

# Disparate Kingdoms Tangled in the Abyss: Biodiversity, Artificial Intelligence and Audio-Visual Performance.

**j Milo Taylor.** London College of Communication / University of the Arts London.  
m.taylor@lcc.arts.ac.uk

## Abstract

The creation of an audio-visual performance responding to a brief relating to biodiversity provoked a range of questions and issues: some at the moment of the work's initial proposal, some in the development process and yet others retrospectively following the project's completion. An assemblage of issues, objects and technologies are introduced and framed from a variety of different perspectives (object-orientated-ontology, entanglement theory, political ecology) before a discussion of the creative work itself articulates the intentions that guided the aesthetic and technical choices.

A generative metaphor of “making kin” (Haraway, 2016) guided much of practice which embraces human and non-human participants. In regards to the former, the variable subject positions of creative technologist rubbed against various national affiliations<sup>1</sup>. Regarding the latter, various technologies (e.g. object-orientated code, DSP, A.I., interface design, OSC) were intentionally troubled by a confrontation with digitally rendered, (un)life-forms derived from the deconstruction of the visual taxonomies associated with Ernst Haeckel (1834–1919), Romantic, zoologist, biologist, artist and “scientific racist”.

The aims of the work were to unpack taxonomic bias in contemporary A.I. by using it to rework Haeckel's, often exquisite, images of natural forms, to thereby problematise inherited notions of biodiversity, hierarchical groupings of various kinds and the aestheticisation of nature in a post-(neo?) colonial context, and crucially, to create a meaningful audio-visual composition that responded successfully to the brief and could be shared with a diverse Mexican audience.

**Keywords:** artificial intelligence, audio-visual composition, creative coding, biodiversity, entanglement, decolonisation, Ernst Haeckel, taxonomy.

## 1. Introduction

“What would an ocean be without a monster lurking in the dark?  
It would be like sleep without dreams.”

Werner Herzog (Williams et al., 2015, p. 8)

Before any discussion of so-called artificial intelligence it would behoove us to consider in the first instance the (perhaps less trendy) ontological and epistemological issues around ‘intelligence’ *per se* in a broader sense. We might also ask how ‘intelligence’ relates to ‘information’, ‘data’ ‘knowledge’, and, might it be said, ‘wisdom’ (Vickers and Allado-McDowell, 2020).

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<sup>1</sup> Welsh / English / British / Mexican, indigenous / settler identities

In this time of synthetic media (e.g. (Waddell, 2019), (Dirik, 2020), (Vales, 2019)) speculative formulations such as ‘artificial information’, ‘robot knowledge’ and ‘machine wisdom’ might not be as outlandish as they first appear. While a deeper unpacking will have to wait for future work, such speculations provided a rich context for the creation of the work that forms the focus of this paper. What does seem clear however is that not only can contemporary A.I. display bias ((Silberg and Manyika, 2019), (Holdsworth, 2023)) along lines of race ((Heaven, 2023) gender (Packer et al., 2018), class and age (e.g. (Thomas and Thomson, 2023), but also that such bias is, in part, a consequence of historic conceptualisations and representations of the Other which play out either implicitly or explicitly in various stages of the AI pipeline (Chapman University AI Hub, 2024)<sup>2</sup>. It was in order to explore such aspects of contemporary A.I. via its practical use as a creative tool that the scope of this project was outlined.

At its centre this paper discusses an audio-visual performance created for a British Council funded sound art and experimental music festival that occurred in Mexico City in Spring 2023. The initial call asked for proposals that responded to the theme of biodiversity and given the UK-Mexico transnational mobilities baked into the scope of the funding criteria, the potential of the then-current wave of A.I. tools to address biodiversity from a critical post-colonial position seemed to offer an interesting challenge. From the very outset was an international collaboration initialised by Mexican group *Volta* and co-curated by the author with significant support provided by the *Casa del Lago*, UNAM. Creative Director of *Volta*, Juan José Rivas, writes the following in the festival catalogue by way of introducing his organisation’s work:

“After more than 10 years of activities and three international festivals, Volta has positioned itself as an obligatory reference in the Mexican and international scene with more than 100 artists and projects from all over the world being presented in the different activities carried out in different institutions and spaces such as the Laboratorio de Arte Alameda, the Cultural Center of Spain in Mexico, Centro de Cultura Digital, Museo Ex Teresa Arte Actual, Vernacular Institute and many others.” (Rivas et al 2023, p. 1)

To conclude this introduction, it is important to note that our collective work occurred within the post-pandemic context, further typified by significant effects of climate change, social turbulence and wide-spread economic and political uncertainty. As mentioned above, the funder’s call for proposals foregrounded the topic of biodiversity and as our work developed in shaping the festival (and our individual creative works) a central metaphor of “the abyss” emerged and it is to this that our discussion will now move.

## 2. The Abyss

“Representation in the abyss of presence is not an accident of presence; the desire of presence is, on the contrary, born from the abyss (the indefinite multiplication) of representation, from the representation of representation, etc.”

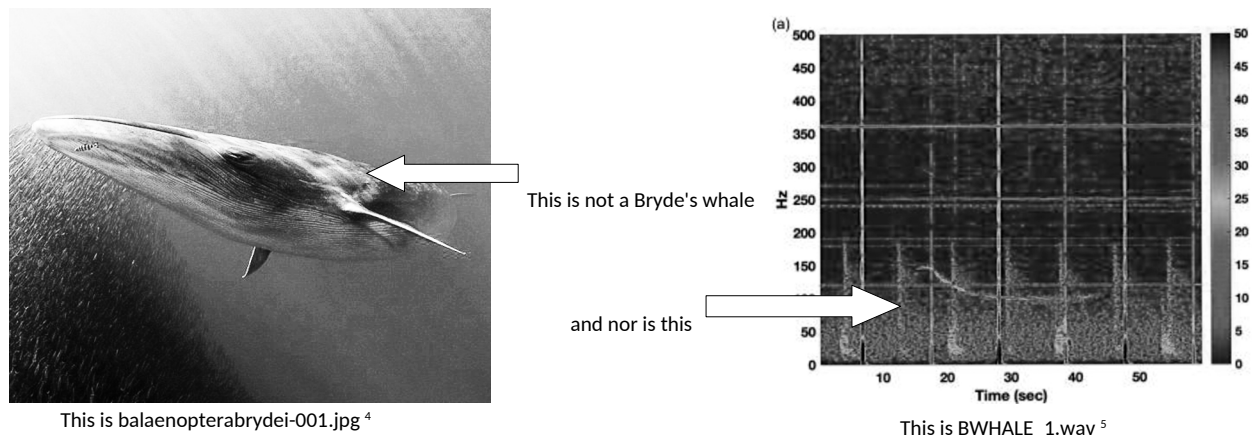
(Derrida, 1974, p.163)

Further to the profound issues of representation in language pointed to by Derrida, I have been troubled for some time by the apparent abyss that exists between non-humans and humans and

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<sup>2</sup> It has also been shown however that racial disparity can be reduced by such means (Kleinberg et al., 2018)“...unlike human decisions, decisions made by AI could in principle (and increasingly in practice) be opened up, examined, and interrogated.” (Silberg and Manyika, 2019). More broadly, one might support the argument that artists’ use of so-called artificial intelligence is a rather trivial use case and that the significant computational power dedicated to the production of A.I. art might be better directed towards solving a different set of problems.

the representation of one (nature) by the other (culture), specifically in relation to certain tendencies within my own creative practice. As a field recordist with an interest in acoustic ecology and biotic and cultural systems, I have at times grappled with the ontological and epistemological status of the digital audio file that is derived from an embodied recording / listening in place which is subsequently remediated in an aesthetic (and by now usually digital) context (e.g. the soundscape concert)<sup>3</sup> - see Figure 1. From a materialistic research perspective I can entertain the obvious utility of audio as data while bracketing out notions of “the real” as referent (Barad, 2007) and consider the wider entanglements of information, technology, subjectivity and discourse as performative articulations of historically and culturally situated practices of (auditory) being and knowing.



