- transposition for each voice - note that because of the unequal nature of the just scales, a transposition by N scale degrees will not always produce the same interval. For example, in Scale 4 [3(2) 5(3)], a interval of 4 scale degrees will produce a 5/4 (386.3c) between scale degrees 0 & 4, 4&8, 5& 9, and 9 & 1; but an interval of 32/25 (427.4c) between scale degrees 1&5, 3&7, 6 & 10, and 8 & 0; an interval of 250/207 (326.8c) between scale degrees 2 & 6; an interval of 125/96 between scale degrees 7 & 11; and an interval of 6/5 (315.6c) between scale degrees 10 & 2, and 11 & 3. With such a wide variety of different intervals available from the same transposition, the concept of harmonic parallelism become interesting, to say the least. As another example, in Movement 18, as already discussed, five different intervals result from a transposition of 3 scale steps in Scale 18.

Movement 1.
Description: A simple four voice canon with harp timbres. The melody is mostly descending, getting faster as it descends. The appearance of high pitches 2/3 of the way through the melody provides a reference point within the counterpoint. The "chain of fifths" transpositions generate a certain degree of harmoniousness.
Sequence 1: read forward
Scale: 1 [3(11)]
Pitch range: 2 octaves + 9 steps, bottom note midi 60 (middle C)
Duration: 3 - 13 ticks.
Dynamics: Velocities from 36 - 96
Tempo: 132
Timbre: all 4 voices: troubadour harp
Delay (32nd notes): V1: 0; V2: 36; V3; 72; V4: 108
Transposition: V1: 0; V2 -7 steps (3/2 down); V3 -14 steps (9/4 down); V4 -21 steps (27/8 down)

Movement 2.
Description: A four voice canon for 2 accordions and 2 ney. One of the ney is played well below its acoustic range, producing a very breathy timbre. Unlike the previous canon, here the successive voice entries ascend. The transpositions by 3/2 match to scale, which is still mostly based on chains of 3/2s.
Sequence: 2, read forward.
Scale: 2 [3(5) 5(1)]
Pitch range: 2 octaves + 1 step, bottom note midi 44 (bottom bass clef F#)
Durations: 3 - 14 ticks
Dynamics: Velocities from 36 - 96
Tempo: 84
Timbre: V1 & 2: Accordion; V3 & 4: Ney Flute
Delay (32nd notes): V1: 0; V2: 30; V3: 60; V4: 90
Transposition - V1: 0; V2 +7 steps (3/2 up); V3 +12 steps (octave up); V4 +19 steps (octave + 3/2 up)

Movement 3.
Description: A variety of plucked timbres makes a wide ranging polyrhythmic texture. The leaping to high values that occurs 2/3 of the way through sequence 3 produces a wistful leading motive that recurs throughout the piece. The piece sounds very motivically united, that is, it has all the sonic hallmarks of a traditional canon, despite its non-traditional tuning and timbre.
Sequence: 3, read forward
Scale: 3 [3(3) 5(2)]
Pitch range: 3 octaves, bottom note midi 53 (F below middle C)
Durations: 4 - 16 ticks
Dynamics: Velocities from 24 - 84
Tempo: 108
Timbre: V1 & 4: Mbira, V2: Cimbalom; V3: Pizzicatos
Delays (32nd notes): V1: 0. V2: 48, V3: 96; V4: 120
Transpositions: V1: 0; V2 -5 steps (4/3 down); V3 -18 steps (64/45 + octave down); V4 -22 steps (16/9 + octave down). These relate to the fundamental by 3/2, 3/2 + 3/2 + 5/4; and 3/2 + 3/2, reflecting the 3/2s and 5/4s which generate the scale.

Movement 4.
Description: A slow meditative cloud of semibowed string sounds. Lots of consonant harmonies result from the delays and transpositions. The slow timbre seems to mitigate against hearing the canonical structure - instead, a sort of timbral/textural listening takes over.
Sequence: 4, read forward
Scale: 4 [3(2) 5(3)]
Pitch range: 3 octaves, bottom note midi 48 (Viola C)
Durations: 3 - 6 ticks times 6; ie, durations of 18, 24, 30, & 36 ticks
Dynamics: Velocities from 36 - 116
Tempo: 36
Timbre: V1 - 4: Bowed Dulcimer
Delay (32^{nd} notes): V1: 0; V2: 15; V3: 30; V4: 45
Transpositions: V1: 0; V2 +4 steps (5/4 up); V3 -4 steps (5/4 down); V4 +10 steps (15/8 up)
This produces a "fanning out" of register in voice entries instead of all voices going in one direction or the other. The transpositions relate to the 5/4s and 3/2s which generate the scale. (15/8 = 3/2 + 5/4)

