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Michael Pisaro's **pi** *and numerical representation*

At 11.00am each and every week day in the Atrium of the University of Huddersfield Creative Arts building for the duration of the Huddersfield Contemporary Music Festival, pianist Philip Thomas performed one piece from the fifteen-piece cycle that comprises American composer Michael Pisaro's *pi (1-2594)*, for solo piano.

The atrium is a space shared by the University's Music and Art & Design departments, and continued operating as a busy workplace for those not involved with the festival throughout the week. These activities provided a backdrop for what became, for me at least, a pivotal event amongst the numerous other concerts taking place in hcmf. The combination of the piano and environmental sounds created a sound aggregate which demanded a continually shifting listening focus; the repetitive nature of the piece ensured that the piano was frequently at the forefront of my perception, however other times I was diverted by sonic interruptions elsewhere in the atrium, allowing me to explore my own perceptual focus as much as exploring the music.

The piece itself describes the numbers following the decimal point in the mathematical constant π. The numbers are divided into fifteen smaller pieces , each with its own assigned pitch which is repeated according to the particular integers in each piece. The groupings serve to present mathematical proportions – which they do in the purest sense (the tangibility of an infinite series takes on a very real form as phrase groupings lengthen and contract). However, they extend further than purely a clinical mathematical presentation: the patterns set up durational hierarchies due to filling the apportioned time up with either more or less piano, depending on how large the integer is. While these hierarchies represent nothing outside of the piece (we know that they are simply the result of an infinite mathematical constant), they allow us to investigate the nature of the groupings further. The instructions at the beginning of the score state that the "notes are played very softly and evenly, with no emphasis given to any note or grouping of notes" - Pisaro allows the groupings to arise purely out of the numbers, rather than the performer's interpretational decisions.

The main body of the score consists entirely of rows of numbers; no other graphics of any kind grace the pages, apart from some brief text at the bottom of each page indicating which of the fifteen pieces is displayed on the page, and the page number. The stark nature of this main body of the score (no extra text, but simply an endless stream of numbers) directs the performer towards a 'non-interventionist' approach described by Philip Thomas[1]. This approach exists "without reference to any external stylistic code" so as to "focus upon the production of sound within the parameters of the score"[2]; the severe lack of parameters within the main body of the score for pi clearly communicates the intensity of this focus to the performer.

Our perceptual processes tend to group the patterns of notes together in terms of similarity; three small integers, leading to short bursts of piano each followed by lengthy pauses, are grouped together, separated from larger integers which ren-

1 Thomas, P. "A prescription for action", *Ashgate research companion to experimental music*, ed. Saunders, J., (Farnham, 2009), p.91.
2 Ibid.

der longer pitched phrases. We don't remember all of the exact numerical values in each piece – we can't – but the grouping allows us to follow the constant changes of the values. American composer James Tenney's theories proposed in *Meta † Hodos*[3] describe our aural perception's process of formally breaking music down into sections of different sizes. The form of the music is realised out of the variance between sonic parameters of these different 'temporal gestalts', based on proximity and similarity; in *pi*, the silence between collections of notes is the main grouping factor, as all other parameters remain the same within each piece. There are similarities here with the way in which our perceptual grouping processes act upon acoustic beating patterns generated from indeterminate means: we tend to group these patterns of oscillating amplitudes (created from interference of wavelengths of similar frequency) into separate sections, dependent primarily on silence between beating patterns (but also beating speeds, dynamic and duration). However, these parametric variations do not hold narrative implications – they are merely factors of acoustics which arise from frequencies in close proximity, and thus the listener does not impose such teleological properties upon them[4]. Just like the continually changing integers in π – and the resulting phrase lengths in Pisaro's piece – the shifting beating parameters simply 'are'. Again, as with the π constant, there is no interpretational or expressive significance to how these materials are presented or how they are grouped; instead, they provide an extra-notational layer of perceptual engagement. The ebb and flow from the various durations of groups of notes encourage us to experience them as they are, to hear them in their surroundings. Indeed, Pisaro himself describes the music as containing "evasive, hard-to-remember contours"[5], suggesting the listener should not try to comprehend, but rather to simply *perceive*.