**Figure 1. Comparing two digital representations of the Bryde's whale (*Balaenoptera brydei*) (after René Magritte's 1929 painting *The Treachery of Images*)**

The obvious, and contrasting, utility of audio as art clearly connects to different actors and networks (human and non-human) and though some commonalities might be identified between the two (i.e. networks of empirical data (e.g. research institutes, laboratories, universities, companies &c.), and networks of aesthetics (e.g. concert halls, record labels, streaming services, universities (!), companies (!)), carefully nuancing these respective (non-exclusive) categories might serve to sketch out an outline of contemporary human-animal relations (and indeed human-human ones).

The anthropologist Tim Ingold notes that it is only humans who construct narratives of the relations between themselves and animals. Animals too have their own history of their interactions with humans – but this objective reality, this abyss if you will, is obviously unknowable and unthinkable for humankind. Ingold's own narrative of human-animal relations provides an “alternative history” of such interactions as laid out in his book [...] *Essays on Livelihood, Dwelling and Skill* (Ingold, 2000, p.61). His ideas helped me to re-conceive my **creative** practice ((field recording / composing / digital creation) as a **social** practice.

Ingold's thinking related creative social practice to livelihood (i.e. labour, income, extraction, ownership), to skill and to lived experience within specific social contexts and natural eco-systems. This expanded field consequently encouraged me to shift my internal conversation from formalist problematicisations of the variable nature and status of the digitally enabled-limited field recording to a fuller range of issues. I began to explore new horizons informed by such

<sup>3</sup> I am certainly not the first to have taken issue with this matter – for an example that discusses bioacoustics in particular see (López, 1998)

<sup>4</sup> (Bond, 2012) Accessed 17<sup>th</sup> March 2024

<sup>5</sup> (Thode et al., 2019) Accessed 17<sup>th</sup> March 2024

work as that of Ingold and Karen Barad, the philosophical paradigm of object-orientated-ontology and an broad range of socio-economic considerations informed by musicologist Christopher Small (Small, 1998). Small's ethnographic investigations of the meanings of performing and listening were originally formulated in the context of Western art music but seemed potentially applicable to my own work, and indeed that of many of my peers, in the contemporary context of globalised sonic arts, audio-visual culture and acoustic ecology.

Conceptual challenges towards the normative and historically situated, originally Canadian, practice of soundscape studies and acoustic ecology (Schafer, 1977) have been prevalent in recent times with many of the assumptions and hidden dependencies inherent in the field's original conceptions being questioned and reshaped by contemporary practitioners moving the discourse forward and generating an ever-evolving form (e.g Wright, 2022). The question of presence (as indicated by Derrida), or rather an *absented presence* of the non-human within (sonic) human discourse networks (Kittler, 1990) (including soundscape performances / installations / streaming platforms / vinyl / CD &c.) is picked up by some of these, with the following pithy statement from Kyle Devine summarising a central point being made here:

“Every system of inscription is tied to a system of extraction. Every discourse network is a resource network.” (Devine, 2019, p. 24)

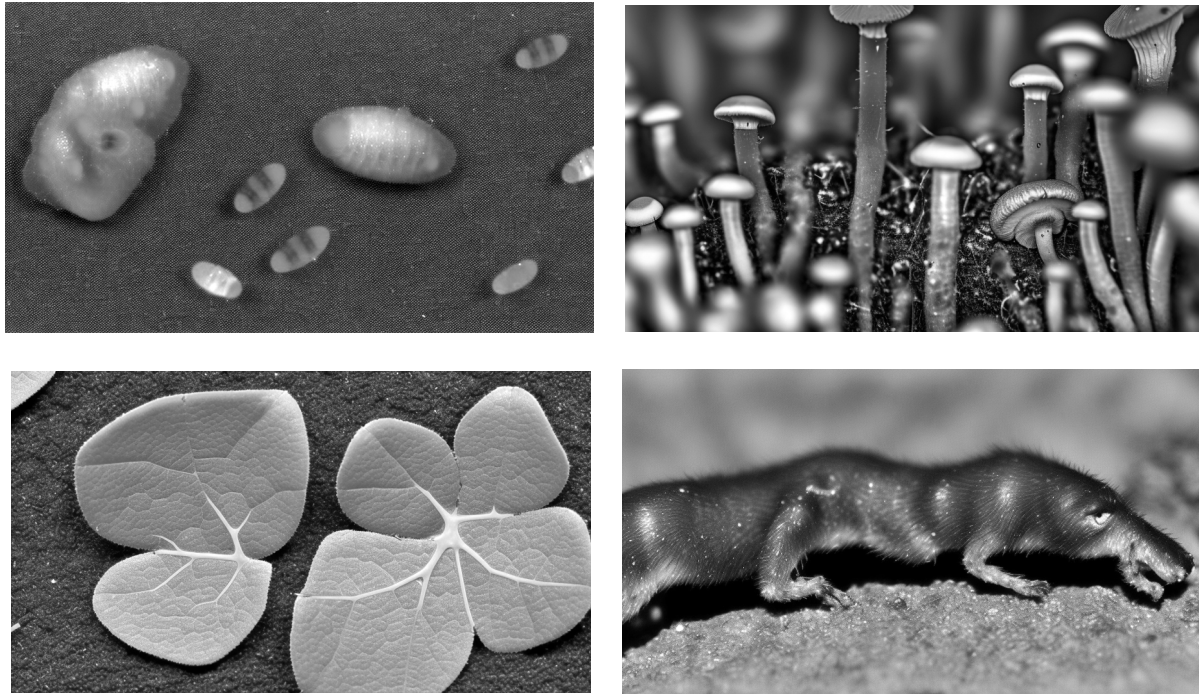
A further nuance of the exclusion of the non-human can be provided via a synthesis of Mundy's problematisation of *personhood* where the question of what may be included within this category (e.g. white settlers, corporations, straight men), and what has been excluded (indigenous peoples, women, queer subjectivities, animals) (Mundy, 2018, p.172) with Robinson's recent foregrounding of some difficult comments made by the central figure of soundscape studies within the Canadian, post-colonial context.

Without a significant degree of caution and consequent creative thinking there appeared to be a risk of my, presumably well-intended, environmental audio-visual performance absenting the very biodiverse entities it sets out to represent (imagine a concert format with computer playback of “natural” sound recordings through P.A. loudspeakers (Helmreich, 2010)). Supplementarily, on a more material level, in a largely state-funded project involving multiple trans-Atlantic mobilities, our participation in the international sound art discourse network entangled us in the international resource networks of the aeronautics, tourism and media industries. How then might this actuality be reconciled with the theme of biodiversity?