Movement 5.
Description: A slow piccolo melody is supported by 3 lines of pizzicato basses. The composite rhythm is fairly regular, produced by the limited set of durations used and the regular durations of the delays. Pizzicato bass lines begin and end the piece, surrounding the piccolo. This is achieved by having one bass line having a longer delay than the piccolo.
Sequence: 5, read forward
Scale: 5 [3(1) 5(5)]
Pitch range: 2 octaves, bottom note midi 36 (Cello C)
Durations: 1 - 4 ticks times 12; ie durations of 12, 24, 36, and 48 ticks
Dynamics: Velocities from 36 - 96
Tempo: 84
Timbre: V1 & 4: Pizzicato 1; V2: Pizzicato 2; V3: Piccolo
Delay (32^{nd} notes): V1: 0; V2: 24; V3: 72; V4: 96
Transpositions: V1: 0; V2+4 steps (5/4 up); V3 +24 steps (2 octs up); V4 -5 steps (3125/2048 down - an "out of tune" fifth to produce some piquancy in the resultant bass pizz harmonies)

Movement 6.
Description: A rather crazed electric organ canon. It has a traditional canon structure - with voices all delayed evenly, and transpositions to harmonically related areas (transpositions by 4 steps (5/4) and 8 steps (two 5/4s) - but the wide range of the melody, the small transpositions, and the ragged, uneven rhythms (made of durations of 13 through 20 ticks inclusive, with 24 ticks per quarter note) lead to a texture where hearing the canon is next to impossible and the disjointed, fragmented nature of the resultant sound predominates. I like to think of this as what might have happened if Jimmy Smith had met Sun Ra in a multitrack recording studio. It's also the fulfilment of the adolescent electric organist fantasies I had as I practiced on my Aunt Billie's Hammond during the school holidays.
Sequence: 6, read forward
Scale: 6 [5(11)]
Pitch range: 4 octaves, bottom note 36, (Cello C) - a wide ranging line to produce perceptual fragmentation and streaming
Durations: 13 - 20 ticks inclusive
Dynamics: Velocities from 36 - 108
Tempo: 144
Timbre: All 4 voices: B3 Mod Leslie (Hammond electric organ emulation)
Delays (32^{nd} notes): V1: 0; V2: 40; V3: 80; V4: 120
Transpositions: V1: 0; V2 +4 steps (5/4 up); V3+8 steps (up 25/16 - (5/4x5/4)); V4+12 steps (up 1 oct)

Movement 7.
Description: A music box texture made with bell like sounds. The metallic sounds give the texture a depth, although perhaps the harmonic content of the bells may obscure appreciation of the scale used.
Sequence: 7, read forward
Scale: 7 [5(5) 7(1)]
Pitch range: 3 octaves, bottom note 72 (Treble clef third space C)
Durations: 4 - 13 ticks times 2; ie durations of 8, 10, 12, 14, 16, 20, 22, 24, and 26 ticks.
Dynamics: Velocities from 36-108
Tempo: 136
Timbre: All 4 voices: "Heavy Tibet", which is a bell-like sound. It seems to be a loop of the sustain of a Tibetan bowl gong doubled at 2 octaves with an electronic envelope. It makes a bell sound with a very sharp attack.
Delays (32^{nd} notes): V1: 0; V2: 39; V3: 65; V4: 104 (these are all multiples of 13 - 3, 5, and 8x)
Transpositions: V1: 0; V2 -14 steps (down oct + 8/7 (transpose by 7/4)); V3 -8 steps (down 8/5 (transpose by 5/4); V4 -16 steps (down oct + 5/4 (transpose to 25/16 (2x 5/4)))

