

Undoing the Human: *Wild* Art and a Poetics of Ecology

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Abstract

The contemporary turn towards 'wildness' and 'rewilding' seeks an intimacy and bewilderment of subjecthood. While wildness as a western concept has very problematic histories, in its reclaimed usage, Halberstam and Nyong'o argue that it can also enact an 'anarrangement' of normalised boundaries and categories. Gordon Pask's 1957 chemical computing experiment that spontaneously grew an ear in response to environmental stimulus poses similar questions about the relational volition of matter, confronting not only the artist or scientist's control of their research, but the fundamentally colonial notion of a world composed of discrete parts. This article engages with a critical reading of Halberstam and Nyong'o's writing to propose parallels between their conception of the wild and the science of self-organisation, both of which engage in aspects of decolonial critique through a troubling of the colonial mindset that separates in order to maintain mastery. Pask's experiment suggests the possibility of alternative discourses and practices that emphasise an ethics of relation through techniques of wilding.

Keywords: ecology; Jack Halberstam; poethics; self-organisation; wild

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A Dark and Stormy Night

A natural historian must change [their] viewpoint to suit a changeful system (Pask 1960: 233).

It has all the resonance of a fable, or perhaps science fiction, or even a B-grade horror movie: surges of electricity, an experiment gone wildly wrong and awestruck scientists. One bewildering late night in 1957, in the midst of an extraordinary and experimental life, the scientist-artist-theorist Gordon Pask and his co-conspirator Stafford Beer precipitated something truly strange and resolutely ecological in its nature. The two had been experimenting for some time with chemical computing, inquiring into, as Pask wrote, 'the possibility of "growing" an active evolutionary network by an electro-chemical process' (1961: 105). But at some time during a long and wild night of experimentation, events took a turn into the Twilight Zone. On a whim, Pask and Beer dangled a microphone attached to the system out of the laboratory window into the busy street and subjected the chemical computer to noise vibrations. Extraordinarily, the computer then 'grew an ear' of its own volition (Beer 2001: 553–55). In this event of radical self-organisation, the experiment seemed to self-generate new potentials and head in a wilder direction than its human instigators had imagined possible. In using the term 'self-generate', I do not mean to imply that the experiment gained 'agency' in the misconstrued sense of volition as a bounded or pre-defined individual entity (Barad 2003: 807 n. 7). Rather, I argue in this article that an ecological and process-based generation occurred in this event. It is this more radical open-endedness and self-organisational capacity of the experimental field – which I will term *wild* – that is the aspect of the work under consideration in this text.

This conception of the wild as that which is beyond mastery, and which I discuss in more detail below, might be thought of as a series of 'alternative formulations that resist the orderly impulses of modernity and [merge] anticolonial, anticapitalist, and radical queer interests' (Halberstam 2020: x). This radical reading of the wild by Jack Halberstam and Tavia Nyong'o's is utilised here to think through Pask's experiment. Their reading conceives of a wild beyond its toxic colonial history as a western concept, which both others non-western thought and peoples as inhuman, and simultaneously romanticises the so-called 'natural' world. Halberstam and Nyong'o are careful to acknowledge these problematic histories, even as they contend that 'the past of wildness is not all that wildness can be' (2018: 453). It is not the purpose of this paper to critique the historical usage of 'wildness' in detail; there are many writers within Black and feminist

scholarship and environmental humanities who catalogue these histories, for example. [1] In brief, as Deborah Bird Rose writes, the colonists see as their task the taming of the wild, whilst paradoxically celebrating and mourning its loss (2004: 65). In addition, she argues, colonisers have divided the wild into two problematic categories: that which can be recuperated through domestication and exploitation, and that which is irredeemably hostile and must be eradicated (2004: 102). The latter creates the Terra (and Aqua) Nullius on which colonial worlds are built, whilst the former opens up new territories to 'improvement' through productivity and growth (Rose 2004: 62; Halberstam and Nyong'o 2018: 455), and indeed places value on and justifies ownership of territory based on this potential for improvement and productivity (extending to the ability for self-improvement) (Harney and Moten 2021: 28–29). [2]

In seeking to rethink wildness beyond these ideas, Halberstam and Nyong'o argue for a wildness 'outside of human forms of control, management, exploitation' (2018: 458). And while ultimately in this article I conclude that, in some aspects, their conception of the wild fall short of the relational potential that I seek to explore through the example of Pask's feral experiment, I argue that the concept does help to open up the possibility of thinking complexity as ecological rather than chaotic, whether chaos is conceived of as a positive (as Halberstam argues) or negative characteristic. Wildness suggests an ongoing excess or potential (Halberstam and Nyong'o 2018: 462), and thus I suggest *wild* as a term, opened at both ends to invitations of mutation/addition/queering by the wildcard symbol '*' twice used to imply a 'broad inclusivity' (Barad 2015 419 note 32) and a useful indeterminacy. As Barad argues, '*', especially in its use within Trans* communities, implies a term and a state of being always in-formation, both between and more-than any one definition or state (2018: 419 note 32). The wildcard symbol is inclusive but differentiated – implying ongoing potentiality – and it suggests itself as a way to avoid falling into rigid classifications. I use it here to evoke without definitively separating: rewilding, wildness, bewilderedness, wilder, wilding, enwilding and bewildering (although this is not intended as an exhaustive list of possibilities). The questions that the wildness of the experiment raises concern the possibility of self-organising capacity to rearrange or 'speak back', as Halberstam and Nyong'o argue, to the master narrative of 'so-called civilised thought on behalf of those who live and dream otherwise' (2018: 455). As Harney and Moten articulate in relation to the relationship between a scientific ontology based on a universe of stasis and the colonial ownership of self and worlds (2021: 14, 34), speaking back to colonialism also necessitates the need to undermine the ontology of Newtonian physics, with objects and abstracted space as primary and relational forces as secondary features, some of the implications of which I return to below.

