

Born out of chaos: Composing cybernetic music

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unpublished conference paper not previously published nor before another journal for consideration

Forbidden Planet composers Louis and Bebe Barron employed technological innovation, theirs the first tape machine in 1940s America, building sound making circuits taken from Norbert Wiener's schematics in *The Human Use of Human Beings: Cybernetics and Society* (1948). Their elaborate precarious cybernetic systems lived, albeit ephemeral and non-recoverable sonic lives. Recalling this time, Bebe in 1997 affirmed Wiener's assertion that equations had a life cycle of their own and that once they were gone they were gone. "We would just sit back and let them take over".

Beginning with the Barrons, I explore and reflect on my own and others' approach to cybernetic composition relating this to my research on 17th century alchemy.

cybernetic, alchemy, error, mapping, our glassie azoth

Dafydd Roberts (MA, PhD) has made music as Our glassie Azoth since 1993. His music has been played by John Peel, Adam Walton (BBC) and Ed Pinent (Resonance FM). Biba Kopf in *The Wire* describes Our glassie Azoth's first CD as "a fabulous delirium of competing frequencies". Subsequent releases were "Emerging at some distant extreme of experimentation...Weird, wonderful alchemy" (Tom Ridge, *The Wire*) and "An astonishing meditation of noise suggesting Dr John Dee at work in his reverbatory, amazed and terrified by the unstoppable power he has unleashed" (Ed Pinent, *The Sound Projector*). Dafydd's music has appeared under various names on full length CDs, limited edition vinyl 7" and subscription series 12" and compilations on Plate Lunch, Camera Obscura, Earworm, Ochre, Spiffing, Ptolemaic Terrascope and Octane Grammophon. Our glassie Azoth have six full length releases with their most recent *Entelekheia* (2012) available for streaming or download from <http://ourglassieazoth.bandcamp.com/>

I think there's a connection between what I do when I make music and what I have done historically, albeit in the earlier days using 4 track cassette machines, scraped instruments and a simple reverb unit made to self-oscillate and nowadays using more often than not an array of convenient software equivalents, I think there's a connection between that and my initial research on 17th century alchemy and a more recent and developing interest in cybernetics. I am not 100% sure what the link is, how strong it is and even if I am forcing it. A singular characteristic of alchemy is after all to recognise and exploit the interconnectedness of everything material and immaterial.

What I propose to do in this talk is briefly survey and bring together some key aspects common to cybernetics, alchemy and approaches used in making my sound piece *Entelekheia*. The three key concepts that I want to look at relate to the (i) self-regulating system, (ii) map work and (iii) error. Across this brief paper I want to consider memory and human agency.

I should say I'm not entirely happy using the term alchemy as it conjures a recondite and lunatic farrago of ideas. Mid-17th century alchemy and its many natural philosopher practitioners were part of a world where more empirical science was set to emerge but boundaries were still blurred. It's well known that Boyle and Newton were fascinated by alchemy. My approach here is to consider cybernetics in terms derived from Wiener, as well as its more general sense deriving from metaphors and practices of steering or mapping.

I'd like to begin by briefly describing my background research. My PhD was on the alchemical ideas and writing of 17th century Welshman Thomas Vaughan (fl. 1650), including their relationship to ideas emerging from the then embryonic Royal Society. During this research, afterwards (and currently), I have occupied myself with one particular tape music project (by the name of Our glassie Azoth) music coloured and driven by many of those same ideas. In preparation for this paper I was surprised to see an old review of one of my pieces by Ken Hollings in *The Wire* describing my *The Magician's Heavenly Chaos* CD as "recalling the gigantic underground generators pulsing at the heart of Altair 1v in (the classic Sci Fi film) *The Forbidden Planet*". Hollings wrote that *The Magician's Heavenly Chaos* "traces a direct line connecting the cybernetic theories of Norbert Wiener with the alchemical diagrams depicted" in the artwork and liner notes (Hollings, 2004) I'd actually already decided that I wanted to write something about the composers behind *Forbidden Planet*. But in truth, when I made the *Chaos* CD several years ago now, I had never heard of Wiener nor even seen the film. At that time there wasn't for me any line connecting my music making and cybernetic theories. Writing this paper gives me an opportunity to consider and respond to Hollings' review .