Movement 8.
Description: A series of slow, meditative chords using an Irish Harp sample. The canonic structure is here turned into a chorale with limited durations and voice delays. The delays are an eighth note, a quarter note, and a dotted quarter note. When combined with the slow quarter notes and half notes of the melody, this makes a pulse oriented resultant rhythm. Mostly chords occur, with the occasional single note resulting from longer durations in the other delayed voices. The melody is similarly narrow in order to constrain the chorale even more. Given Cowell's fascination with Irish folk music, how can one possibly make an homage to him without including an Irish Harp? (Note that in the course of the piece three different sampled harps are used - Troubadour, Irish and Exotic, as well as a number of other plucked instruments, Santur, Koto, Cimbalom, Harpsichord, and various Pizzicati.)
Sequence: 8, read forward
Scale: 8 [5(3) 7(2)]
Pitch range: 2 octaves + 1 step, bottom note 48 (Viola C)
Durations: 1 - 2 ticks times 24, ie, 24 and 48 ticks only - ie, only quarter and half notes.
Dynamics: Velocities from 36 - 108
Tempo: 30
Timbre: All 4 voices: Irish Harp plus a long reverb.
Delays (32^{nd} notes): V1: 0; V2: 16; V3: 32; V4: 48.
Transpositions: V1: 0; V2 + 9 steps (up 7/4); V3 -9 steps (down 8/5, or up 5/4); V4, +7 steps (up 25/16 - 2x 5/4)

Movement 9.
Description: A bit of classic "modern music" chaos. The melody covers 6 octaves, and has a wide dynamic range and irregular durations. When combined with the four plucked or struck string timbres, it makes a texture where melodic lines break up into separate registers, and the ear is continually pulled from one detail to another.
Sequence: 9, read forward
Scale: 9 [5(2) 7(3)]
Pitch range: 6 octaves, bottom note midi 24 (lowest C on the piano)
Durations: 1 - 6 ticks times 2, ie, 2, 4, 6, 8, 10, and 12 ticks.
Dynamics: Velocities from 24 - 120. Very loud to very soft.
Tempo: 120
Timbre: V1: koto; V2: Grand Piano; V3: Cimbalom; V4: Harpsichord
Delays (32^{nd} notes): V1: 0; V2: 23; V3: 29; V4: 31 (short delay differences produce flanging)
Transpositions: V1: 0; V2 -2 steps (up 35/32 (5 x 7)); V3 +7 steps (up 49/32 (7x7)); V4 +16 steps (up octave + 5/4 (5))

Movement 10.
Description: I don't know if these timbres are actually sampled wine glasses or just stacked sine waves pretending to be wine glasses. In either case, I've liked this timbre since I first heard it in the late 1980s on the Proteus 1. In this long, sustained meditation, the canonic delays are usually shorter than the durations of the melody. This means that all four voices are usually heard in their relevant transpositions before the next note occurs. This creates a series of harmonic "clouds" that, if the scale were equal tempered, would always articulate the same chord. Given the uneven nature of the just scale, however, chords with different fundamentals are made of different intervals, so a sense of harmonic variety results.
Sequence: 9, read backward
Scale: 10 [5(1) 7(5)]
Pitch range: 2 octaves and 1 scale degree, bottom note midi 43 (G on bottom of bass staff)
Durations: 7 - 18 ticks time 5, ie 35 - 90 ticks, in 5 tick increments.
Dynamics: Velocities from 48 - 96.
Tempo: 42
Timbre: All 4: "RB's Wine", slightly modified for different beating rates and decays than the preset timbre.
Delays (32nd notes): V1: 0; V2: 11; V3: 17; V4: 23 (23/32nds of a 24 tick quarter note = just over 17 ticks. The durations are from 35 - 90 ticks. So all these delays are shorter than the shortest melodic duration.)
Transpositions: V1: 0; V2 +10 steps (up 7/4); V3 +7 steps (up 12005/8192 (661c); V4 + 5 steps ((up 84035/65536 (430c); these unusual transpositions are used to get beating tones and unusual harmonies.

Movement 11.
Description: A stringent, harsh etude for very low and very high woodwind sound. The low contrabassoon and bass clarinet play canonically, while the high flute and oboe are in rhythmic unison but two scale degrees apart. The uneven nature of the scale makes the high winds articulate a series of differing seconds, while the low winds puff away below.
Sequence: 8, read backward
Scale: 11 [7(11)]
Pitch range: 1 octave + 11 scale degrees, bottom note 34 (Bb below cello C)
Durations: 1 - 4 ticks times 12; ie, 12, 24, 36, and 48 ticks (eighth, quarter, dotted quarter and half note)
Dynamics: Velocities from 60 - 108. (Moderate to loud).
Tempo: 68
Timbre: V1: Contrabassoon; V2: Bass Clarinet; V3: Oboe; V4: Clarinet.
Delays (32nd notes): V1: 0; V2: 48; V3 & 4: 96.
Transpositions: V1: 0; V2 +17 steps (up oct. + 343/256 (7x7x7)(oct + 506c); V3 +31 steps (up 2 octs + 49/32 (7x7)); V4 +33 steps (up 2 octs + 7/4 (7))