Those who 'speak back' to colonialism and who 'live otherwise' are, so often, those peoples, animals and ecologies that have been instrumentalised and othered as inhuman in western culture in order to shore up the human as an exclusionary category (Braidotti 2014: 15; Plumwood 1993: 37–38). The human, Erin Manning argues, is 'shorthand for the most impoverished forms of living, and the most violent' (2020: 40), and its insistent designation both deprives and negates others and, more fundamentally, sets out a world of rigidly bounded categorisations. Sylvia Wynter proposes that the category of the human arises in the fifteenth century with and as a fundamental operation of concurrent mass western colonisation, capitalisation and enslaving of peoples and the earth (cited in Manning 2020: 39), to which we might add the rise of sciences that focus on 'grasping' the earth through greater control over navigation, time and space. [3] Humanism, Wynter argues, categorises and naturalises Blackness and queerness 'in negative being' and whiteness as 'positively marked' (2006: n.pag.). Furthermore, as Nyong'o explains, the human (colonial, white) 'observer, knower and actor in the world' divides the world into those accepted as human

and therefore ‘transparent subjects of reason’, and ‘an external world of’ passive and ‘affectible objects’ that perpetuates domination and exclusion (Nyong’o 2018: 24–25). Likewise, Val Plumwood’s analysis of the rigid dichotomies of the ‘master model’ in western culture, which importantly includes ‘nature’ and the wild in opposition to culture, and which defines the exclusive category of the human, outlines ways in which the non- or less-than-human are incorporated into the logical structure of domination (1993: 36–38, 41–42). The potential power of an ‘inhumanness’ (which we might also read through Braidotti’s ‘critical posthumanism’), far from necessarily delineating a lack, might then suggest an affirmative potential ‘ethology of forces’: multiplicities of relation and becoming beyond the human/non-human, culture/nature or culture/wildness dichotomies (Braidotti 2014: 49, 72). As Halberstam and Nyong’o write elsewhere of the power of queer failure and queer-fabulation, in the texts considered here they couple that power of queerness with the concept of wildness, proposing an ‘undoing of the human’ through indeterminacy (Halberstam and Nyong’o 2018: 454).

Pask and Beer’s chemical computing experiments were from the outset an attempt to explore indeterminacy: to germinate an adaptive system out of base materials with as little as possible predetermination of function (Bird and Webster 2001: 38–46). In basic terms, these experiments consisted of trays of a ferrous sulphate solution (FeSO_4), with a number of electrodes immersed in the solution. An electrical current was then generated between various electrodes adding energy to the system and causing metallic iron to precipitate out of the ferrous sulphate solution, and this iron began to form threads, some of which then joined positive and negative electrodes. The ‘computer’ efficiently performed all the tricks the pair devised: navigating various disruptions, barriers and shifts in polarity, forcing the system to reorganise itself to accommodate the new environmental dynamics (Beer 2001: 553–54). But the experiment shifted radically with the introduction of sound stimulus via the microphone lowered onto the street below the laboratory. Rather than simply accommodating this input in the form of two additional electrodes (if oscillating ones) as the two expected, the computer then ‘grew an ear’ in the already-made gap in a thread, where iron fibrils ‘resonat[ed] at the excitation frequency’ (Pask 1960: 261; Cariani 1993). Thus the system somehow adapted to incorporate this new type of force into its structure in a manner both without precedence for the computer and without any design aimed specifically at promoting the capacity to recognise the new input, and was ‘rewarded’ for this emergent capacity with a new sensing ‘organ’ with which to engage with the world (Pask 1960: 107–08).

If the parallels to Doctor Frankenstein’s experiment are inevitable (the dangling of a wire, the vitality that surges down its length, the strange monster that it breathes life into), Pask’s Ear experiment perhaps lacks the egoistic drive of the mad doctor. Instead, I propose, it is a rare example of a truly ecologically driven or motivated work, whose queerness might be best understood within the framework of ‘wildness’ in the sense that Halberstam and Nyong’o’s recent writing has remediated the term (Halberstam 2020; Halberstam and Nyong’o 2018). Pask’s Ear demonstrated a distinct appetite for adventure, a capacity for, as Karen Barad has written about all matter, ‘a wild exploration of trans* animacy, self-experimentations/self-recreations’ (2015: 411). Were this fiction, a reader would expect drama to ensue, but in fact the solution was unceremoniously poured down the sink and largely forgotten about until more recent interest in generative models of art amongst new media artists and writers such as Peter Cariani generated conversations about Pask’s work (1993).

While many so-called ‘generative’ computer artworks exist, their focus has unfortunately often been on a human-orientated representation of novelty that is in fact contained within very limited parameters.

Generally, these works either extract data streams from nature to force a randomised novelty (problematically positioning 'nature' as random and against technology and culture) and/or rely on pre-programmed algorithmic decisions (such as neo-Darwinist fitness criteria) that in effect mean that humans have made all the significant 'decisions' *a priori*. Pask's *Ear*, on the other hand, was able to 'determine the nature of its relation to, and knowledge of, the world' (Bird and Webster 2001: 44). Such 'epistemic emergence' or novel perspectives on the world, as Cariani argues (2008: 2), is exactly what are often lacking in generative artworks. While relevant, such discussions of *Ear*'s epistemic emergence are inadequate to explanations of the system's move, as a whole, into a new state whereby new and spontaneous relations to unforeseen forces could be created. Here, my inquiry focuses on a consideration of a potential *wildness* that Pask and Beer unleashed, with its associated *inhumanness* in the radical sense that both words might imply.

