Natural Resonance

An exploration of acoustic heterodyning frequencies

For string quartet

Ian Percy

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I. Light
II. Sound
III. Colour

Approximate Duration: 9-10 minutes

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2004/10

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This three-movement score for string quartet was initially composed in 2004, but revised within the boundaries of its original format in January – February 2010 and then formally revised later that year. The piece was originally conceived as a compositional study: a practical research exercise exploring the acoustic phenomenon of natural resonance.

Natural resonance seems to describe the timbral characteristics of a string quartet quite accurately. It implies an organic phenomenon: acoustic vibration. It is as old as nature and is often discussed in relation to space and time, even the origins of the universe itself.

In literal terms, natural resonance refers to the additional sympathetic tones that can be generated when sustained resonances vibrate with and against each other. These heterodyning frequencies can be produced above the pitches, as combination tones (the sum of the two frequencies), or as difference tones (the difference between the two), they can also generate acoustic multiphonics in wind instruments and produce escalating dynamics reminiscent of contemporary guitar feedback.

This quartet, with form, tempi and proportion influenced by the Golden Ratio, could be described as an ambient dreamscape. It is true that the music is quite static and reductive, but it maintains a fluid sense of 'slow motion'. The three movements explore the same material in very similar ways, but each movement retains its own individual characteristics and subtle distinguishing features.

Natural Resonance is a peaceful, meditative and ambient sonic journey, a developed compositional sketch through which the composer first opened the door into this ancient and eternal acoustic realm. 2010 revisions added more sustained resonant harmonies and adjusted pitch content in order to balance multiple heterodyning relationships and extend elements of vertical harmony. The addition of more tangible musical units (phrase, melody and motif) helped to turn the initial study into a valid and coherent performance piece.

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An Exploration of Acoustic Heterodyning Frequencies

(Three movements for string quartet)

Third Movement Analysis

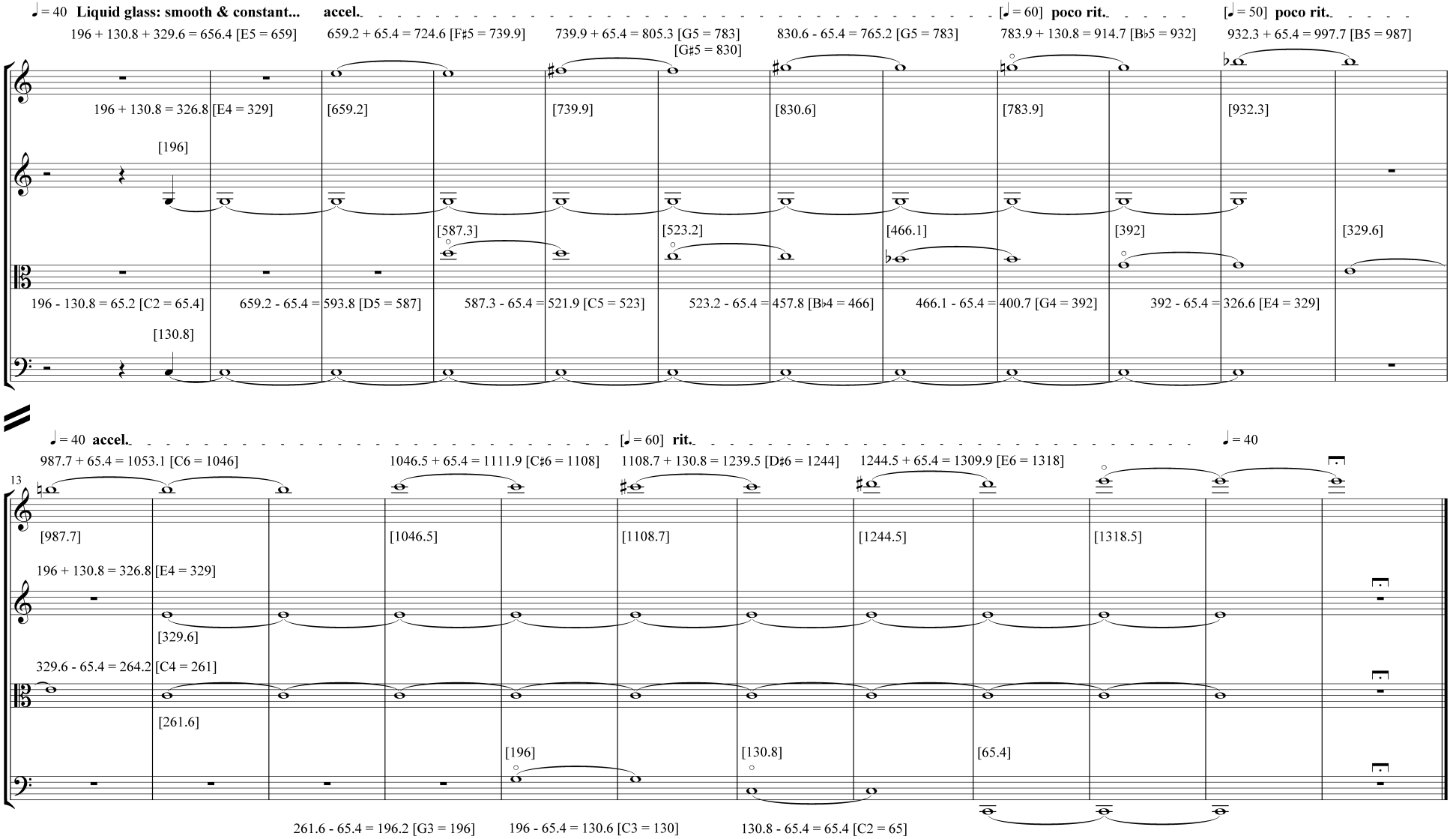
In the first bar of the third movement (below), the cello plays C3 [130.8Hz] and the 2nd violin plays G3 [196Hz]. When added together, they produce the combination tone of 326.8Hz. The closest concert pitch is E4 [329.6Hz] and so this determined the next pitch played by the 2nd violin.

For the 1st violin entrance the combination of all three frequencies was used: 130.8 + 196 + 329.6 = 656.4Hz
The closest concert pitch is E5 [659.2Hz] and so the 1st violin starts on E5.

The difference tone of C3 and G3 is 65.2Hz: 196 – 130.8 = 65.2Hz
The closest concert pitch is C2 [65.4Hz]. This frequency determined the step motion in the 1st violin, viola and cello parts (2nd system).
The cello also resolves to C2.

The entry note for the viola was determined by deducting C2 from E5: 659.2 – 65.4 = 593.8Hz
The closest concert pitch is D5 [587.3Hz] and so the viola starts on D5.
D5 is therefore the difference tone between C2 and E5.

Natural Resonance: III. Colour



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