TECHNOPHANY
A Journal for Philosophy and Technology

Special Issue: Computational Creativity
Vol.3 No.2, 2025

Edited by Anna Longo

Published by

RADBOUD UNIVERSITY PRESS

Research Network For Philosophy and Technology

hanart press

HANART FORUM

Supported by

Erasmus School of Philosophy

Technophany is founded in view of the need to create a singular and unconventional space for reflections on philosophy and technology, which is diminishing today due to dogmatic academic practices and their reluctance to confront challenges imposed by the industrial world. Technophany aims to facilitate original reflections and provocations on the philosophy and history of technology, and contribute to the reshaping of the contemporary landscape of thought.

Technophany is a journal of the Research Network for Philosophy and Technology, dedicated to the philosophical and historical studies of technologies.

Technophany is published by Radboud University Press and Research Network for Philosophy and Technology.
E-ISSN: 2773-0875

Paperback is published by Hanart Press.
ISBN: 978-988-70268-1-5

https://technophany.philosophyandtechnology.network
https://www.philosophyandtechnology.network

Table of Contents

Introduction[1]

Anna Longo

In the contemporary landscape of rapid technological advancements, Artificial Intelligence (AI) has emerged as an important factor in reshaping practices, world-views, and expectations. One of the most intriguing and thought-provoking areas of AI's influence is its intersection with creativity. By deconstructing the cognitive processes involved in human creativity, researchers can design algorithms that simulate these processes. This involves machine learning, neural networks, evolutionary algorithms, and other AI techniques that enable computers to recognize patterns, generate new ideas, and refine them through iterative processes. Can AI's outputs—whether in painting, composing, writing, or other forms of artistic production—be considered genuinely creative, or are they mere reflections of the data and rules we feed into these systems?

The question of whether AI can truly be creative necessitates a reexamination of what creativity means. Creativity encompasses the generation of novel ideas, artistic expressions, and innovative solutions that push the boundaries of conventional thought. Traditional definitions often emphasize intentionality, consciousness, and emotional depth—qualities typically attributed to human minds. AI, with its computational prowess, algorithmic learning, and data-driven processes, operates differently from humans while achieving comparable results. For these reasons, the advent of AI challenges the traditional view according to which inventiveness is an inherently human attribute that distinguish the creator of machines from her ingenuous realizations. Nevertheless, the surprising upshots of neural networks and machine learning compel us to reconsider the essence of creativity as well as the relation between humans and their productions. To put it differently, AI's realization might contribute to renew the awareness of the available possibilities for world-making (see Anil Bawa-Cavia's proposal). This challenge motivates the recent research field of computational creativity. It refers to the study and development of algorithms and systems capable of performing tasks that would be considered creative if done by humans. This includes generating art, music, literature, architecture, urban planning, and problem-solving in novel ways. The field intersects with cognitive science, psychology, philosophy, and the arts, creating a rich tapestry of multidisciplinary theoretical and practical investigations.

1 This introduction is the result of a collaboration between the invited editor of the issue and Chat GTP-4.

 Corresponding author: Anna Longo, annlongo@gmail.com

ISSN 2773-0875

As we navigate the burgeoning field of computational creativity, ethical and philosophical considerations become paramount. While the potential benefits are immense, so are the concerns. First of all, the authenticity and value of AI-generated works are often debated. Can a machine's creation hold the same emotional and cultural significance as a human's? What does it mean for art, music, or literature if it is produced without human intention or experience? (see Ella Dawn McGeough's and Brendan Flanagan's contribution). While AI can analyze cultural data, it does not possess an intrinsic understanding of cultural meanings and values. Moreover, while, humans create with a sense of purpose and meaning that goes beyond mere functionality, AI lacks the capacity of achieve a vision responding to the limitations and constraints experienced within a particular social context. In this sense, creativity often involves making ethical and moral judgments, a capacity that machines do not share with their creators and that prevent them from understanding the broader ethical implications of their productions. Furthermore, we might wonder about the negative effects of generative AI on human creativity. Will reliance on computational creativity tools diminish human creative skills, or will it augment and inspire new forms of human expression? For instance, we can worry about the consequences of humans' over-reliance on AI tools: depending too heavily on algorithms, they might abdicate the ability to think critically and inventively without technological assistance and guidance. This might lead to the homogenization of productions: as AI systems often generate outputs based on patterns found in their training data, in the absence of human criticism, evaluation, and feedback, this can affect content diversity and originality. While AI cannot replace human creativity due to several inherent limitations, understanding the balance between augmentation and replacement is crucial for fostering a healthy collaboration between humans and machines.