In recognition of this contradiction, it was felt that some kind of response to the pragmatics of precarious working practices within an epoch described as capitalist realism (Fisher, 2009) might serve to offset the keenly experienced paradox of the internationally mobile “ecological sound artist” (Gilmurray, 2017, p. 32). The conceptual thought, inspired by accelerationist philosophies (e.g. (MacKay and Avanesian, 2014), (CCRU, 2017)) was to seep the project in digital artifice, to fully immerse the work in the artificial and to render a work, though distantly referencing biotic entities (micro-organisms, fungi, plants and animals) via wholly synthetic means as shown in Figure 2. Silicon-based actants (e.g. A.I. prompts, digital code, jpegs and consequent .avi video, sequencing and DSP hardware, network communication &c.) were considered as meaningful participants in an expanded, post-digital, ecology. The move was not so much as to remove the natural / organic / biotic from the piece's formal structure, but more to challenge any sense of ecological determinism and instead to accelerate one's emergent and

tangled relations with the weird / eerie<sup>6</sup> digital representations of such biological entities of the kind produced, historically by such figures as Ernst Haeckel, and in our own time, by the mangled idiosyncrasies of so-called “artificial intelligence”.

“... in recent times, language is no longer paramount. Information/ data has superseded it. Scientific codification has “gobbled up” language. This does not mean that language has been completely destroyed, rather that another form of codification and categorisation, perhaps more sophisticated than mere words, is conditioning our experience of the world. For example, the body is now a genetic body, well codified.” (Pearce, 2010, p.92)



**Figure 2. Artificially generated images of protista (micro-organisms) (top left), fungi (top right), plants (bottom left) and animals made for *VOLTA - Abismal***

The taxonomic codifications associated with the digital, as pointed to by Pearce above, and of which A.I. is an emblematic contemporary example, simultaneously expand, renew and obsolete historical orderings of beings, objects and things. Such digital representations can exist in a number of related domains; natural language (meta-information, tagging, prompts); formalised abstraction in computer code and algorithm; as digital audio (multi-channel bitstreams of data at sample-rate  $a$  and bit-depth  $b$ ); as images, still and moving (image width \* image height at  $x$  frames per second in codec  $c$ ) – digital audio and video both being underpinned by definition by the symbolic representation of bytes, bits (see Figure 3 below) and at a deeper level (of the abyss?) as the manipulation of electron flow within proprietary circuitry.

Hence, the artist’s complicity in discourses of power (state apparatus i.e British Council (Beeley, 1971), (Biswas, 2021)), corporate bodies (Apple, British Airways (The Guardian, 2019), (British

<sup>6</sup> Two modalities of ‘the strange as identified by Mark Fisher in his 2017 book *The Weird and the Eerie*. While “the weird” involves something appearing where it shouldn’t (“the weird is constituted by a presence – the presence of that which does not belong.” (Fisher, 2017), p.27). “The eerie, by contrast, is constituted by a failure of absence or by a failure of presence.” (ibid.)

Airways, 2023) and computational paradigms (java) was intended to be articulated by the formal choices made and this work offers an effort to render a marked subjectivity not as a proponent of A.I. art, nor actually an audio-visual evangelical of any sort, but rather a critical practitioner exploring contemporary (unavoidably digital) paradigms with a set of key questions around the contemporary episteme of representation of the non-human via digital means, the effect of those tools upon ones own conceptions of the natural world and indeed an exploration of the resultant affective nature of such upon the audience during live performance.

Mac OS meta data of BWHALE_1.wav	Top level definition of an uncompressed BWF .wav <sup>7</sup>	
Kind: Waveform Audio	<WAVE-form> → RIFF('WAVE'	Put #1, 1, "RIFF" RIFF marker
Size: 8,641,992 bytes (18.6 MB on disk)		Put #1, 5, CInt(0) file-size
		Put #1, 9, "WAVE"
	<fmt-ck> // Format of the file	Put #1, 13, "fmt"
Duration: 01:00	[<fact-ck>] // Fact chunk	Put #1, 17, CLng(16)
Audio channels: Mono	[<cue-ck>] // Cue points	Put #1, 21, CInt(1)Wave PCM
Sample Rate: 44.1 kHz	[<playlist-ck>] // Playlist	Put #1, 23, CInt(2) 2 channels
Bits per sample: 16	[<assoc-data-list>] // Associated data list	Put #1, 25, CLng(44100)
		Put #1, 29, CLng(88200)
		Put #1, 33, CInt(2)
		Put #1, 35, CInt(16)
		Put #1, 37, "data" ' "data"
	<wave-data> // Wave data	Put #1, 41, CInt(0)' data-size

**Figure 3. Some formal qualities of an uncompressed audio datafile**

I offer here some problematicisation of creative choices leading to the extraction of material (data) from nature, in order to aestheticist it via audio-visual computation, and thereby to further the career of a contemporary “eco-acoustic” creative practitioner (Gilmurray, n.d.).

The interconnections between some of the entities mentioned above and the position taken is unambiguously informed by the reality of global warming crisis, its present and future impact upon biodiversity and the potential for sustainable audio-visual practices to make their contribution towards manifesting a liveable future for the widest possible range of life-forms. The field of ecomusicology (e.g. (Allen, 2012), (Pezanoski-Browne, 2015), (Challe, 2015)) has served to frame some of this thinking with the paradigm’s original discussion of environmental sustainability in relation to music, culture and nature, being refocused here upon audio-visual performance.

My hope throughout this project has been to avoid any hint of “greenwashing” <sup>8</sup> and to establish “an intervention at the level of the everyday” (Pezanoski-Browne, 2015, p.9) – this ‘intervention’ being inserted into to the lived experience of the audience, my collaborators in the festival, and most fundamentally, into my everyday working practice as a creative technologist. The notion of the abyss suggested a deep dive into unknown depths, and having donned some appropriate protective conceptual gear (outfitted below), I began to descend into the recursive and indefinite machine-generated multiplication of representation.

“the domain in which human persons are involved as social beings with one another cannot be rigidly set apart from the domain of their involvement with non-human components of the environment. Hence, any qualitative transformation in environmental relations is likely to be manifested similarly both in the relationships that humans extend towards animals and in those that obtain among themselves in society.”

(Ingold, 2000, p.61)

<sup>7</sup> (IBM Corporation and Microsoft Corporation, 1991)

<sup>8</sup> An “attempt to promote the style, but not the substance, of environmentalism as a ‘feel good’ consumer norm.” (Kahn, 2013, p.412)

The central conceit of the present work (hereafter referred to as *4TRK*<sup>9</sup>) is the argument that the disruptive nature of A.I. is in fact a “qualitative transformation in environmental relations” of the kind indicated here by Ingold and that creative and critical involvement with such technology might illuminate the nature of such change.

Before sharing in the latter section of this paper a brief discussion of the creative work itself, I would like to touch upon some supplementary areas of discourse that, alongside our primary themes of biodiversity and the abyss, provided vital orientation for the development of *4TRK*; namely, object-orientated-ontology (OOO), entanglement theory, and the political ecology of “eco-sonic” media. Each of these areas are expansive (and emergently interconnected) with significant amounts of related literature to explore. What is subsequently provided here is, by necessity, partial and contingent, but, it is hoped, indicative of the conceptual context in which the author was working and of potential directions for future work.