Initially Wiener's cybernetic systems were "organisms" calibrated by a "closed circle of corrective feedback" (Dunbar-Hester, 2010, p.116). Later exponents of cybernetics found that they could take the principles governing such homeostatic systems, turn them back in on themselves and thus cause more complex behaviour. This particular approach was used to great effect by Louis and Bebe Barron in the electronic soundtrack they produced for *Forbidden Planet*.

Louis and Bebe Barron employed technological innovation, theirs the first tape machine in 1940s America, building sound making circuits taken from Wiener's schematics in *The Human Use of Human Beings: Cybernetics and Society* (1948). Establishing their own studio around these bespoke devices the pair quickly formed the heart of New York Village's avant garde. John Cage, David Tudor, Edgar Varese, Pierre Boulez and Stockhausen amongst many other notables frequented the Barrons' studio. Reluctant initially to call their

sonifications music, preferring the term "electronic tones" they recognized each circuits' sonic signature as a character in an aural drama unfolding in front of them. Their elaborate precarious cybernetic systems lived, albeit ephemeral and non-recoverable sonic lives (Youtube, 2009).

Recalling this time, Bebe in 1997 affirmed Wiener's assertion that equations had a life cycle of their own and that once they were gone they were gone. "We would just sit back and let them take over". The circuits spoke for themselves, it was "not our interpretation" and "working with our eyes and minds open" they marveled at "the organic rightness" the "awe and beauty coming from the circuits" (Youtube, 2009).

When I heard Bebe's regard that equations had a life cycle of their own and displayed psychological aliveness and organic vitality I construed a similarity with Vaughan's own conception of a living universe. Vaughan claimed that his proto chemical work was inspired from a childhood fancy, namely what he called the "continual action of fire upon water"(Rudrum p.521). He believed that "the System or Fabrick of this world" was a "certain Series, a link or Chaine" and that by the alchemical process of solve et coagula, dissolving the bonds of matter and recombining its quantum parts, matter could be perfected (Rudrum, p.328). Vaughan set-up a laboratory in 1650 with a future fellow of the Royal Society, one Thomas Henshaw, and the pair worked on saltpeter and may dew. Left for weeks on end in a closed room they returned to their vat of dew and "found it very full of little insects with great heads and small tapering bodies". (Roberts, 2001, p.34)What they believed had happened was generation *ex nihilo*, spontaneous generation, auto generation. Vaughan repeatedly marvels, in a way reminiscent of Bebe Barron, that "The whole earth is full of Intelligence"(Rudrum, p.350).

For Vaughan and the Barrons the system of nature, as homeostasis, can be excited by affecting the resistance of capacitors in a circuit or employing proto chemical means. Both concern themselves with apparently live and self-making systems.

Hollings' review indirectly points at an important aspect of the aesthetics of cybernetic composition. He cites the generators of Altair 1V. What are we listening to in that film, Foley effects which convey the representation of generators alongside a soundtrack of futuristic incidental music?

No, Wierzbicki regards the soundtrack as of significance in that the Barrons "completely obliterated...distinctions between music and effects" (Wierzbicki, 2005, p.37). Their soundtrack posits the possibility of sonification of data as music rather than electronics as effect. In turn this raised a concern, what was the role of the composer in a work that displaced them? Their personality and voice was muted.

Herbert Brun's (1918-2000) cybernetic compositions broach this specific. Describing his 1964 piece *Soniferous Loops* he stated his desire

was to prove to (himself)...and to other colleagues that (he) could program a computer...so that they would recognize it as a piece by Brun. It was polemic. The idea was in response to rumors that personality can't get through, that you can't compose with a machine (Dunbar-Hester, 2010, p.120).