As the articles proposed in this issue argue from different perspectives and disciplinary backgrounds, AI is a valuable means for fostering human creativity by enlarging the sphere of possibles experiences, interactions and inquiries. Risks aware collaboration and critical cooperation might, in fact, act as an important stimulus for rethinking established concepts, practices and world-views (see Renzo Filinich's and Christo Doherty's paper). With this regard, AI tools can serve as a source of inspiration, generating new ideas that humans might not have conceived. For instance, generative design in architecture can produce thousands of design alternatives, from which architects can draw inspiration. In this sense, AI can act as a partner that brings computational power and novel approaches to the table, while humans provide intuition, emotion, and contextual understanding. The fusion of AI and human creativity is giving rise to entirely new forms of artistic expression. Interactive installations, AI-generated performances, and dynamic urban environments are examples of how this synergy is pushing the boundaries of what is possible (see Roberto Bottazzi's article). Moreover, the widespread adoption of AI in creative fields may lead to cultural shifts in how creativity is perceived. Finally, it is aesthetic judgment that undergoes a deep transformation while considering the surprising

effects of machines' productions as well as their capacities for matching human tastes and captivating their interest (see Sebastian Rozenberg's contribution). Understanding and adapting to these shifts is crucial for maintaining the richness and diversity of human culture. In this regard, it is interesting to note the impact of generative AI on our notions of creativity. In particular, it has motivated the introduction of the idea that this faculty is not exclusive to organic life, but which can potentially also describe the behavior of some systems mechanics (see Betti Marenko's article). AI exhibited creativity forces us to rethink the relevant parameters that define what it means to be creative, while maintaining the traditional association between creativity and intelligence. The effect of the discovery driven interaction with AI is twofold: on the one hand, it allows us to understand in what sense a non-living system can be creative; on the other, it could open a window into human creativity and, more broadly, into intelligence (see Keith Tilford's essay).

As we advance into an era where the line between human and machine creativity blurs, the potential for collaboration and innovation grows exponentially, together with potential risks and dangers. By fostering a deeper understanding of how machines can augment and transform creative processes, we hope to pave the way for productive future experimentation as well as for active critical evaluations of the effects of interactions. As we navigate the uncharted waters of AI's rapid evolution, this special issue serves as a critical resource for understanding the philosophical, ethical, and practical dimensions of this transformative phenomenon.

TECHNOPHANY
A Journal for Philosophy and Technology

Technophany Vol.3 No.2

Art & Language After AI

AA Cavia

Abstract

By ingesting a vast corpus of source material, generative deep learning models are capable of encoding multi-modal data into a shared embedding space, producing synthetic outputs which cannot be decomposed into their constituent parts. These models call into question the relation between conceptualisation and production in creative practices spanning musical composition to visual art. Moreover, artificial intelligence as a research program poses deeper questions regarding the very nature of aesthetic categories and their constitution. In this essay I will consider the intelligibility of the art object through the lens of a particular family of machine learning models, known as 'latent diffusion,' extending an aesthetic theory to complement the image of thought the models (re)present to us. This will lead to a discussion on the semantics of computational states, probing the inferential and referential capacities of said models. Throughout, I will endorse a topological view of computation, which will inform the neural turn in computer science, characterised as a shift from the notion of a stored program to that of a cognitive model. Lastly, I will look at the instability of these models by analysing their limitations in terms of compositionality and grounding.