The contemporary turn towards 'wildness' and 'rewilding' seeks, Halberstam and Nyong'o argue, to activate the term to 'undo' the human through an intimacy and 'bewilderment' of 'all sovereign expectations of autonomous selfhood' (2018: 454). Wildness as a western concept has, of course, problematic histories in its othering of non-western thought and its romanticisation of the so-called 'natural' world, but in its reclaimed usage, Halberstam and Nyong'o argue that it can also enact an 'anarrangement' of normalised boundaries and categories (2018: 456). Thinking with wildness challenges, amongst other things, generative electronic/media art, which gestures towards self-organisation but remains mired in a naturalised anthropocentrism and metaphoric or representational modes. Wildness, in the sense I wish to employ it, is *ecological* in its insistence on the immanent dynamics of relation that resist representation within normative scientific and western cultural frameworks. I argue that the question is not to ask what a wilded art might look like or what novelty it might offer the viewer, but instead to explore how it might enact *vitality* or an *appetite for expression* of its potentials.

In what follows, I briefly consider the term 'wild' in relation to Halberstam and Nyong'o's writing and then think it in relation to *Ear* through discussion of the science of self-organisation. While the physics of self-organisation and wildness may seem antithetical, my argument rests on their shared investment in ecology. As expressions of ecological dynamics or thought, both the far-from-equilibrium dynamics of self-organisation and the bewilderment Halberstam writes of as wild are at their core concerned with the incipient gathering of an ecology's potential in ways that circumvent the static object-subject power schema of western colonial/enlightenment thinking. I hope to think through from the perspective of an ecological dynamics of relation what actually occurred that night in Pask's laboratory. In doing so, I attempt to avoid wildness falling into merely metaphoric usage. I am also aware that 'rational' scientific explanation has the potential to erase the strangeness of life (its bewildering and more-than qualities), but I take heart from writers such as Raymond Ruyer and Barad who navigate such terrain whilst maintaining the 'perversity and monstrosity at the core of being' (Barad 2015: 401). Ultimately, I seek an ecological 'poetics' in *Ear*, though as with all ecological dynamics, it may remain just beyond reach, in-forming and unsettled.

Into the *Wild*

To say that the term 'wild' is problematic, with long and toxic histories in the service of colonialism in all its forms, is to put it mildly. The wild, coupled with civilisation, is one of the great western dichotomies that underpin the structuring of a series of oppressions and 'otherings' of difference. Most peoples (the non-westernised, but also children, neurodiverse communities, differently-abled, -gendered, -sexually

expressive, and to a large extent, women in general), animals and the earth itself as ‘nature’ (an equally problematic concept) are kept at bay by these structurings of power and privilege. This ‘wildness’ constructs the ‘human’ in positive opposition as male, white, western and ‘civilised’ (Plumwood 1993: 36–39), and thus, as I have discussed above, ‘human’ is itself an equally problematic term in western thought, given that it has been given, taken away and denied so many peoples. Such labelling in order to ‘other’ manifestly is one of the weapons of colonialism; [4] imaging and fixing sets of relations in simplified forms that belie the complexity – the nuance and bewildering intertwinedness – of life. However, Halberstam and Nyong’o’s project is to remediate wildness, to find in it ‘a poetics of power’ that reaches beyond colonial fantasies of both the sublimity and horror of nature, and that anarranges western paradigms (2018: 456–58).

As Halberstam outlines in his book *Wild Things: The Disorder of Desire* (2020: 9), Europeans, particularly post-Enlightenment, have a complicated relationship to wildness, both mourning its supposed loss and feeling the urge to tame or eradicate it. Wildness in all its forms holds a terror for the civilised, threatening as it does to undo, and the wild is indeed ‘world’s end’ when the conception of ‘world’ is limited to western notions of sovereignty (psychic, social and territorial). [5] In this sense, wildness is a space imagined, constructed and disavowed by colonialism in order to create a boundary to an imagined normativity (Halberstam 2020: 40). This wildness then becomes both a material and intellectual resource for the construction and maintenance of white culture (Halberstam and Nyong’o 2018: 455). If, as suggested above, nature-as-wild forms a dichotomy in so-called ‘objective’ western thought with culture or civilisation, then nature, and all those human and non-human creatures associated with it in this mindset, are cast as untimely, irrational and inhuman precisely in order to construct and prop up a prehistory and a model for the human (Halberstam 2020: 116). Colonialism utilises all its weapons (ethnography, law, arms, farming and animal husbandry, patriarchy, capitalism, etc.) to control, separate and extract value from wildness, and/or eradicate that which it cannot corral (ibid.: 38; Plumwood 1993: 41–47), whilst at the same time imaging nature and the wild in romantic and nostalgic terms in the arts. Thus, while the scientific project invests in a rigidly constructed norm that the world must conform to, the romantic project invests in the sublime. In various ways, these projects reduce, other, objectify, represent and/or seek control over the wild, with ongoing histories of devastating results for all that are labelled such (Halberstam 2020: 91). [6]

However, such hollowed out and toxic configurations of the wild are not all there is to the concept, and wilding has a capacity to bewilder through its queerness, monstrosity and ‘impossibility’. Impossibility refers to a series of potentials that cannot all be simultaneously actualised, existing together on the virtual plane but representing possible contradictory futures. These potentials are attractive to those who seek a different and differential understanding of the world. Halberstam, both writing with Nyong’o and alone, thus constructs other, affirmative potentialities for the wild. Wildness here ‘speaks back’ to civilisation’s noisy thoughts that attempt to drown out the other voices of the world (Halberstam and Nyong’o 2018: 455), that are stranger, queerer, and that might seek not autonomy (to be constructed as an independent thing amongst a world of independent and self-acting things), but precisely the messy entanglement of becoming that civilisation so fears. Wildness here is not something ‘lost’ through processes of civilisation and rationalisation, but something far more radical. As an ecological movement of forces, it sits outside the homogenising powers of identity whilst remaining singular: difference is activated, potentialised.