Another cybernetic composer, Roland Kayn (1933-2011) set about purposefully engaging with the problem of what could be called "generative aesthetics", by this is meant the belief that through cybernetics beauty could be programmed (Patteson, 2012, p.49). Kayn responded to the philosophy of Max Bense, a professor at the Technical University in Stuttgart in the 1950s who was largely responsible for promulgating Wiener's writings across

European intellectual circles. Bense held that “the improbability of aesthetic states can be produced mechanically through a methodical combination of planning and chance” (Patteson, 2012, p.50). So whilst beauty could be part programmed by Kayn’s machines, what specifically could he or we say regarding the function of the composer?

We can come close to this answer by turning to the original etymology of cybernetics, as helmsman or to steer.

I want to try and draw alchemy, the Barrons and Kayn together now under this navigational heading and by seeing how such navigation relates to the ephemeral, to compositional practice, one strand of which I used in my sound piece *Entelekheia*.

Vaughan’s private memorandum collects his numerous attempts to regain secrets and methods now lost to him: “the Secret of extracting the oyle of Halcali, which I had once accidentally found...I could never remember how I did it, but made a hundred Attempts in Vaine”. In one of his tracts, Vaughan pleads: “ Give me an Art then that is a perfect intire Map of the Creation, that can lead me directly to the Knowledge of the true God”. For the Barrons Wieners schematics were just such a map, not pointing to God but to psychological sentience, and yet “over and over again” circuits burned up and they had to re-embark on their cybernetic journey of composition (Barron, 2009).

Kayn strikingly comments that : “the electric current has no memory, is governed only by the present, and is thus in great measure authorized to unleash improbable phenomena” (Patteson, 2012, p.59). For Patteson, Kayn in works like *Cybernetic Serendipity* (1987) “map out sonic scenarios whose results would be neither fully random nor fully predetermined, but rather ‘guided’ or ‘steered’ ”(Patteson, 2012, p.61).

The flaw and instability inherent in Kayn’s analogue circuit “is calculated as a generative principle...up to and including malfunctions” he wrote. It is Kayn’s privileging of the malfunctional essence integral within composition that prefigures more contemporary conceptions of glitch music. In terms of compositional approach, Kayn concluded:

The composer is entirely divested of his original function. He can merely decide whether to intervene, guide, and direct, or whether he is prepared to accept what emerges as an auto-generative procedure (Patteson, 2012, p.62).

Some brief words about making *Entelekheia*. Within Vaughan’s immanentist philosophy the concept of entelekheia is important. The term invented by Aristotle is sometimes translated as ‘actuality’ “but also as fulfillment, perfection and completion and has been interpreted by some scholars as referring not only to the state of actuality, but also to the process of actualization”. (Wisnovsky, 2003, p.22) Entelekehia relates as well to Vaughan’s protochemical approaches as it does the self- making cybernetic system.

My intention was to take raw files of data, scans of alchemical emblems and text made sonic by databending, signals fed back into themselves, reprocessed following a cybernetic systems approach realised using *Audiomulch* and *ProcessPack*. The prima materia of this work would be Thomas Vaughan’s private manuscript notebook, *Aquae Vitae non Vitae or The Radical Humidity of Nature : Mechanically, and Magically dissected, by the Conduct of Fire and Ferment* (British Library MS, Sloane 1741).

Curtis Roads’ *Microsound* asked do particles of sound exist

In certain sounds, such as the taps of a slow drum roll, the individual particles are directly perceivable. In other words, we can prove the existence of a granular layer through logical argument (Roads, 2004, p.27).