To conclude, it can be said that the intention was to propose an understanding of biodiverse reality as dynamic, immense and unfathomable (*inmensa e insondable*<sup>10</sup>). We were interested in presenting work that offered new and provocative ways to reconfigure the relationships between the planet and its inhabitants – reflecting, and participating in, a reality in which the human and non-human are linked in entangled relation. We were situating our respective practices alongside the living and the dead, the micro and the macro, and with the aspiration of kinship with indigenous Meso-American communities whose world-view, in their, and our own, alterity, might suggest a means of fathoming the unfathomable<sup>11</sup>. The *VOLTA Abismal* festival sought to reflect upon sound from multiple perspectives where bioacoustics, soundscape, hauntology and notions of the inaudible (Goodman, 2012) would meet each other in a fragile and dynamic series of encounters. On one hand, we recognised, celebrated and critiqued the techno-scientific paradigm - upon the other hand, we offered problematic questions around ecology, economy, ethics and aesthetics.

The partial knowledges we brought to bear upon such issues, and the awareness that human and non-human alike might exceed the limits of the knowable, led the author away from naturalistic / realist renderings of the biological, and towards Timothy Morton’s notion of *dark ecology*, which is, at least in part, closely associated with the adjacent philosophical paradigm of object-orientated ontology and it is to this topic to which that we will now briefly turn.

### 3.1 Theoretical Context: Object-orientated ontology (OOO)

“... the time is out of joint... ”

Hamlet Act I, Scene V (Shakespeare, 1599-1601, p.47)

“Acousmatic sound is disembodied sound emanating from an unseen source. It comes ‘from nowhere’ ...” (Morton, 2009, p.41)

The linkage between any soundscape recording and the total complexity of the living ecosystem from which it derives is weak and audio playback of any such mono-sensory source is a less-

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<sup>9</sup> i.e. *Pedair Teyrnas / Quatro Reinos / Four Kingdoms = 4 Teyrnas / 4 Reinos / 4 Kingdoms = 4TRK*

<sup>10</sup> How interesting that the Spanish word “insonable”, (lit. unsoundable) can be translated by the English word “unfathomable” with all its association with Britain’s maritime colonial history, seafaring and oceanic abyss.

<sup>11</sup> Due to the constraints of space a fuller engagement with, and account of such, will have to occur at a future time.

than-partial means of knowing that to which it supposedly refers (see Figure 1 above). This obvious claim is not however the argument being made here in relation to the central claims of object-orientated ontology. Graham Harman, among others, takes pains to differentiate OOO from arguments made by various Western philosophers that suggest the broader point that reality *per se* is ultimately unknowable to humans<sup>12</sup> (Harman, 2018). This would be the case regardless of the means used to capture / represent / share conceptualisation of any such exteriority (language, text, image, code, acousmatic sound &c.). Instead OOO identifies a “mutual darkness” of objects; such objects existing in an unfathomable abyss would be my rejoinder). OOO proposes that entities are mutually ‘withdrawn’ (Heidegger, 1962, p.279) from each other and “objects, whether real, fictional, natural, artificial, human or non-human – are mutually autonomous and enter into relation only in special cases that need to be explained rather than assumed.” (Harman, 2018, p. 12). Harman makes the counter-intuitive argument that direct contact between objects is in fact impossible, and that any contact requires a mediator in order for any contact to occur.

Further to this, Harman makes the point in respect to variable valuations of different forms of cognitive activity that knowledge (“what a thing is”) and know-how (“what a thing does”) are valued more highly than those things that cannot be expressed in “literal prose terms” and of these, “art comes immediately to mind, since the *primary* role of art is not to communicate knowledge about its subject matter” (p.44 (Harman, 2018).

These observations encouraged the development of my position introduced earlier regarding digital audio as data vs. digital audio as art with a re-casting of my practices relating to the latter acting as heuristic devices that do indeed tell me ‘something about something’ - but as mentioned earlier I have been left wondering for some time now what that ‘something’ could most fully involve. Perhaps what my normative soundscape / field recording practices reach are in supplemental excess to the partial audio representation of nature “captured” in any sound file derived from actual, real-world, real-time environments, and perform as much about the extensive discourse and resource networks in which such objects exist (Devine, 2019).

I would of course include my own subjectivity within this set of objects, as I would the other participating humans in *VOLTA – Abismal*<sup>13</sup>, but would also depreciate the importance of these actors and instead think through a fuller range of “object-object” relations. If this presents as a series of irrelevancies to the contemporary audio-visual composer, I would challenge any such position by drawing attention to an imperative drawn from Harman’s work to “*begin* by casting the widest possible net in aspiring to talk about everything”. Harman calls this a “flat ontology” (p.256) - an avoidance of any tendency to reduce an object (e.g. a living actant) via paraphrasing it via a literal sonic representation into a sum of (sounding) qualities and (sonic) effects (p. 257) (Harman, 2018).

Instead of a basing a creative response to the brief of biodiversity though a conventional deployment of a literalist composition based upon the audio capture of complex existing environments<sup>14</sup>, a different set of questions seemed to be emerging; in part informed Manuel

<sup>12</sup> Harman mentions Kant (“things in themselves”), Heidegger (“being”) and Lacan (the “real”).

<sup>13</sup> <https://voltamx.info/volta-abismal/> Arcangelo Constantini, Amy Cutler, Ella Finer, Ariel Guzik, Interspecifics, Cinthya García Leyva, Robert Piotrowicz, Rhys Trimble and Michael Z Prime.

<sup>14</sup> Soundscape / field recording / acoustic ecology practice is in no way being dismissed nor caricatured and there are many contemporary creators producing work with a vast range of different approaches. Notables might include Leah Barclay, Matthew Burtner, Kate Carr, Peter Cusack, Francisco Lopez, Patrick McGinley (aka murmer), David Monacchi, Tito Rivas, Chris Watson, Jana Winderen, Mark Peter Wright, Manrico Montero and many others. I was simply keen, at this moment to explore something of a different range of issues.



Delanda's thinking on assemblage theory (itself based upon this nascent concept in the work of Deleuze and Guattari) and Ian Hodder's related work on entanglement which seeks to unpack and explore an archaeological deep time of the relationships between humans and things (Hodder 2012). These two themes together seemed to offer an exciting counterpoint of their own to the *object-object* emphasis of Harman in the OOO camp.

### 3.2 Theoretical Context: Entanglements in Assemblages

“What is an assemblage? It is a multiplicity which is made up of many heterogeneous terms and which establishes liaisons, relations between them, [...] – different natures. Thus the assemblage's only unity is that of a co-functioning: it is a symbiosis, a ‘sympathy’. It is never filiations which are important, but alliances, alloys; these are not successions, lines of descent, but contagions, epidemic, the wind.”