Thus wildness is positioned, for Halberstam, outside of categorisation, not simply as the ‘underside’ of white colonial culture, but as an irreducible series of experiments in thought, action, being and knowledge that refuse to be tamed, and as a concept that ‘offers a way of being in the world differently, of interacting with,

rather than separating from, vegetal and animal forms of life' (Halberstam 2020: 46, 11). But why stop at the vegetal and animal? As Karen Barad argues in her discussions on quantum field theory, matter itself at a subatomic level is 'promiscuous and inventive' and capable of 'desiring and imagining' (Barad 2015: 387). Through examples ranging from the potentialised field of lightning and the virtual becoming-faces of frog embryos through bioelectrical signalling, to the virtual play of electron-photon coupling, Barad shows that at a fundamental level, all existence is saturated with a 'perversity and monstrosity', with an indeterminacy (an impossibility of abundant potentials) at play that troubles any concept of a bounded self (2015: 401). All matter, and all space in other words, 'is a wild exploration of trans* animacy' (Barad 2015: 411), [7] and importantly for Barad and for my argument here, this directly defies the colonial project which purports to discover, conquer and exploit wild 'voids' (2015: 417).

What Barad highlights, and what Halberstam writes in sympathy with, is that this impossibility is a field effect. That is, it is the ongoing potentialisation of the field (electro-magnetic in the case of Barad's examples) that makes this wildness that escapes boundaries refute both hierarchies and notions of the bounded individual. I would argue that what is wild is ecological, provided this is a discussion about dynamic ecologies, which 'shimmer' or 'vibrate' with potential (Rose 2017: 53), with difference and novelty. In ecology, it is the woods, not the tree, that is considered, in that ecologies are dynamic systems of forces of relation, operating globally or synergetically (at a different register) from component parts of the ensemble (Clark 2017: 198). Ecological causality is 'braided' in that it is not only operating simultaneously from multiple perspectives and positions but in that it is also a co-evolving actuality and virtuality (Massumi 2017: 353). Thus, ecology, like Halberstam's wildness, has no truck with the individual that colonial thought wants to enforce. [8] Wildness, Halberstam argues, trades a psychologically bounded self for 'a wide-open space across which an unknowable self is dispersed' (Halberstam 2020: 10), and which, I would add, is remade in symbiogenesis with the flows and 'dynamic differentiation' of its ecology (Clark 2017: 201).

There is a wildness in many aspects of Pask's Ear experiment, though it is not the experimenters' expansive imagination that is of interest here, but the manner in which Ear wills itself a demonstrative vitality and 'undoes' or goes beyond human volition. That an experiment can surprise its maker in terms of results is nothing special, but to drastically reframe the parameters and context of its enquiry is a radical thing – a point at which, perhaps, it undoes strict boundaries between science, with its careful framing, and art. Ear is bewildering, not only in its surprising expressions beyond the scientists' imagination, but more fundamentally in going beyond the propriety of the initial experiment, in a 'becoming that moves in an opposite direction to colonial [scientific] knowing', leading itself 'astray' (Halberstam 2020: 67). That is, it works as 'an impediment to knowledge and power', if such knowledge is taken to be the controlling actions of a human seeking confirmation of a thesis (Halberstam 2020: 67). Bewilderment here is perhaps a queer failure that leads 'from being found' and from 'knowing' as a subject to (creative) 'confusion' and 'abandonment' (Halberstam 2020: 67). However, such abandonment does not entail separation from the messiness of life as is the white fantasy, rather it precipitates a re-immersion in its coming into being, disorientating the self (whether the experimenter or the experiment is under consideration as subject), through a 'becoming vulnerable' to the field or ecology (Singh 2018: 67), through listening to the other voices and the other forces in the world. Opening, in other words, to the *wild*.

Lost in the Field

The Laws of nature, which no longer deal with certitudes but possibilities, override the age-old dichotomy between being and becoming (Prigogine and Stengers 1996: 155).

In this section, I attempt to understand the Ear through the still-emerging science of self-organisation with its long history of being silenced in the West. I consider the ways in which the force of self-organisational wildness constructs far-from-equilibrium relational fields that fundamentally challenge notions of individualised agency. My contention is that ecologies are necessarily wild in the positive sense outlined above, but also that this wildness is not chaos. It may look like chaos if the attempt to understand it is taken from the perspective of individual objects, since these are more expressions than building blocks of the system, but it is a deeply entangled and dynamic web of relations that flings itself outside of stasis in order to engender the production of novelty. In this sense, 'polyphony' as 'systems that do not crush all material into one message' (Kohn cited in Halberstam 2020: 85–86) (and which Denise Ferreira da Silva thinks of as a 'difference without separability') (2018b) is a better term than chaos. 'Chaos' misnames the virtual as random rather than impossible in its irresolvable complexity (Bak 1997: 31). Self-organisation is a challenge to enlightenment thinking, and specifically to Newtonian physics (and its accompanying biological studies and Linnaean classification), which wants to picture the world in stasis and which will disorder on that which it cannot image. [9] It is not surprising that the same cultural tradition that gave us wilderness opposed to culture (and Blackness as a negative, and women as a lack) also gave us, as the control of nature moved from God to Man's work with the rise of enlightenment thinking, scientific proof of a world of objects (Foucault cited in Halberstam 2020: 29), separate and immutable. The same fear of dynamism, of contagion and intermixing, motivates both positions and seeks safety in artificially stable categories from which none may stray. That this worldview persists, despite its failure, even at the most basic scientific level, to explain the world as it is experienced, demonstrates the colonial force that continues to invest in its fallacy for political reasons. [10]