Number patterns have served as the basis for compositional structures for millenia, but rarely do composers ensure that comprehension of the number sequence should be the primary focus for the listener – often they are hidden by dense sound-worlds, available only to those who perform detailed analysis of the music. Pisaro's employment of the mathematical function as primary information carrier bears similarities with other music, such as the additive procedures in early Glass, Reich and Rzewski[6]; and also Tom Johnson's varied approaches to mathematical constructs[7] in creating compositions which expose the mathematical function as the main information carrier. However, the key difference between a piece like *pi* and these other examples is that there is no iterative process at play, but rather a seemingly straight-forward list of numbers with no immediately discernible, teleological procedure behind them. Due to the lack of iterative process, the piece transcends this forward momentum and the listener is faced with dealing with each sound in its own right – not as part of a logical, teleological series which entails anticipation, but simply as a sonic function of an infinite number. For me, this resulted in a perceptual state bordering on Kramer's verticality[8] – a real 'perception of the present' – as we listen to the sounds of the piano nestle in comfortably alongside the sounds of the atrium, merely numerical abstractions played out amongst other objects within the space.

The fifteen pieces are all of differing lengths (ranging between 5'00" and 54'10"), and each has a different pitch. Hearing the nine pieces which were performed consecutively over the five days, these shifts in notes resulted in an exploration of the nature of pitch itself. To be sure, the extreme registral differences in piano timbre colours one's sensation of the pitch, but this aspect is quickly diluted through the repetition. The pitches ceased to be well-tempered, and due to the almost devotional nature of reiterating the same pitch continuously, the listener is no longer reminded of the existence of other notes, similar to Scelsi's explorations with single note pieces. As opposed

3 Tenney, J. *Meta † hodos*, (Frog Peak Music, 1988).

4 Some notable exceptions are pieces by Alvin Lucier and James Tenney, which are centred upon the acceleration and deceleration of beating speeds.

5 Pisaro, M. "Writing, music", *Ashgate research companion to experimental music*, ed. Saunders, J. (Farnham, 2009) p.36.

6 e.g. Glass's *Einstein on the beach* and Reich's *Four organs*. See Keith Potter's book *Four musical minimalists* (New York, 2000) for further discussion of these processes.

7 Much of Johnson's *oeuvre* could be included here; the reader is referred to *Self-similar melodies* as a starting point for Johnson's theoretical work with number sequences.

8 As described in *The time of music* (New York, 1988). The description is particularly effective here, as the piece does not 'exhibit large-scale closure', a defining feature of Kramer's 'vertical' music.

to a drone, whose sustained surface texture invites you to focus on the spectral qualities of the tone(s) and how they operate within the listener's acoustic[9], the repeated subtle attacks of each note in *pi* continually re-focus perception onto pitch and I found myself being encouraged to explore the frequential space of this fundamental pitch, rather than other characteristics of the tone.

Constant repetition also drew my cognitive mechanisms towards comprehension of scale, and the differing durations of each piece. While the longer durations allowed a more sustained examination of the relevant pitch, I discovered that I attributed no more meaning to these differences in scale. Perhaps it was the superbly clinical performance of Thomas, who gave no special attention to the longer durations, allowing the perceptual identity of separate pieces (which pitch as their defining parametric indicator) to be as seemingly arbitrary as the number sequence itself.

I use the word 'representation' in the title with slight trepidation, as it almost implies that the pieces are at best joined at the hip with that which they represent, at worst subservient to them: these pieces are artistic objects in their own right. However, there is no sense that Pisaro is manipulating an existing infinite mathematical function to his own ends, to create a finite artistic object which acts as a vessel through which he can communicate. Instead, the manner in which the piece is constructed feels very much like Pisaro himself is subservient to the constant, creating a structured environment through which the numbers can attain a voice for themselves.

9 e.g. perception of beating in higher-order harmonics, standing waves apparent within the space, combination tones and other psychoacoustic factors.