Keywords: art, computation, AI, aesthetics, algorithm, deep learning, semantics

ISSN 2773-0875

1. The Crisis of Representation

The advent of generative deep learning signals a development in the technics of cognition which merits a re-evaluation of certain tenets of computational aesthetics. As with all defining moments, it is accompanied by a sudden awareness of a before and an after, of a landscape irrevocably altered. By ingesting a vast corpus of source material comprising multi-modal data, deep learning models are capable of aggregating original works into synthetic outputs which cannot easily be decomposed into their constituent parts. This development calls into question the relation between conceptualisation and production in creative practices spanning musical composition to visual art. We could bracket the aesthetics of computation prior to this watershed moment as essentially algorithmic in its tendency, a characterisation that seems inadequate in light of the neural turn in machine learning. This discontinuity concerns, on the one hand, a transition from the concept of a stored program to that of a cognitive model, while on the other, a departure from the canonical framework in computational linguistics, which tethers automata to certain classes of formal grammar. The emerging landscape hints at a newly configured relation between computation and language which offers its own account of intelligibility, along with a constituent aesthetic theory, the broad outlines of which I will attempt to sketch out in this paper. I will proceed in the spirit of speculative phenomenology, considering the aesthetics of deep learning models from within a specific theory of computation, rather than adopting a purely critical stance. I argue that Artificial Intelligence (AI) represents a challenge to what Deleuze once called the "dogmatic image" of thought, characterised by an affinity for truth, a presupposition of all Western philosophical enquiry.[1] By 'image' here I am alluding to a certain schema of intelligibility which computation (re)presents to us as the navigation of a topological space, to which I give the name 'site.' In this sense computation marks a reorientation of thought, displacing the centrality of truth in favour of a dynamic notion which I will attempt to ground in a property that Kleene first termed 'realizability,' an interpretation of logic whose emergence I diagnose as a symptom of the cognitive tendency of computation. This challenge in turn compels a re-evaluation of the semantics of computational states, exposing an irreconcilable gap between syntax and encoding, a distinction which serves as a major theme of this article. I will defend three interrelated claims in support of this argument: that computation has never been formal in the strict sense, that it seeks its own grounding, and that this condition propels it to generate novel sites for thought.

The crisis which this novel image precipitates is ultimately a crisis of representation, its repercussions akin to the shift to perspectivalism, as it concerns the absorption of a move in epistemology from naive to critical conceptions of space. To understand this

1 Gilles Deleuze, "The Image of Thought" in *Difference & Repetition* (London: Continuum, 2005), 129–167.

movement in full would require a diachronic account of the mathematical conception of topology, from Euler to Riemann, Grothendieck to Voevodsky, an introduction to which can be found elsewhere.[2] Let us for now simply consider this an insistence that all space comes with an attendant structure and that all thought must contend with its own embedding. Euclidean notions of space are set aside in favour of *locales of thought*, where a locale is conceived as an inferential lattice structuring a space. This view motivates a topological interpretation of machine learning which offers itself as a candidate theoretical framework for the integration of the symbolic and connectionist traditions in AI. Here, philosophy can aid not only in delineating the epistemological limits of such a framework but in providing a semantic theory with which to underpin said claims. This is an admission that in order to gain traction on the phenomenon of computation, an act of interpretation must necessarily take place. In this manner, the image of thought re-presented to us via generative AI opens out onto the problem of interpretation more broadly, which I will approach as a problem regarding the intelligibility of the art object. There are two moments in the history of modern art which allow us to frame the current rupture in computational aesthetics. Firstly, the move from abstract painting to algorithmic composition characteristic of a generation of artists who experienced their formative phase in the early post-war period, bookended by the end of WWII and an increased access to mainframe computers, roughly the period from 1950 to 1970. Secondly, the rebellion against gesture signalled by the proliferation of art practices which labelled themselves as 'conceptual' in the early to mid-1960s, of which I take the Art & Language group and their associated journal to be paradigmatic.