As Pask explains, an evolutionary (as opposed to prescriptive) model of self-organisation consists not only of intensive relational factors (internal to the system) but also of a system's abilities to adjust its types of inquiry into the world: a dynamic capacity to feel and self-satisfy in relation to the larger field (1961: 230). From the perspective of physics, for any system such as Pask's chemical computer assemblage to develop its own global 'rules' or modalities of interaction, it needs to reach a state of 'self-organising criticality' (SOC), a state where potential is maximised. To achieve a state of SOC requires that systems have an ability to develop new dimensional capacities, and, concurrently, to move to a far-from-equilibrium (FFE) configuration. Below I discuss the occurrence of these phenomena in relation to the Ear's growth of its new sense organ and mode of inquiry. [11]

In his careful choice of materials and forces, Pask had devised a system with a high level of flexibility and potential integration amongst individual components. The ferrous sulphate solution could individuate into filaments that in themselves were highly flexible in their modes of construction, and the electrical flows could both pass through all the solution and also select or give preference to certain establishing paths. The components could combine in multiple ways and were imbued with a high range of sensitivities to their environment (Bird and Webster 2001: 430). Key here is the flexibility of flow and connection throughout the experiment; iron filaments are able to dissolve back into the solution, and electrical flows can easily redirect and find old connections. Thus the system had metastability (Beer 2001: 554), with a cleverly inbuilt open-endedness making novel combinations possible – as parts here were never subsumed in some stable

'whole', but rather retained molecular capacities to re-engage or to continue to individuate (Simondon 1980: 13). This epistemic autonomy, with not only unspecified goals but a capacity to generate new potentials or states (Bird and Webster 2001: 43), constituted, as Cariani argues, a capacity to develop an 'enlarged... dimensionality' (2008: 3). Here, whilst there was clearly an element of 'bottom up' design in the flexibility of the 'raw' materials, it is perhaps both that a system-level enmeshment was achieved – an exploitation of the 'rich resident physics' of both these materials and systems – and that system-level motivations became active organisers of a collective individuation. [12]

Pask's Ear, through its invention of novel sensory capacities, enhanced its ability to feel or ingress, enlarging, as Cariani terms it, its 'life-world' (2008: 3). In physics, as he notes, this is termed the invention of a new 'dimension' of the state space (14). 'Dimensions' are one way of thinking of an entity's capacities to interact and differentiate within the field, or, as DeLanda terms it, the entity's 'degrees of freedom' (2005: 13). For the Ear, new dimensional capacities for individuation meant an evolution or increased richness of the virtual milieu of the system. In this, it was an increase in intensity – differentiation on the actual and virtual plane – and here the system's evolution was problematised by the greater range of (impossible) futures towards which it was drawn: a move towards a multiscalar polyphony that broke 'the link between necessity and determinism' (DeLanda 2005: 28, 35). Positively charged iron molecules (cations) that were already drawn towards organising themselves in respect to their relation with free negatively charged electrons that flowed through the system so as to form filaments, now began to feel the urge to organise themselves, on a *different plane*, in relation to vibration, feeling with this force to individuate in new, ear-like ways. The precipitating or emerging iron now held three potentials in tension (if the return to the iron-sulphate solution is included), allowing, as Barad says of pre-lightning strike potentialisations, an 'emerging play of a desiring field' (2015: 388).

If this autonomous growth in dimensions and attractors is part of what gave the chemical computer its surprising powers to evolve new interactions with a shifting field, then the inquiry still needs, I would argue, to go further and investigate the nature of ecological systems with such capacities for novelty, flying as they do in the face of classical physics' notions of stability and entropy. This 'autonomy' to evolve dimensions in response to changes in the field requires non-equilibrium conditions (Collier 2008: 12). That is, the expressive capacity of a system depends not only on the complexity of potentiality but also on the degree of intensity – held difference – with which it operates (DeLanda 2005: 76). Here 'intensity' is defined by the system's distance from equilibrium or its non-linearity. The chemical computer system organised (and organised itself through) the continued flow and transduction of energies (DeLanda 2005: 75; Bak 1997: 50) – for example, seeking the quickest path from node to node for the current. Here the limited force (electrical current) made available to the state that led to system-level dynamics and increasing intensity, as parts negotiated for the energy – more current to one filament implied less for another filament – thus each became entangled and co-evolutionary or symbiogenetic.

Ilya Prigogine's research explores ways in which the nature of systems with such FFE dynamics is markedly different to that of systems in equilibrium states. Firstly, in FFE systems, there is a move towards non-linear complexity, as discussed above, where cause and effect are immanent and suspended in a quasi-causal and collective production (Prigogine and Stengers 1996: 42–44). [13] Here, a part of an FFE system cannot be considered in isolation, as small local changes can produce amplified disruptions over time (Prigogine and Stengers 1996: 45, 30). [14] Pask's Ear had multiple attractors in play before the event of interaction with the vibratory force, but this moved towards a stable solution of minimal resistance in its production of

filaments between nodes. Once the vibratory force was added to the mix, however, the dynamics shifted: not only did the system have more energy with which to individuate, but it became suspended between three co-dependent and irresolvable resolutions.