(Deleuze and Parnet, 2002, p.69)

“The concept of assemblage is helpful. Ecologists turn to the assemblages to get around the sometimes fixed and bounded connotations of ecological “community.” The question of how the varied species in a species assemblage affect influence each other – if at all – is never settled; some thwart (or eat) each other; others work together to make life possible; still others just happen to find themselves in the same place. Assemblages are open-ended gatherings. They allow us to ask about communal effect without assuming them. They show us potential histories in the making.” (Tsing, 2015, p. 22-23)

Within lived experience there appear shifting entities occupying variable temporal-spatial localities – these might include sounds, images, viruses, capital flows, algorithms, complex life-forms, human subjectivities, technologies, intelligences, data, ecosystems &c. Let them all be called ‘objects’ in a manner inspired by OOO. These objects of life somehow exist alongside each other but, as we have seen, in the main remain “mutually withdrawn” from each other. Might the artist / composer's entanglement with this array of actants somehow be articulated? Could the hidden connections between those objects associated with the activity associated with the creation and distribution of an ecological audio-visual work be explored and somehow made explicit?

“As I wait for another plane home I ponder how much of my life is involved with people and things who keep things and bodies going – garage mechanics, plumbers, electricians, cable and broad-band providers, software code writers...” (Hodder, 2012, p.64)

Hodder, Professor of Anthropology at Stanford University, by using the notion of “entanglement”, enables a compelling encounter between the natural and human sciences (e.g. between material culture and anthropology). Additionally, as the quote above indicates, he also incorporates his lived experience (being stranded in an airport) into his academic writing. His narrative based upon his practice as a working archaeologist seeks to draw together the mutual dependencies of objects – “temporary bundles of matter, energy and information.” (p.4) (ibid.). He encourages us to think about things in a novel way and to approach them, from our human position, in a very general manner.

At the outset, we are asked to consider the following points; things, though mutually withdrawn (OOO) are *not isolated*; human-made objects are always associated (entangled) in discourse networks and resource networks, while objects that are not produced by humans are always part of inter-related eco-systems. Secondly, things are *not inert* - “matter, energy and information” are all unstable and subject to on-going change. Thirdly, the sameness of objects, their apparent

ability to maintain coherence over time plays out upon *different temporalities*. The transience of a sound or an animal's glance are examples used by Hodder to illustrate relatively short time spans with the scope of temporal reference subsequently widened to the biological time span of a human life, to geological duration in relation called mountains, valley-systems and the like. Fourthly, things often appear as *non-things*<sup>15</sup>; the omni-presence of certain things renders them invisible and they can become "background, frame or medium" and at such a point our relationships with them become non-discursive. Fifthly, the "forgetness (sic) of things" in both spatial and temporal domains. To explain this novel formation *forgetness*, an automobile is used as an example. We are likely to perceive a car as an isolated perceptual object, Hodder however emphasises that in actuality, the car is connected to many other things; the tarmac of the road, the mines where the iron ore was sourced to make the steel frame of the car, the factory where the car was assembled by humans and robots, the oil fields from which the plastics and fuel upon which the car further depends and so on.

In relation to the temporal domain, Hodder suggests that we consider the historical dependencies of things – the example of the wristwatch is used to unpack the dependencies of a contemporary timepiece upon distantly ancient conceptions number systems and astronomy (based upon sexagesimal number systems as used by Sumerian (c.3500 BCE), Babylonian (1894 -539 BCE) and Ancient Egyptian cultures (c.1570- c.1069 BCE), Roman annual cycles (Caesarian calendar) and the wheel.

"The defining aspect of entanglement with things is that humans get caught up in a double bind, depending upon things that depend upon humans. Put another way, things as we want them have limited ability to reproduce themselves, so in our dependence on them we become entrapped in their dependence upon us." (p. 88)

Hodder's exposition is extensive and it offers a rich seam of thought to rework in relation to contemporary audio-visual composition. It is hoped that future work will allow a more nuanced and developed response to Hodder's insightful perspective, and without doing his work any disservice, a rather reductive summary of the defining aspects of entanglement can be expressed in the following sets of dependencies:

**Entanglement = (HT) + (TT) + (TH) + (HH)**

Wherein entanglement involves the relations between *humans and things* (HT), *things and things* (TT), *things and humans* (TH) and *humans and humans* (HH).

Within this framework it became possible to problematise the creation of *4TRK* and to explore the limits of my competencies and practice, determined as they were by digital media, my lifeworld (Buchanan, 2008) in the global north and my own particular racialised and gendered subjectivity tangled up with this historically and geographically bound assemblage of humans and things.

The U.K-Mexico collaboration offered an opportunity to undermine some of problems perpetuated by OOO and its allies in posthumanism, new materialism and related discourses – namely their recent tendency that "has sometimes reinforced, rather than resisted, the erasure of racial politics from the nature / culture divide, locating itself in seemingly unmarked discursive traditions that on closer examination comes from white, European, masculine voices." (Scott,

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<sup>15</sup> We might think of Marc Auge's casting of airports, supermarkets, telephone kiosks, chainstore, motorways &c. as "non-places" as informing this aspect of Hodder's thinking. (Augé, 1995)

1988, p. 170). Such unmarked discursive traditions are of the type associated with Ernst Haeckel and his many European peers in their nineteenth century endeavour to capture, collect and order representatives of the natural world as well as the subsequent aestheticisation thereof. A mutated form of such extraction and abstraction is surely continued today by the neo-colonial territorialisation of nature / culture by techniques and practice of surveillance capitalism (Zuboff, 2019) within the digital regime (Hollings, 2014) more broadly and A.I. more narrowly.

#### 4. Work Discussion: *Pedair Teynas/ Four Kingdoms/ Quatro Reinos (4TRK)*

“The affinities of all the beings of the same class have sometimes been represented by a great tree. I believe this simile largely speaks the truth.” (Darwin, 1859, p.143)

While writing the original proposal, I needed to find an entryway into the vast topic of biodiversity<sup>16</sup>. I knew of Ernst Haeckel and was aware of his influence upon a number of artists<sup>17</sup>. In making an initial literature review, and recognising the great variability and variety of life on Earth (Mora et al., 2011), I soon came across a vocabulary of taxonomic rank (species, genus, family, order, class, phylum, kingdom, domain).

A normative discourse describing the classification of living things would refer back to antiquity noting that while Aristotle (384-322BC) classified animal species in his *History of Animals*, it was only in the early eighteenth century that separate ‘kingdoms of life’ were differentiated<sup>18</sup>. Haeckel’s work was situated in this lineage and expanded a “two kingdom” schema (*Regnum Animale* and *Regnum Vegetabile*) in 1866 to include protista (single-celled life-forms) alongside plants and animals (excluding Linnaeus’ *Regnum Lapideum* – kingdom of minerals). The “tree of life” visual metaphor, mentioned in the above quote by Darwin and published by Haeckel in 1866 (see Figure 4. below) has been described as one of the first models of biodiversity (Hossfeld and Levit, 2016). The subject of some contemporary disagreement, there is now thought to be five<sup>19</sup>, six<sup>20</sup> or seven<sup>21</sup> distinct kingdoms of life – though the very term “kingdom” has also been challenged (e.g. (Moore, 1974), (Balch et al., 1977), (Woese et al., 1990)). Haeckel’s work offered me a workable counterpoint to my pre-existing soundscape (audio) practice within this expanded (visual) context and the “four kingdoms” of the piece’s title are directly derived from the development of modern taxonomic biological nomenclature, for which Haeckel is well-known – having originated such terms as phylum, phylogeny and ecology. One

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<sup>16</sup> I hope that it is clear that I am making no claim to be specialist in the field, nor do I have a very nuanced hold of the multifarious aspects of biodiversity. There are, I suggest, problems in inviting artists to respond to such calls as described in this paper. Artists have very specific sets of skills and references, for organisations to instrumentalise creatives in order to demonstrate environmental responsibility for example through the production of aesthetic objects, would seem to be less than ideal for artists, organisations and audiences alike.