Three exemplars of the shift to algorithmic composition will aid us in rendering the current crisis as a problem of intelligibility. Consider Vera Molnár, a Hungarian migrant artist trained in abstract painting, and inventor of the *Machine Imaginaire*, working algorithmically by hand in the period 1957 to 1969, at which point the artist gained access to the mainframes at Orly.[3] Molnár is rightly regarded as a pioneer of computer art, but it was her anticipation of computation that prepared the foundations for her subsequent work, grounding her practice in the transformation of the painterly gesture into (in)formal procedures of various kinds. In Molnár's work, rule-following behaviour is continually destabilised by the psyche of the artist, but the pointed resistance to an axiomatic imperative is not presented as a confrontation between human and automaton, but rather as the fruits of an exploratory collaboration. The systems artist François Morellet similarly began using algorithmic compositional methods peppered with sources of entropy in his painting by the 1960s, a tension exemplified by the arbitrary selection of numbers from the telephone book to determine both the colour and composition of his

2 AA Cavia, "The Topological Turn" in *Logiciel: Six Seminars on Computational Reason* (Berlin: &&&, 2022), 107–145.

3 Vincent Baby, *Interview with Vera Molnár* (Paris: Manuella Editions, 2022).

canvases.[4] The title of Morellet's works reveal their algorithmic nature—encoding a lossy compression of the work conceived as the realisation of a program executed by the artist—while remaining incomputable in themselves. Here we can begin to intuit the idea that the notion of an algorithm is not a strictly computational concept after all, having been inherited from algebra, moreover that it may not play a role in computational aesthetics indefinitely, but rather signal a certain phase in its development. A certain triangulation of this shift is completed by tracking members of the New Tendencies group, located in Yugoslavia and active from the late sixties onwards, whose incorporation of concepts from the information age into art production came largely without recourse to computational hardware.[5] Julije Knifer's *Meander* series is of special relevance here—a sequence of works spanning almost forty years reproduce a motif which becomes emblematic of his oeuvre; a single meandering line or element which can be interpreted as a computational cipher of sorts, an emblem resonant with the recasting of computation as a means of navigation, Knifer's gesture calls into question the intentionality inherent in forging a path through space. All three exemplars serve to highlight the figure of the algorithm in art as a question regarding the limits of contingency as formulated from *within* the regime of computation. Each artist questions the notion of formalism *qua* rule-following automata, such that the technics of art practice and the figure of computation—conceived as the artefactual elaboration of cognition—are unified in destabilising the axiomatic precepts of formalism. Art is taken to create a privileged mode of encounter which attempts to unground the human gesture by submitting the act of composition to the *conditions* of computation.

The advent of algorithmic composition was contemporaneous with the foregrounding of language enacted by the Art & Language group (A&L) during the early years of what has been termed 'conceptual art.' As Isabelle Graw has since noted, the role of the conceptual artist was "to adopt different production-aesthetic premises and hence favour a kind of painting that *conceptualizes* expression."[6] This led Graw to conclude that "conceptual and expressive-painterly practices are… irreconcilable opponents."[7] By contrast with algorithmic composition, which sought to lay bare the notion of formality by aesthetic means alone, we can think of this moment as an attempt to collapse the compositional and propositional aspects of art practice. In the work of A&L this leads to a disavowal of gesture, dispensing with any obligation to produce identifiable art objects, a practice given by turns a rigorous and playful gloss, with varied outputs broad in their scope

4 François Morellet, 1971, *Répartition aléatoire de 40 000 carrés suivant les chiffres pairs et impairs d'un annuaire de téléphone, 50% bleu, 50% rouge*, oil on canvas.

5 Armin Medosch, *New Tendencies: Art at the Threshold of the Information Revolution 1961-1978* (Cambridge, MA: MIT Press, 2016).

6 Isabelle Graw, "Conceptual Expression," in *Art After Conceptual Art*, ed. Alexander Alberro (Köln: König, 2006), 121–135.