Movement 12.
Description: A jolly duet for drums and a cheery melody on the ney. The duration scaling produces all sorts of simple "folk-like" rhythms among the complexity. Orchestrating this for drums and solo melodic instrument does thoroughly obscure the canonic nature of what's going on, but given that all these pieces are canons anyway, that kind of variation provides a welcome sense of variety. There might be more than a hint of "exotica" in this piece. I'm also reminded of the very cheesy music that accompanied the Clutch Cargo cartoons I saw as a child.
Sequence: 7, read backward
Scale: 12 [3(1) 7(5)]
Pitch range: 3 octaves, bottom note midi 36 (cello C)
Durations: 1 - 3 ticks time 4; ie. 4, 8 & 12 ticks
Dynamics: Velocities from 36-108.
Tempo: 136
Timbre: V1: 3; Voudon Drums tuned to scale; V4: Ney Flute
Delays (32^{nd} notes): V1: 0; V2: 24; V3: 120; V4: 96. (Note that the delay of 120 for Voice 3 means that the drums will both begin before and end after the ney flute in Voice 4.)
Transpostions: V1: 0; V2 +7 steps (up 3/2); V3 +8 steps (up 49/32 (7 x 7)); V4 +22 steps (up oct. + 7/4)

Movement 13.
Description. This is a duet for baritone sax and harmonium timbres. It puffs away in it's low bass way. I think I've finally written a piece I can honestly describe as "lugubrious." Again, the harmonium voices are in rhythmic unison, reducing the 4 voice texture to 2 parts.
Sequence: 6, read backward
Scale: 13 [3(2) 7(3)]
Pitch range: 2 octaves + 7 scale degrees, bottom note midi 36 (cello C)
Durations: 6 - 17 ticks times 2; ie 12 - 34 ticks, in increments of 2 ticks
Dynamics: Velocities from 48 - 108.
Tempo: 64
Timbre: V1: Baritone Sax and Reverb; V2: 4, Harmonium
Delays (32^{nd} notes): V1: 0; V2-4: 33 (rhythmic unison of the 3 harmonium voices.)
Transpositions: V1: 0; V2 -2 steps (down 8/7 (up 7/4)); V3 +4 steps (up 21/16 (7x3)); V4 +11 steps (up 63/32 (7x3x3))

Movement 14.
Description: Tuned tabla samples, along with pizzicato basses, and high metallic sounds with a slow attack produce music that refers to at least three different cultures, India, Europe, and whatever fantasy world the metallic / electronic sounds evoke in your imagination. The two metal timbre voices are transposed 1 scale degree apart, to create a series of beats and small intervals.
Sequence: 5, read backward
Scale: 14 [3(3) 7(2)]
Pitch range: 5 octaves, bottom note midi 48 (viola C)
Durations: 3 - 12 ticks
Dynamics: Velocities from 36 - 108.
Tempo: 144
Timbre: V1: Tablas tuned; V2: Pizzicato bass; V3-4: "Bronze Pad", a metallic timbre with slow attack
Delays (32^{nd} notes): V1: 0; V2: 93; V3-4: 127 - irregular delays to produce "off balance" rhythmic relationship between parts
Transpositions: V1: 0; V2 -18 steps (down 4/3 (up 3/2)); V3 - 0; V4 -1 step (down 63/32)

Movement 15.
Description. A wistful march for electric piano. Simple rhythms, matching delays, and voices transposed in fifths and octaves create the most traditionally "fugal" sounding texture of the piece. The solo ending reveals the individual lines having a bit of a "Javanese" feel to them.
Sequence: 4, read backward
Scale: 15 [3(5) 7(1)]
Pitch range: 2 octaves, bottom note midi 60 (middle C)
Durations: 1 - 4 ticks times 3; ie 3, 6, 9, and 12 ticks (for a regular rhythmic sense)
Dynamics: Velocities from 36 - 84 (restrained dynamics)
Tempo: 48
Timbre: All 4: Electric Piano
Delays (32^{nd} notes): V1: 0; V2: 36; V3: 72; V4: 108 (evenly spaced delays with given durations produce march-like rhythms with lots of 3:2 rhythms resulting)
Transpositions: V1: 0; V2 -12 (down octave); V3 +7 steps (up 3/2); V4 -17 steps (down octave + 4/3 (up 3/2))