Secondly, in Prigogine's definition of FFE, system-level behaviours become observable – new collective properties beyond individual component trajectories. These are not simply composites of individual trajectories, but the continued production of novel system-wide capacities (Prigogine and Stengers 1996: 77, 81), where 'nothing in the individual [components] suggests the emergent properties of the [system]' (Bak 1997: 60). FFE can only be thought through these ongoing processes of collective genesis – explorations of potential – not as a system defined by existing possibilities (Stengers 2004: 96). At equilibrium, variation in a system is defined by component variables (for example, the iron's possible states and relations), whereas in an FFE state, 'the very functioning of the system [determines] how processes and interactions will matter and matter together' (95). That is, the 'choices' made are made ecologically. Such systems can no longer be defined by notions of inherent individual or combinatory qualities of the materials, but only by this open-ended capacity to globally reorganise: [15] the system is now defined as an event of relation. FFE dynamics suggest a different mode of valuation, not one of the tame and the stable, but one that might bring forth the values of the *wild* that is ungraspable in its open-ended exploration or play (Halberstam 2020: 7, 22).

Here there is an essential creativity or production of novelty in a system that rejects notions from classical physics of an inevitable move towards entropy and minimum energy configurations (Green 2001: 674; Stengers 2004: 94; Sagan and Schneider 2005: 6), moving instead towards greater relationality and therefore potential: a 'creativity' that is born not of pure chance or chaos, but rather of intensity – of relation at an ecological level (Prigogine and Stengers 1996: 88–89, 189; Stengers 2004: 94). In its FFE state, the Ear no longer seemed to seek minimum energy expenditure, but rather maximum connectivity or relation to whatever forces it could gather in its becoming-ecology. It demonstrated an emerging appetite to connect in novel ways and for the development and exploration of new potentials. [16]

The point at which these FFE characteristics truly took hold and the system reached a state of maximum potentialisation can be termed a state of 'self-organising criticality' (SOC). Bak defines SOC as a 'poised' FFE state, where the fullest range of events is potentialised, and where the organisation of the system is governed by emergent global dynamics (1997: 48, 51). Once it has entered a critical state, the temporal order of events within a system cannot be predicted, as they are not only highly complex and intertwined, but contingent or quasi-causal (alongside the rules that govern the system). That is, the event of production of the state is also producing the relational dynamics or rules and the potential or virtual milieu as 'one complex emergent dynamics that cannot be described by local dynamics' (Golyk n.d.: 2). Events are no longer predictable (linear), but they are still causal and not chaotic, in that they are complexly and emergently relational, and can only be understood as such. In a SOC state, there is none of the separability or central control that enlightenment demands of things, and there is an abundance of the difference that it fears, and this is its wildness.

In experiments such as the Ear, Erin Manning states, 'entertainment' (a self-satisfaction of potential) might begin to exceed 'human-centered narratives of consumption so aligned with capitalism, [and become] distributed across the ecology of experience' (2016: 100–01). These works might tend towards abandoning established identity for a more dispersed and open-ended modelling that is 'unknowable' *a priori*, as

Halberstam argues wildness requires, and seek to interact with rather than separate from the larger field or ecology (Halberstam 2020: 10–11). Pask's Ear thus experiments with an ecological ethics in its particular care for the opening of the conditions of emergence over what emerges: a turning towards a collective listening and the expression of a 'self-tuning': the will of the event to emerge and to carry forward. As I suggested at the start of this section, I do not think it is going too far to say that the physical sciences' conception of a universe of stable and separable things held in their proper place is more than a simple misunderstanding of the world. Rather, it might be seen as a wilful and unethical rationalisation of colonial efforts to control the earth, peoples, flora and fauna, which denies the inherent and bewildering complexity of relationality in all its forms and the volition of events of relation themselves to move towards novelty (in other words, it denies the ecological plane of existence). And, slight as they are in the scheme of things, experiments such as the Ear palpably demonstrate the lively ethics of the *wild* that sits outside or underneath fantasies of mastery based on human-centred identity and human-exclusive control.

Listening to the Shimmer

Nature is perverse at its core; nature is unnatural (Barad 2015: 412).

The laws of thermodynamics are purported to imply that as all systems are entropic, they necessarily run down to a standstill, to a state of absolute energetic equilibrium. This notion of a 'cold, dead' and separable universe reflects a colonial worldview, as Harney and Moten amongst others argue: one which is heavily invested in stasis and ownership of worlds (2021: 14; Peat 2002: 74–76; da Silva 2018b). However, a pragmatic approach might ask to look around: does this adequately explain the universe experienced? Perhaps it does, if that world or system in view is only the deadening monoculture of whiteness (acres of corn, soybeans, cows; western politics, TV, Netflix and social media), but perhaps not if the investigation is wider reaching. Then what might be found, in any wilded and thus dynamic ecology (that is, one in an FFE state), is novelty, entanglement, dynamic relations that repotentialise and enfold themselves. This is the 'brilliant shimmer of the biosphere' that 'brings you... into the experience of a vibrant and vibrating world', as Deborah Bird Rose describes it: an experience of the *wild* and of the immersion in the field, in the dance of 'ecological pattern[ing]' (2017: 53–54).