7 Graw, "Conceptual Expression," 132.

and ambition—I wish here only to draw attention to an *indexical* attitude to art which becomes a key methodology in its conceptualisation. Take, for example, *Index 01* (1972), which attempts an exhaustive self-referential cataloguing of A&L. The piece alludes to the "concatenation" of an archive of textual output, rendering each passage addressable via a meticulous numbering system, arranged in a mainframe style installation of filing cabinets.[8] Elsewhere in *(Index (Model (...)))* (1970), A&L seek to locate the notion of an 'art world' as a modal proposition, presenting an essayistic text in the form of index cards on a rolodex, pronouncing by turns that "One doesn't deal with art-works but art-worlds," and that "Any description of 'the art-world' is a description of a possible art-world."[9] Indexical strategies are used to encode the apparatus of art production in ways which we can discern as computational in nature, precisely because the relation between computation and language is characterised by the encoding of syntax, which is itself an indexical operation that affirms the locativity of any linguistic expression. If we take indexicality to signal the context sensitivity of reference as integral to the meaning of a statement, computation admits a profound referential instability whilst simultaneously asserting the locality of truth procedures; it follows that ungrounding, orientation, and navigation are complementary operations which typify the computational domain. This deictic conception of language is reinforced by the appeal to possible worlds in the work of A&L, which alludes to the modality of art itself as an indexical procedure, as a practice which renders the modal relation between model and world artefactual. Why do I refer to these moments in art history? In part because we are currently faced with a means of production anchored in articulation, a dialogical interaction in which natural language prompts generate synthetic media. We are essentially dealing with a mode of conceptual art in which verbalisation of the outcome is paramount. Secondly, because we are witnessing a general move in the conception of computational procedures from the algorithmic to the neural. Thirdly, because the indexical relation between computation and language calls into question the relationship between syntax and encoding; the cleaving of these concepts is laid bare by the topological view of computation which deep learning brings into focus. In this sense, the incipient phase of algorithmic composition and the commitments of conceptual art give us reference points with which to distinguish the pre- and post-conditions of the dyad *art-language* after AI.

To briefly summarise the history of neural computation, we can trace its cybernetic origins to the theoretical work of McCulloch & Pitts, developing from the late 1940s, to its first instantiation in Rosenblatt's *Perceptron Mark 1* at Cornell University in 1958, which served as the architectural prototype for artificial neural nets. Following a hiatus in connectionism within AI research, this is followed by the phase which Rina Dechter first termed "deep learning," the latter emerging as a series of technical breakthroughs

8 Robert Bailey, *Art & Language International: Conceptual Art between Art Worlds* (Durham, N.C: Duke University Press, 2016), 45.

9 Bailey, *Art & Language International*, 28.

in the late 1980s.[10] The learning scheme known as 'back-propagation' created a feedback mechanism that was to prove an effective means of supervised training, while developments in both attention and memory completed the generational shift from earlier models.[11] The conceptual underpinnings have survived surprisingly intact in the thirty years it has taken for deep learning to reach its ascendancy, aided largely by a combination of vast training data, increased computational resources and distributed computing. Notably, the interpretation of the neural metaphor has shifted to a vector representation in which 'deep' layers of activation functions inhabit high-dimensional spaces. The geometric logic of such models underpin the key theoretical insight behind contemporary AI: multi-modal data can be embedded into a common space in which vector transformations define conceptual relations, with computations serving as 'realizers' of conceptual roles. This in turn yields in deep learning models an ability to generate what has come to be known as 'synthetic media', exhibiting a grasp of both compositionality and grounding previously unseen in AI. I am alluding here to both the lexical and semantic sense of compositionality, in which terms can be composed into ever more complex expressions whilst retaining soundness and meaning, and its representational sense, in which the composition of a scene presupposes an entire set of inferential and referential relations—the manner in which aesthetic composition summons a 'world.' The term grounding in turn is multivalent, but we can conceive of the challenge to AI in terms of rational, referential, and interpretative modes of grounding. Whereas canonical accounts of representation usually make an appeal to the Fregean distinction between sense and reference, the referential grounding of computational states is unstable to the point that we might question how their meaning can be fixed at all. On this question I will foreground the language games that agents are capable of partaking in, following Meredith Williams' critique of Donald Davidson, whose work in turn allows us to approach the problem of interpretation as integral to the project of AI.

2. Unstable Diffusions

I should firstly like to draw attention to some aspects of the technical architecture of the family of models in question, known as *latent diffusion* models, in order to aid an understanding of the mechanisms at play, which will support some of the subsequent discussion.[12] The first detail to note concerns the mapping of the model's input data to

10 Rina Dechter, "Learning while Searching in Constraint-Satisfaction Problems," *AAAI-86 Proceedings* (1986): 178–185.

11 Geoffrey Hinton et al., "A Theoretical Framework for Back-Propagation," *Proceedings of the 1988 Connectionist Models Summer School* 1 (1988): 21–28.