<sup>17</sup> e.g. Leopold and Rudolph Blaschka, Karl Blossfeldt, Hans Christiansen, Charles and Ray Eames, Antoni Gaudi, Zaha Hadid, Henry Moore. See also (Jungck et al., 2019) for a contemporary, computational expansion of Haeckel’s interdisciplinary legacy.

<sup>18</sup> In 1735 Carl Linnaeus’ (‘the father of modern taxonomy’) *Systema Naturae* describes two kingdoms of living things – the “animal kingdom” (*Regnum Animale*) and the “vegetable kingdom” (*Regnum Vegetabile*). Interestingly he also included minerals in his classification system. The parlour-game ‘Animal, vegetable or mineral?’ recalls this Linnean taxonomy in the popular imagination.

<sup>19</sup> The UK, India, Brazil and others tend to use a five kingdom model (1. Animalia, 2. Plantae, 3. Fungi, 4. Protista, 5. Morena).

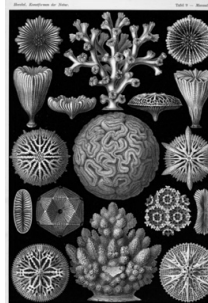
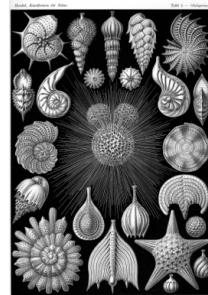
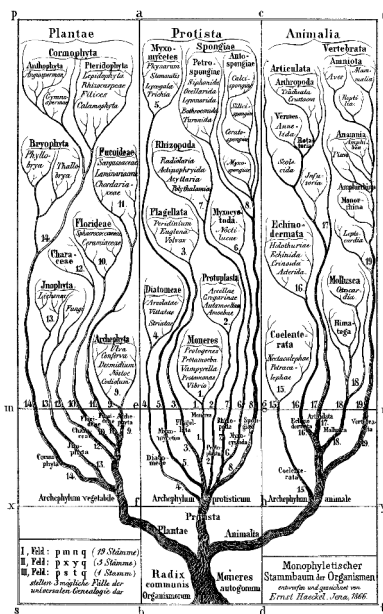
<sup>20</sup> Traditionally associated with the USA and Canada (1. Animalia, 2. Plantae, 3. Fungi, 4. Protista, 5. Archaea, 6. Bacteria)

<sup>21</sup> Developed by researchers working on the open-source [Catalog of Life](#) but yet to experience wider adoption. It appears, to the non-specialist, that work regarding high-level classification and taxonomic richness is on-going. e.g. (Ruggiero et al., 2015)

of four kingdoms of life forms a distinct section of the performance which was structured as follows:

- Prelude
- First Movement: Protista
- Second Movement: Fungi
- Third Movement: Plantae
- Fourth Movement: Animalia

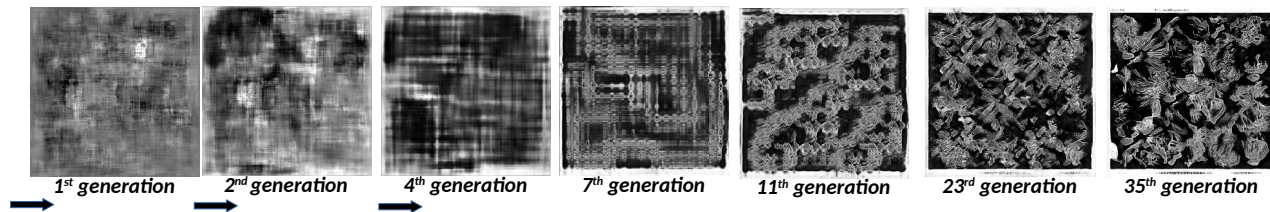
It is important, and actually central to my intentions, to note that Haeckel’s work and worldview has been the subject of criticism and reexamination from a variety of perspectives over the years, and this is not the place to further rehearse these points (e.g. (Gould, 1977), (Medicus, 1992), (Gasman, 1998), (Gilbert, 2006), (Jackson and Weidman, 2006), (Richards, 2008), (Aita et al., 2009), (Jenner, 2022)). I hope it sufficient to say that I have recontextualised certain elements of his practice which occurred within a context of German Romanticism, colonial discourse (e.g. (Haeckel, 1882)), eugenics, European industrial extraction and the development of evolutionary biology. Mindful of the historicity of Haeckel’s imagery I was interested in destabilising conceptions around the fixity of forms and the historical privileging of certain objects over others (e.g. living / unliving, human / nonhuman, fungi / protista, animals / plants).



**Figure 4. (left) Haeckel’s three kingdoms model (plantae, protista, animalia) presented as a ‘tree of life’ in *Generelle Morphologie der Organismen* (1866). (centre) Black and white plates from *Kunstformen der Natur* (1899) and (right) uncanny “gunk” imagery generated by machine learning (2023) trained on a sample of *Kunstformen der Natur* and used as visual material during the prelude of *4TRK*.**

Figure 4. above (right) shows examples of such unstable imagery generated by machine-learning algorithms and which I began to call “gunk” following contemporary composer Jennifer Walshe’s entertaining thinking about A.I. (Walshe, 2023) and Figure 5. below illustrates the gradual appearance of the weird and eerie morphologies used in *4TRK* beginning (at left) in unstructured noise (i.e. random distribution). The changing morphology of these images over iterative generations suggested a metaphor; on the one hand the evolutionary development of actual biological objects (i.e. protista, fungi, plantae, animalia) over evolutionary temporalities, on the other hand, of the changing human conceptions of natural life within cultural time (e.g. Aristotle, Linneaus, Haeckel, Ruggeiro). On the other other hand (sic!) the gradual process of

creative development over the duration of this project; beginning in a state of uncertain unknowing, through a middle period of speculative experimentation, followed by another clearer phase of committing to what has emerged, and concluding with final implementation; an immanent “isness” of the complete work.



**Figure 5. Gunky “unlife-forms” emerging from noise and evolving over 35 generations of machine-learning**

At this point I feel the need to draw the conversation in closer proximity to the lived experience of my studio work while developing 4TRK as emphasising the creative practice is at this juncture a vital move in thinking with and through the human-thing entanglements that I have described thus far.

In the very early stages of development I found myself coding in the java-based *Processing IDE* (Fry and Casey, 2001) chosen for its accessibility, inclusivity, expressivity and, not least, the fact of it being an object-orientated programming language<sup>22</sup>. Code as a fundamental part of the project and questions around the affordances it offers, the communities to which it connects, and those whom it excludes all played their part in guiding this choice. The dependencies, relations and “structures of feeling” (Williams in eds. Sharma and Tygstrup, 2015, p.20) performed by my exploratory coding practice were intended to *rethink* and perform an “unforgetness” of the ubiquity of computation in my everyday life and work.