This notion of the granularity of the material world affords a good link with the (al) chemical idea of the alkahest or Universal Solvent as applied by Vaughan and Henshaw, means whereby matter could be reduced to its most quantum parts. Recalling an alchemical dictum *solve et coagula* matter is dissolved and recombined; then brought to perfection

Whilst Kayn's circuits were valuable precisely because of their flaws, databending takes an approach akin to Vaughan's raid on matter. Databending is

the alteration of raw data to influence the data's interpretation. Databending is commonly used to create in sound and image files effects that are exclusively digital in nature" (Intelligent Machinery, 2014).

Databending is an approach to new media wherein software is made to behave in ways it wasn't originally intended, to steer it, exposing flaws or producing a glitch.

Sorg describes

the idea that all data inside the computer is essentially the same, and that it just takes someone to peel the skin, and peer inside, either with ears or eyes, or whatever we care to translate the switching of 1s and 0s into...To me (he says) the most interesting thing about "data-bending"...is letting the data speak for itself, trying to listen to the data stream with as little interference as possible (Whitelaw, 2004)

I equate letting the data speak for itself as the same expectancy cybernetic composers have, whilst admitting Brun's anxiety about the composer's personality.

Vaughan's method is improvisatory. He privileges matter prizing the liminal which is always ephemeral. For Nick Briz in his Codec Tutorial databending is essentially a processural art of enquiry. Glitch comes when the misencoded file is opened in software and/or device used to view this file.

In this way the glitch is itself ephemera; existing somewhere in between these two points - and as technologies "upgrade" and error-checking protocols horde in, this particular glitch may cease to exist (Briz, 2010, p.15)

Set out thus as dull pseudo empirical stricture it's a problematic method. Not least for me as it perpetuates Brun's anxiety. Import an image file to Audacity to sonify. Effect with delay say and reopen elsewhere as a newfound image perhaps. Or use Hex Editors to elide, cut, insert text strings of import to the underlying code, save as an alternative file format. Purposeful trial and error fathoming the hidden structure, degrading it till nigh broken, operations somewhat akin to alchemy's divers cohobations.

Perhaps Vaughan's alchemical text, his composition if you will, his aesthetic-the cybernetic aesthetic- incarnates an ergodic engagement, recording and requiring of us path work, erring divagation through a terrain as much proliferated with matrices, loops, mazes and the

like as that which Mark Bernstein identifies as dominating contemporary digital poetics; here “repetition or recursion (is not) a flaw but a crucial constituent of meaning” (Nunes, 2011, p. 254) Robert Halleaux summed alchemy as “History of an error” which in this context seems adroitly apposite (Roberts, 1994, p.7) Moulthrop recognising that

Amongst the many transformations that have come with digital culture, we must include a new understanding of error. Once we undertake work or play with software, the original sense of this term-errare, to move without clear direction, departing from truth, norm, or some other analogue of unity-gives way to something more complex (Nunes, 2011, p.254)

To conclude, a cybernetic approach to composition historically and currently conceived struggles with and cannot resolve the conundrum foisted upon the composer such engaged. The auto generative system or databent sonic terrain affords novelty presents intelligence-not necessarily spiritually conceived but one that is nonetheless liminal. For me the crux is that as in early modern science or natural philosophy expectation is upon some miraculous effect, for those within Wiener’s sonic shadow there is a strong sense that implicit to the cybernetic matrix there is an ‘artificial’ yet organic vitalism. A databending approach itself is imbued with a metaphor of haphazard haptic divagation, erring maybe more than steering, an instinctive rather than intellectual paradigm. Rosa Menkman author of seminal *Glitch Manifesto* sheds good light on the intersection between cybernetic composition and a databending/glitch approach:

When you let loose of your agency, contexts and results get a different meaning which renews your thinking, sometimes it even renews your thought patterns. You get a bit lost and have to start from some new baseline, maybe building from nonsense or maybe you can find new meaning. I think this is a very useful, enriching way of working (Blumenkranz. 2012. p.25)

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