12 Robin Rombach et al., "High-Resolution Image Synthesis with Latent Diffusion Models," *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition* (2022): 10684–10695, doi: 10.1109/CVPR52688.2022.01042.

a so-called 'latent' space, a process achieved by dimensionality reduction. In the case of an image, the dimensionality is synonymous with its pixels and therefore its resolution, whereas for text, one can consider the unique tokens in any given sequence creating an *n*-dimensional space in which they can be modelled. These representations can be mapped to spaces of varying 'shapes,' yielding an embedding of the original data. The act of embedding in this sense is a means of encoding relationships latent within the input space, with inferential roles being a prime example in the context of language models. For adherents of deep learning, such embeddings do not pre-suppose a symbolic representation akin to language, they are merely vectors whose operations are canonically interpreted as transformations described by linear algebra. By contrast, in the topological interpretation they are conceived as the induction of a manifold, the act of embedding then taking on a key inferential role: the creation of a topological site that encodes the relations intrinsic to a set of data. But one can take the topological view a step further, linking deep learning models to a theory which considers computations as classes of paths in continuous space, effecting isomorphic transformations with a view to constructing identities, a foundational framework in theoretical computer science.[13] This appeal to geometry is moreover coupled to a claim, which we can trace to the work of computer scientist Steven Vickers, regarding the fundamental *geometricity* of computation. In this sense, every space is to be treated as a space of models satisfying a given geometric theory.[14] Space is no longer in the Euclidean sense an empty container or repository, a given for geometric axiomatisation, but rather the result of the existence of an inferential structure which we can call the topology. Such a spatial treatment of types, notably absent from AI research, is the kind of theoretical shift required to consider a hybrid model of machine learning, spanning affordances that range from inductive pattern recognition to the construction of a fully-fledged 'world model' of the kind I argue is a pre-requisite for sapience.

We can charge deep learning research to date with several counts of epistemic naivety, commencing with an overly *retinal* view of intelligence, principally concerning itself with the role of perception over that of cognition and action. Indeed, Rosenblatt's early neural net was equipped with an array of photo-voltaic cells and four flash bulbs as a means of engaging the problem of optical character recognition, which remained a canonical challenge for machine learning for over 30 years. It's likely that an overt emphasis on visual cognition stymied connectionist approaches in their development of the properly inferential affordances we rightly demand of intelligent agents, capacities which symbolic AI has proven itself unable to grasp despite its focus on logical reasoning. But the question of supervision should also be critiqued as an empirical bias that accepts the given as 'ground truth,' restricting models to a supervised learning regime which tethers AI to

13 Steve Awodey, "Structuralism, Invariance, and Univalence," *Philosophia Mathematica*, 22, no. 1 (2014): 1–11, doi: 10.1093/philmat/nkt030.