What emerged quite quickly were issues around any claimed alterity of FLOSS / open-source practices in reductive comparison with proprietary models of computation regarding sustainability, impacts upon biodiversity and what might be called, in a manner informed by Devine, a political ecology of computation (see (Devine, 2019), (Nost and Goldstein, 2022)). Although the *Processing Foundation* does provide a *Land and Digital Acknowledgment* noting that “We, and our devices, exist on stolen land. Our digital infrastructures exist globally through foundations of anti-Blackness, anti-indigeneity, Orientalism, racism, heterosexism, femmephobia, slavery, classism, colorism, ableism, ageism, surveillance capitalism, sizeism, and religious imperialism”<sup>23</sup> it would also appear however that more significant action can be taken in order to offer fuller redress of these uncomfortable and self-evident truths (holloway and Xin, 2021), (Corbett, 2024).

The super-modern practice of coding in an environment like *Processing* nevertheless does offer relatively open scope for the expression of audio-visual ideas and, to counter its unavoidable dependency upon formal logic, English language, intellectual labour and a consumer-driven technological paradigm, I was considering, while coding 4TRK at home, how these programming

<sup>22</sup> “OOO merely borrowed the phrase ‘object-orientated’ from computer science and was not directly motivated by developments in that field.” (Harman, 2018, p. 11). Harman does though go on to mention some passing resemblance however, “‘object-orientated programs’ make use of independent programming ‘objects’ that interact with other objects while the internal information of each remains hidden (or ‘encapsulated’) from the others”. (ibid). A deeper exploration of OOO philosophy in an object-orientated programming environment (Processing for example) would be a fascinating experiment to undertake.

<sup>23</sup> <https://processingfoundation.org/home/land-and-digital-acknowledgements>

objects sit alongside other objects - such as any micro-organisms, fungi, plants, animals and children or friends I had, intentionally or otherwise, in my household at any given moment. Via formal logic and object-orientated practice I began to explore ‘becoming animal’, ‘becoming biotic’ in the kingdom of Javacode.

There was plenty of scope to implement a creative strategy based upon sonification - indeed two specific pieces of recent research were especially seductive “Probing nanomotion of single bacteria with graphene drums” (Rosłoń et al., 2022) and Andrew Adamatzky’s work on “the language of fungi” (Adamatzky, 2022) yet such an approach was resisted and the main part of the work was a speculative imaginative endeavour inspired by such impossible thoughts as “If I were I fungi composer, what would I want to hear?” and “If I were a protista what would I want to sing?”

“music no longer evokes animality but rather itself becomes animal.” (Campbell, 2017, p. 122)

Such disconcerting disruptions of normative practice opened up new thought at some productive distance from the easy-to-reach and often overdetermining affordances of specific code libraries, useful though such objects can be<sup>24</sup>. What emerged in the studio was closer to the kind of thought found in the magical realist literature of such post-colonial writers as Jorge Luis Borges (see the opening of the Conclusion below). Campbell (2017) discusses a comparable aspiration of kinship with the non-human (becoming-animal) in relation to the composers Michaël Levinas, Gérard Grisey and Georges Aperghis. Campbell writes of extreme amplification in the work of Levinas whereby “it becomes ‘an almost animal living mob” (Campbell, 2017, p. 122), the absented presence of the great whale throughout Aperghis’ version of Moby Dick and Grisey’s use of variable temporalities in the late work *Le Temps et l’écume* (1989) wherein “three times - ‘normal’, extremely compressed and extremely slow, indicate the temporal frames of humans, birds and whales.” (ibid.)

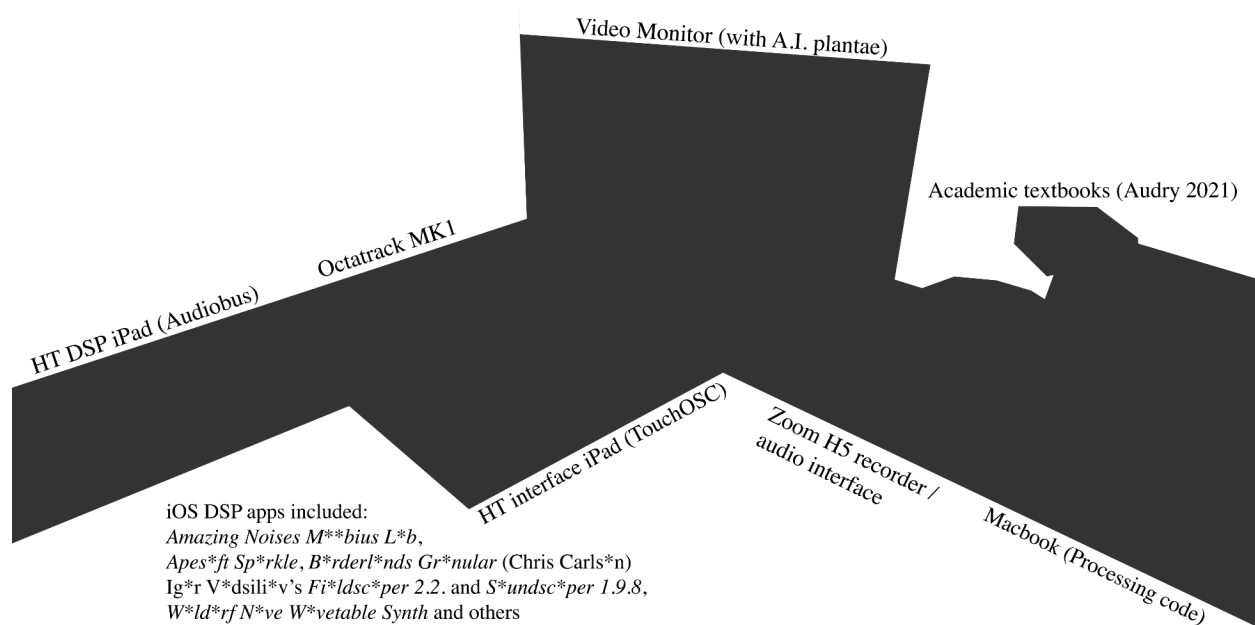
Although I was working with a broader range of biotic objects, not only animals, and although my work was audio-visual in nature rather than being absolute music, the notion that a piece might not seek to evoke life, but to instead become it, was an important, inspiring and creatively challenging consideration.

While being reasonably ambitious (and somewhat anxious) in conceiving the piece in such an idiosyncratic manner, I was simultaneously also pragmatically engaging with important logistical limitations - the processing power of the standard university MacBook that I was working on<sup>25</sup>, the weight limit of my baggage allowance on British Airways, the time I had to develop the project, the fee being offered me and so on. Consequently, it was decided that the Macbook would be used wholly to process visual elements, and audio would be handled by an Electron Octatrack (a complex, durable and reliable eight track performance sampler) thereby enabling the maximum amount of computational power with a minimal amount of equipment. One major shortcoming of the Octatrack is a rather restricted form factor and so a multitouch *iPad* interface was customised which enabled a much more flexible way to control sequencing and improvisational performance over all eight channels of audio during live performance. A second *iPad* with various multitouch DSP tools was used to augment pre-programmed sections of material performed on the Octatrack. These rather banal, generic and everyday objects were chosen for exactly such qualities - their everydayness - again a move to *rething* and *unforget* ubiquitous digital devices.

