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Composition Research

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Scott Mc Laughlin - Composition Research

Harmony

Frequential Harmony

Harmony defined as frequency values (in hertz) rather than pitches. This allows mathematical manipulation of frequencies and their relationships from the simple to the complex. Frequential Harmony also moves away from traditional 12tet (12 tone equal temperament) ideas by considering harmony as a **continuum** of frequency rather than a series of quantised pitch steps.

This way of looking at musical harmony was started in earnest by the Spectral School of composers in 1970s France. They used techniques from computer music applied to the realm of acoustic sounds.
Ring Modulation is a simple technique used since the beginings of electronic music which adds sidebands of harmony when two pitches are heard together, this harmony is often microtonal. My initial attraction to these ideas was the thought that this harmony was always present whenever two pitches are heard together but usually too quiet to hear, I set out make it audible.

The equation for ring modulation is simple, given two frequencies f1 and f2, ring modulation produces a summation-tone

f1 + f2

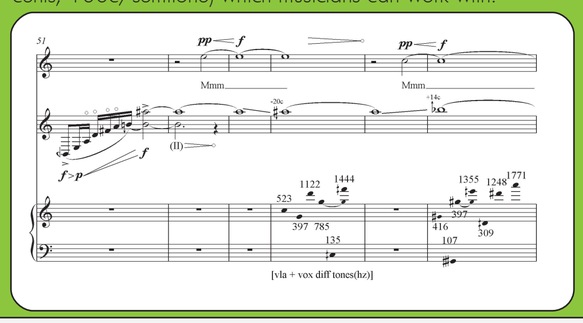
and a difference tone

f1 - f2

The sidebands appear as this process continues.

2f1 + f2	2f1 - f2
2f1 + 2f2	2f1 - 2f2
3f1 + 2f2	3f1 - 2f2
3f1 + 3f2	3f1 - 3f2 etc.

This can create a rich microtonal harmony, the frequencies are then translated into microtonal pitch notation (in semitones and cents, 100c/semitone) which musicians can work with.

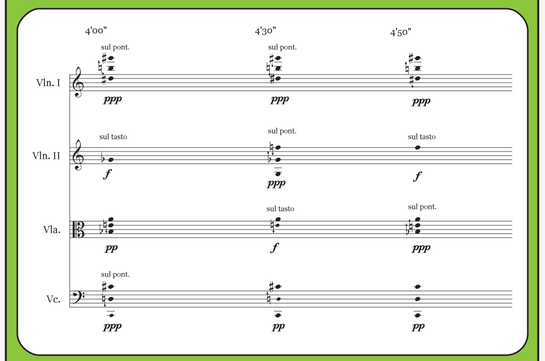


Spectral Modelling

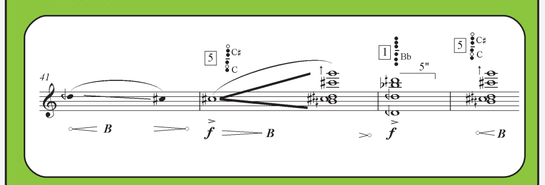
Also developed by the Spectral School, modeling involves carrying out spectral analysis of sounds and using this data to define harmonies. This allows morphing/manipulation of sounds. The intention is not to emulate natural sounds with instruments, but rather to use these as archetypes for harmonic exploration.

In my work I've mostly used the sounds of **bells** and wind instrument **multiphonics**.

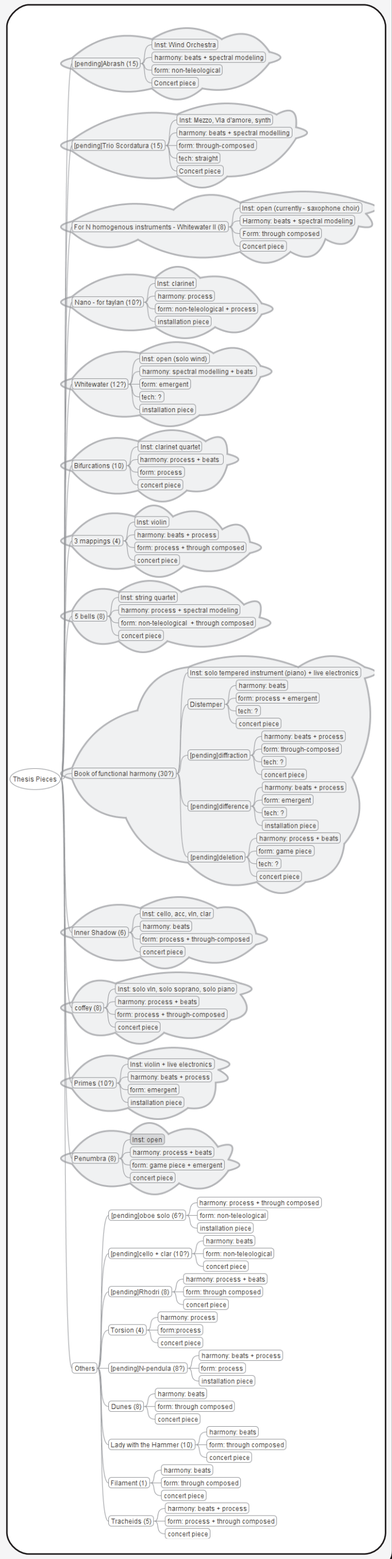
'5 Bells for Elliott Carter' (2006) takes the final chord of Elliott Carter's 3rd String Quartet and sustains it across ten minutes, all the while slowly changing the chord into different bells through subtle alteration of intonation and dynamics.



In 'Whitewater' (2007), multiphonics are analysed live by computer and played back. Performer and computer then improvise around the multiphonics by changing their internal structure.



List of pieces composed during PhD
(lowest = oldest)



Form

Game Pieces

Where the form of the piece is not controled by a fixed score, instead the players work from a set of rules which define how they interact and their sound materials.

This derives from several sources, most notably from looking at **chaos/complexity theory,** this shows how simple processes can lead to unpredictable and complex outcomes. It's possible to create musical systems with a globally predictable form and soundworld but where the details of each performance will be different. Pieces are effectively open-ended and may continue indefinitely without repetition.

There is also a political element in this, by moving beyond the paradigm of composer-controller to one of composer-designer, where the performers are partcipants who may explore the piece from within. As my research has progressed, more and more of my music relies on these forms where I am simply creating an environment and rules of interaction, the music is an **emergent** property of these rules.

Below, 'Nano' (2007) for solo clarinet is an example of how simple rules can define the sound and the form of the piece. Current research involves working on a piece for large ensemble based on the rules of flocking, how agents in a group act simultaneously as individuals and as a group.

Nano

for Taylan Susam

I. Choose a high pitch, clarino or altissimo range.
II. Maintaining a constant pulse (any tempo, but it must be constant), play a descending line in the smallest possible gradations of pitch.
  i. Each pitch should be stable, no glissando/portamento.
  ii. The largest interval allowed is smaller than the semitone.
  iii. Each pitch should diminuendo slightly towards the end.
III. Stop at the end of breath or when the next pitch cannot be smaller than a semitone
IV. Pause.
V. Choose new tempo and starting pitch, and start again.

VI. Repeat I – V for a time, then stop.

- All notes as quiet as possible: close to noise and air but with a definite sense of pitch. Consistently quiet.
- Each phrase/event to be within one breath, but not necessarily using the whole breath.