Movement 16.
Description: Another piece for a wind instrument and accordion-like timbre. In this case the accordion is a musette, which has slightly detuned beating reeds. The accordion consists of 2 parts - a single line, and a series of dyads. The solo accordion line plays canonically with the clarinet part. The dyads are canonic as well, but seem to provide a sense of harmonic "fill" instead. The clarinet is transposed by 3 scale degrees. This produces a variety of very flat thirds, so that the clarinet sounds a bit out of tune or "squawky" compared with the accordion.
Sequence: 3, read backward
Scale: 16 [3(2) 5(1) 7(1)]
Pitch range: 1 oct + 7 scale degrees, bottom note midi 48 (viola C)
Durations: 12 - 24 ticks.
Dynamics: Velocities from 48 - 96.
Tempo: 120
Timbre: V1-3: Paris Musette (Accordion with beating reeds); V4: Clarinet
Delays (32^{nd} notes): V1: 0; V2-3: 24; V4: 108. (The rhythmic unison of Voices 2 and 3 produces dyads in canon with the melody of Voice 1)
Transpositions: V1: 0; V2 +9 steps (up 7/4); V3 +19 steps (up octave + 3/2); V4 +3 steps (up 315/256 - a flat third to make the clarinet seem extra squawky)

Movement 17:
Description: The model for this movement is Confucian ceremonial music of Korea, China or Japan, with the taiko drum, bells, plucked shamisen and short piccolo notes. However, the syncopation in the rhythm quickly sends the music far away from its model. The very simple, repetitive nature of the generating number pattern produces a series of gestures that sound similar, but which constantly vary.
Sequence: 2, read backward
Scale: 17 [3(1) 5(2) 7(1)]
Pitch range: 2 octaves, bottom pitch 40 (E on bottom of bass staff)
Durations: 12 - 24 ticks times 2; ie 24 - 48 ticks, in increments of 2 ticks.
Dynamics: Velocities from 48 - 96.
Tempo: 52
Timbre: V1: Taiko Drum; V2: Bali Bells; V3: Shamisen; V4: Piccolo.
Delays (32^{nd} notes): V1: 0; V2: 28; V3: 56; V4: 112.
Transpositions: V1: 0; V2 +7 steps (up 3/2); V3 +16 steps (up oct + 5/4); V4 +22 steps (up oct + 7/4)

Movement 18:
Description: A 2 timbre canon, using the simplest of the number patterns, which consists of interlocked ascending number series. The harp timbres make a 2 voice canon, and the vibes are in rhythmic unison, doubled by 3 scale degrees. Due to the nature of the scale, however, the thirds are of many different types. On scale degrees 0 and 2, the resulting interval (3 scale degrees) is 5/4 (386.3 cents). On scale degrees 1, 3, and 11, the interval produced is a 6/5 (315.6 cents). Scale degrees 4, 6, 8, and 10 have the interval of 7/6 (266.9 cents) between them and the note 3 scale degrees above them. On scale degrees 5 & 9, the interval is 8/7 (231.2 cents), and the interval produced by combining scale degree 7 and its neighbour 3 degrees above is 60/49 (350.6 cents). Thus, the vibes continually articulate an ascending series of 5 different "thirds". As they climb the slopes of the number series, they are always changing harmonically. This is an example of the character of the number series, the choice of orchestration and canonic delays, and the nature of the scale used combining to form a musical pattern which articulates an essential aspect of the chosen scale.
Sequence: 1, read backward
Scale: 18 [3(1) 5(1) 7(2)]
Pitch range: 4 octaves + 2 scale degrees, bottom note midi 36 (cello C) (a wide melody so the clear ascending patterns of sequence one can have a large range to climb)
Durations: 12 - 48 ticks
Dynamics: Velocities from 36 - 96
Tempo: 104
Timbre: V1 & 4: Exotic Harp; V2 & 3: Vibraphone
Delays (32^{nd} notes): V1: 0; V2 & 3: 48; V4: 24.
Transpositions: V1: 0; V2 + 3 steps (up 5/4); V3 +6 steps (up 3/2); V4 +9 steps (up 7/4)