<sup>24</sup> Although indeed several of these were in fact used (e.g. camera vision, blob detection, video playback, Open Sound Control) others were not (e.g. particle systems, 3D meshes)

<sup>25</sup> 2Ghz Quad-Core Intel Core 15, 16 GB 3733 Mhz LPDDR4X





**Figure 6. Some withdrawn ‘things’ assembled in North Wales during the development of 4TRCK**

## 6. Conclusion and Future Work

“animals are divided into: (a) belonging to the Emperor, (b) embalmed, (c) tame, (d) sucking pigs, (e) sirens, (f) fabulous, (g) stray dogs, (h) included in the present classification, (i) frenzied, (j) innumerable, (k) drawn with a very fine camelhair brush, (l) et cetera, (m) having just broken the water pitcher, (n) that from a long way off” look like flies”. In the wonderment of this taxonomy, the thing we apprehend in one great leap, the thing that, by means of the fable, is demonstrated as the exotic charm of another system of thought, is the limitation of our own, the stark impossibility of thinking that.”

Borges’ *Celestial Emporium of Benevolent Knowledge* (Foucault, 1968, p. xvi)

This project has been an adventure through the abysmal depths of contemporary computational capitalism. Various objects have been encountered along the way and a number of limits and thresholds reached. A few lessons have been learned.

There is the opportunity for the contemporary sonic practitioner to acknowledge and situate their practice within and alongside structures and systems of exploitation and extraction in the global South as the post-colonial context is keenly perceived by the British, (might one dare say, Welsh) visitor to contemporary Mexico. Such problematic legacies in the broader global context are being articulated by many (Tan, 2021), (Robinson, 2023) as well, from a North American/ English perspective, by the musicological *Sounding History* podcast<sup>26</sup> (Smith and Irvine, 2021) yet there is the risk that any decolonisation of sound art / audio-visual practice operates within an ongoing discourse and practice of empire and neo-colonial territorialisation, appropriation, extraction and incorporation.

Further to these issues another unavoidable conclusion; in order for the contemporary artist to make a meaningful contribution to a sustainable praxis alongside any discourse around biodiversity, funders and commissioning bodies might think though their budgeting, the scope

<sup>26</sup> Which relates Western art music to three main themes of labour, energy and data and provided a useful encouragement to the scope of this paper

and scale of deliverables and the means by which they might offer fair remuneration for artist labour. If not, there is the potential that what is being performed is, in part at least, the same exploitative practices that are contributing wider environmental and social damage.

The aim of the current work has been to use an assemblage of interconnected concepts, political provocations and digital tools in order to deconstruct and decolonise my own personal creative practice, notions of biological taxonomy and the relative status of human and non-human actors (Holdsworth, 2023) within a digital paradigm that simultaneously enabled and limited the scope of this audio-visual performance. Whether I have been successful surely remains open to question, however the intention remains to further a discourse and praxis of decolonisation enabled by a “critical music” (Barrett, 2016) participating fully in the troubled reality of the Chthulucene (Haraway, 2016).

In terms of future work a few speculative notions arose over the creation of *4TRK* in the stimulating nexus of computation, intelligence, diverse life, audio-visual performance and sustainability:

- **Speculation #1:** Development in computation may soon allow for the creation of highly complex and intelligent audio-visual systems. Such systems might be sustainable, utilising renewable energy sources and minimising their environmental impact and could even be considered a form of life in their own right as they will be able to adapt and evolve over time. These systems could incorporate technologies such as artificial intelligence, machine learning and advanced robotics to create immersive performances that integrate auditory and visual elements in novel ways.
- **Speculation #2:** Advancements in computation may also enable the creation of new forms of sustainable life that are able to interact with their environment. These life forms may have the ability to learn, adapt and evolve in response to their surroundings, potentially leading to the emergence of new forms of art and entertainment. This could also lead to the development of new sustainable technologies that are capable of harnessing and transforming energy in more sustainable ways than at present.
- **Speculation #3:** We may see a convergence of computation, audio-visual performance and sustainability where intelligent systems powered by sustainable energy can perform complex audio-visual tasks. These systems could be designed to learn and adapt like living organisms. As these systems become more advanced, they may even exhibit a form of consciousness, blurring the line between artificial and biological intelligence. Additionally these new life forms may be designed to be highly sustainable with a focus on minimising energy consumption and reducing environmental impact. They may operate on renewable energy sources such as solar or wind power and may incorporate advanced recycling and waste management systems to minimise their ecological footprint paving the way for a more sustainable future.
- **Speculation #4:** We can consider the creation of entirely new forms of life, based on silicon or other materials. However, in order to ensure the sustainability of such life forms and their ecosystems it will be necessary to develop novel approaches to energy generation and resource management that are compatible with the needs of these new entities. This will require a significant shift in our current practices and values, as well as a willingness to embrace new forms of technology and collaborate across different disciplines and sectors. The emergence of these new forms may mark a profound shift in the nature of existence and the relationship between humans and technology. While their



emergence may pose new challenges and ethical considerations, it also holds almost unimaginable potential for new forms of creativity, intelligence, and sustainability<sup>27</sup>.

To conclude: In a manner extending outwards from Small's notion of musicking, a contemporary "sonicking" might involve a broad range of objects and actants encompassing the speculative points shared above, and indeed the other areas discussed earlier in this article. This expanded scope of thinking has shaped new conceptions for me of what an ecological audio-visual performance might involve. I make this move not in isolation, but in entangled kinship with others; the many thinkers cited throughout this text, Ernst Haeckel, you the reader, and not least my collaborators during the *Volta – Abismal* festival. I would like to acknowledge Arcangelo Constantini, Amy Cutler, Ella Finer, Ariel Guzik, *Interspecifics*, Cinthya García Leyva of *Casa del Lago*, Robert Piotrowicz, Rhys Trimble, Michael Z Prime, British Council staff, my co-curator Juan José Rivas and the unnamed sound engineers, venue technicians, drivers, security staff, cleaners, caterers and translators who made this work possible.

"Environments are constituted in life, not just in thought, and it is only because we live in an environment that we can think at all." (p.60) (Ingold, 2000)

There is also another register of acknowledgment addressed to a non-discursive space withheld from me. The dark interiors of the things that populate my lifeworld, those objects with which I share my studio and with which I am entangled that help me think, act and be in the world. To those objects, to those complex assemblages, to those "temporary bundles of matter, energy and information" I send appreciation, while recognising the violence embodied in their silences and being mindful of their afterlives once they have left me behind.

In every meaning of the word, an abyss starkly exists between my aspirations for a sustainable and non-extractive practice and the lived reality of a practicing sound artist caught betwixt precarious labour practices, climate crisis, machine-learning, state apparatus and inter-object negotiation within the digital regime. Without doubt it is clear that this abyss remains profoundly deep and in significant need of illumination, populated still, as it is, by monsters of many kinds.

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<sup>27</sup> These four speculations are edits I made of ChatGPT responses to the prompt "Make a speculative statement about computation, intelligence, life, audio-visual performance and sustainability".

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