If thermodynamics demands that energy gradients move towards equilibrium (the hot and the cold combining to make a warm mixture, for example), in complex ecologies this leads to an extensive cycling of forces and matter (that some have termed Gaia) (Bunyard 1996), that at a system level does not wear down and homogenise, but that is intensifying and potentialising (Sagan and Schneider 2005; Jantsch 1980). The misunderstanding of entropy comes perhaps from the desire, yet again, to consider the world 'piece by piece', when thermodynamics suggests, alongside the science of FFE, that there must be a consideration of 'the forest not the trees' – in other words, of the field – to gain an understanding of ecologies (Sagan and Schneider 2005: 54, 111). Thermodynamics is the science of whole systems, seen from an ecological rather than object-orientated perspective; thermodynamic law is a dynamic that entangles relations and forces in endless cycles, producing, as effects or expressions, new combinatory forms. Thus they are, in effect, laws of affirmation – of potentiality and endless novelty. Just as quantum field theory tells us there is no void to conquer in the bewildering goings on of the subatomic register, the becoming-wild ecology in this sense 'refers not to the colonial fantasy of untouched and unoccupied space but rather to a sensibility... and a poetics of power' (Halberstam and Nyong'o 2018: 459). If the wild is uninhabitable for the modern colonial

subject, this does not mean that it is empty, Halberstam and Nyong'o argue, as it is 'crammed with interesting life-forms of its own' (459).

The wilded ecology, I would argue, is a special type of *wild*, neither romantic nor chaotic. As Halberstam notes, the wild 'refuses and resists the order of things' (2020: 178). However, unlike Halberstam's literary and sometimes metaphoric reading of the wild, I suggest wilded ecologies might not simply resist comprehension. It is true that vital ecologies resist the methods of classification that western thought tries to impose – that is, methods that separate into component parts, ignoring and destroying the dynamic flows that are the registers in which ecology exists (including flows of potential). The wild requires a different set of terms, different perspectives, different technics to activate, which I have suggested might be found in the special dynamics of self-organising criticalities. These resolutely ecological movements operate at the level of flows of matter and energy, and they have little regard for the sanctity of objects and subjects, which are bewildered by flux.

In the Ear, shimmer – as the vitality of the field – begins to come to the surface. If such shimmer marks an attention to a 'lively, pulsating world' of 'multifaceted' relations that are not predicated on the perspective of the white subject, it marks a turn away from a world composed, as Newtonian physics would have it, of 'gears and cogs' (Rose 2017: 55). Shimmer exists in 'encounter' – the coming into being of relationships – it is the world understood as 'a kind of motion' or rhythm of becoming and patterning (Rose 2017: 52–54). Not only is it not mechanistic, it is not humanist, and it does not hierarchise, but instead 'move[s] across registers or worlds affirmatively' (Rose 2017: 51, 60). Pask's Ear cannot be understood on the level of parts, its eruption of novelty makes no sense at this level. It undoes the human intent, affirms difference as it adds to rather than subtracts from its potential expressions. It might mark the emergence of just such a sensibility tuned to shimmer, to the expressive force of life saying 'yes' (Rose 2017: 61) and to the more radically wild 'poetics of power' that Halberstam and Nyong'o call for (2018: 459).

Perhaps then, this poetics approaches a poethics, a term drawn from Denise Ferreira da Silva's thinking (2015; 2018a), which seeks to look beyond 'the end of a World produced by the tools of reason' (2015: 84). Such tools are, as many have argued, inadequate to discuss the indeterminate science of the ecological forces of self-organisation that lie at that epicentre of dynamic systems (Jackson 2018: 618–20), bewildering as this dynamism is to the privileged position of the subject. Given that da Silva's project is specifically addressing the experience of Blackness rendered apart by colonial practice (namely 'that which has been appropriated [extracted, violated] but not fully obliterated by the practices and discourse that describe what happens and what exists as determined by form... or law') (2018a: 1), it is a step too far to suggest that the science experiments of white western men such as Pask and Beer can embody poethics (even if it is a quite radical and speculative form of cybernetics and speculative and relational thinking that they practice). However, there are resonances, particularly if the Ear is considered from the perspective of the experiment's own volition (its 'electrifying yearning for connection') (Barad 2015: 388) rather than by collapsing the ecological actions of forces into the figure of the scientist.

Da Silva suggests that the non-locality and virtuality of quantum physics troubles the supposed stability of systems at a fundamental level, and she reasserts a non-hierarchical differentiality (without separability) as fundamental to existence (2018b: 4–5). Black materiality released 'from the registers of the object' might open up other more ethical 'ways of knowing and doing' beyond the violence of the 'universal tools of reason' (2015: 81, 84). Da Silva's poethics calls for the embrace of the 'creative capacity, which is a quality

only apparent when one contemplates the World as plenum and not as Universe' (2015: 85); that is, the world as 'infinite and contingent' and 'deeply interconnected' (da Silva 2015: 95–96). This is the perspective that the *Ear* expresses – a world of novelty and affirmation driven by SOC and one that does not assume 'invariant truth' but explores potential (Pask 1960: 233). In this way, the *Ear* experiments with an emergent or contingent 'play of a desiring field' (Barad 2015: 388), and with a wildness that offers 'a way of being in the world differently' that avoids the separation from material, 'vegetal and animal forms of life' (Halberstam 2020: 11).

It is, as Rose also articulates, a question of value: of revaluing that which escapes or 'nullifies the whole signifying order' (da Silva 2017: 9) – that which is thought only as a 'void' or chaos (Barad 2015: 417; Jackson 2018: *passim*). Just as Rose uses shimmer to think a world without pulling it apart into mechanics, so da Silva uses poethics to think a world beyond this 'violence of modern thought' that is the 'scientific imaging of The World as an ordered whole composed of separate parts' (2018b: 1–2). Like Rose, and like Barad in her critique of the void and description of the liveliness of becoming, here da Silva utilises the impossibility of the virtual to think the entanglement of life that reaches beyond determinacy and separability (2018b: 4–5).

As a line of inquiry, da Silva's poethics seeks to undermine the space Man (the white western human subject) occupies as the locus of knowledge that all life and experience refers to, and to 'dissolve the workings of the separability in the delimitation of the position of the transparent subject' (da Silva 2018a: 4). In other words, it seeks to undo the human in all its colonial forms, questioning its methodologies of subjugation (critical distance, privileged positions, form, law). Pask's *Ear* practices an 'unmastery', an unknowing which, in its own way and within its own frames of reference (the western tradition of scientific experimental inquiry) is radical in its queer outcomes, whether intended or not. If the figure of the masterly hand excludes most thought, most practices operating in the world (Singh 2018: 3–5), such experiments in the enabling of the organisational flows of forces over the stasis of forms and prescribed fields of inquiry are indeed practices that approach a poethics of emergence and might begin to 'release [them] from the realm of the subject' and an abstracted and reductionist understanding of volition (da Silva 2018a: 6). Pask's *Ear* thinks alongside poethics, challenging some of the tools of this oppression of indeterminate liveliness, as a *wild* and radically inhuman disruption that invents a way of working with rather than separating from emergent conditions, appetites and enthusiasm in the world (Halberstam 2020: 11).

My intent here has been, at least in part, to show that wildness does not simply resist understanding, in some senses of the word. That is, whilst wildness is necessarily bewildering in its engaging with the unknowable (from any one position) and the impossible (the virtual), perhaps it suggests possibilities for investigations with ways in which artistic and other generative experiments might help to set themselves 'free' from the limitations of humanist preclusion and control. This might occur through the enabling of non-linear complexity, intensified to the point of SOC. These questions are particularly pertinent for contemporary art and its current enthusiasm for ecology, as such an embrace requires attention be paid to other voices, other volitions, appetites and perspectives, and care taken not to fall into the traps of extractive or human-centric practices. There is a need to 'undo' the human in a deep sense and develop a poetics of the non-human, in the sense that the human is an exclusionary category. A poetics is needed that is wilder of heart and that does not simply engage in the representation or metaphorical usage of other worlds, but that gives space for and resonates with the shimmer.

ENDNOTES

[1] For example: Deborah Bird Rose, Julietta Singh, Val Plumwood, Saidiya Hartman, Denise Ferreira da Silva, Tyson Yunkaporta, Robin Wall-Kimmerer, Fred Moten and Kathryn Yusoff.

[2] See Stefano Harney and Fred Moten's *All Incomplete* (2021) for an extended discussion of the concept of 'usefract', a term which defines ownership through improvement to land, and which they extend into a critique of the entwinement of productivity with self-possession in enlightenment thinking and contemporary logistical capitalism values of 'continuous improvement' of both work and self (2021: 28–41).

[3] As Edouard Glissant states, such understanding through grasping 'has a fearful repressive meaning' within colonialism (2010: 52).

[4] On Linnaeus and his system of classification as a tool of colonial power, see Monique Allewarert, *Ariel's Ecology: Plantations, Personhood, and Colonialism in the American Tropics* (2013), Chapter 2.

[5] On the end of the world in that it is a capitalist/colonial concept, see Ferreira da Silva (2015). For Indigenous peoples of Australia, it was the colonisers who appeared 'wild' or unhinged in their wanton destruction of life, land and culture (Rose 2004: 65).

[6] See Plumwood for a detailed and critical history of the nature-culture dichotomy in western thought, which of course precedes Enlightenment, being a feature of much classical Greek philosophy and Christianity (1993: 41–55).

[7] This line of inquiry is pursued in detail by the philosopher Raymond Ruyer (2016).

[8] As Barad makes clear, neither does it accept notions of 'autopoietic' systems, a concept drawn from, though often misreading, Varela and Maturana's work in valorising the individual, upholding a myth of a bounded and independent system. The phenomena Barad speaks of undo the self and notions of individualism (2015: 411). Autopoietic theories have been applied to Pask's Ear (Collier 2008: 16), though I would argue like Barad that a more ecological and field-centric explanation is a better fit. Ruyer uses the terms 'self-survey' and 'neo-finalism' to describe this same play of potential that describes a self-awareness or will to power in all matter (Grosz 2012; Ruyer 2016).

[9] That is, the abstractions of Newtonian physics are useful, but they need to be understood as abstractions and special cases of larger and more complex real-life operations (Bak 1997: 1–7; Jantsch 1980: 23–24).

[10] On Chaos as a political construct, See Jackson (2018). On the link between colonial mastery and other forms of mastery, especially academic forms, see Singh (2018: 9–12), and Harney and Moten (2021).

[11] Per Bak's work (1997) provides a more detailed account of the science, and Jantsch provides a more ethically orientated discussion (1980).

[12] Thus the experiment was able to evolve system-level organisational capacities or dynamics, whereby, as John Collier has written, system and model remained immanently intertwined and could not be separated (2008: 14).

[13] See also DeLanda (2005: 174) on the quasi-causal.

[14] The repercussions over time are in themselves non-linear, in that the scale of resonance of an event in the system does not flow smoothly from the local out to a global effect but can jump across these registers (Bak 1997: 61). Local events are therefore always implicated in the 'long-range order through which the system acts as a whole' (Prigogine 1980: 104).

[15] In an open or dissipative system, its 'momentary deployment of forces produce[s] systematic orderings, local eddies or drifts' (Yates 2002: 50).

[16] That is, when the vibratory force occurred, potential for expression as vibrating fibrils arose as a collective potential (as an emergent FFE property not attributable exclusively to the molecules), subjectively felt by the iron-solution-filament-vibration-current. See Stengers (2004: 94).

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