14 Steven Vickers, *Topology via Logic* (Cambridge: Cambridge University Press, 1989).

human epistemology in ways which constrain it to acts of mimicry and recognition. It should be clear in this regard that the role of intelligence as a function of cognition is not merely to engage in Bayesian acts of prediction, but to actively engage in the shaping of worlds, the kind of "normative pragmatism" that Brandom has endorsed in his critique of AI.[15] For Brandom, the prospect of "autonomous discursive practices" hinges on their "algorithmic decomposability," of which he is sceptical on account of the interactive nature of speech acts.[16] These acts, he in turn argues, are embedded in a normative space that necessarily cleaves sentience from sapience. A version of this critique is to be found in the work of Cantwell Smith, which exposes a fissure between prediction and explanation, rendered as the distinction between reckoning and judgement.[17] If the origin myth of AI is that mimicry and intelligence are indistinguishable, as concretised in Turing's imitation game, then the ensuing conception of AI as our mirror image has led much research into inductive dead ends of the sort that are vulnerable to such critiques. I would contend that the movement which Hegel once called the 'self-estrangement' (*Entfremdung*) of reason finds in AI its paradigmatic expression, which is to say that it undermines the Hegelian project from within. Stripped of an enlightenment *telos* and shorn of its commitment to absolute knowledge, what remains is a logocentric husk which reveals a distinct mode of explanation that stubbornly resists universalisation, a distinct *logos* which sets computational reason apart from the general field of technicity. This movement is not a process that can in principle be supervised, since it identifies deracination, which is the continual labour of ungrounding reason, with thought itself. It is the essential *opacity* of this process to a given epistemic perspective that raises the problem which Davidson once termed "radical interpretation," a paradox concerning how to engage the speaker of a *lingua ignota*.[18] This is a problem which remains largely obscured by the entrainment of machine learning to human epistemology, but which nevertheless represents one of the central research questions for AI. For now, large language models instead signal a move to an entirely Wittgensteinian model of language reliant on the unsupervised learning of *patterns of use*. In this scheme, the meaning of a term is rendered in terms familiar to pragmatism—it is to be equated with its usage in a corpus of human expressions. In this regard, language models have gained their affordances *in spite* of our attempts to guide them, with the human taking on the role of reinforcing certain norms in posterior learning phases.[19] Back-propagation has been replaced with a feed forward scheme in which supervision is only productive once the models have learned not only the grammatical rules which govern lexical competence, but the inferential and referential architectures

15 Robert Brandom, "Artificial Intelligence and Analytic Pragmatism," in *Between Saying and Doing: Towards an Analytic Pragmatism* (Oxford: OUP Oxford, 2010), 69–92.

16 Brandom, *Between Saying and Doing*, 70.

17 Brian Cantwell Smith, *The Promise of Artificial Intelligence: Reckoning and Judgement* (Cambridge, MA: The MIT Press, 2019).

18 Donald Davidson, "Radical Interpretation," in *Inquiries into Truth and Interpretation* (Oxford: OUP, 1991), 125–140.

19 This technique is known as reinforcement learning with human feedback (RLHF).

implicit in human language use. The latter are inferred largely of their own accord, with the only guidance provided in this regard being a next token prediction learning strategy.

Here we should be clear to call out 'unsupervised' learning too as a misnomer of sorts, as the effect of the phrase is to blind us to the specific logics of encoding that operate in the input data, be it RGB colourspace structured into pixels or the sequential feeding of Unicode characters in the case of text. It may be that in this approach there is no 'ground truth' presented in the form of conceptual scaffolding attached to observations, but there is a clear biasing of the form in which the data is rendered intelligible to the model. Not only does the training data guide the attentional modulation of the model, often forcing it into sequential or linear attention patterns, it also conditions its respective architecture, which has to be retro-fitted with attentional components to provide greater flexibility during learning.[20] It is quite clearly not the case that the saccades of a human eye train our attention linearly from left to right, from top to bottom, in our field of vision; quite to the contrary, many organisms seem heavily reliant on novelty filters and notions of saliency to guide their visual attention in non-linear patterns that may be advantageous to their survival.[21] Recognition alone cannot account for what pushes us to cognise beyond our established conceptual categories, as Deleuze puts it: "Something in the world forces us to think. This something is an object not of recognition but of a fundamental *encounter*."[22] This should prompt a general scepticism towards 'unsupervised' learning strategies which remain guided by distinct notions of encoding that in turn train the attention of the model. These should be considered forms of training, with all the pedagogical baggage that term implies, but to break from the locus of re-cognition requires a further speculative leap, which raises the question of interpretation as a key theoretical problem for AI. We can express this challenge as shifting from the mere recognition of inhuman intelligence to the estrangement of intelligence itself as an essentially inhuman vector.

Let us consider the lack of rational grounding exhibited by contemporary machine learning models not simply as a technical deficiency or design fault, but as a symptom of the informal nature of neural computation. In this sense, generative machine learning models provide insight into twin notions whose expression has otherwise been obscured in many readings of computation, namely *suspension* and *diffusion*. The valence of the term suspension is twofold—firstly, the deferral of a decision, choice, or action, in effect the suspension of judgement, as a properly computational act. This by no means signals an obscurantist position that seeks to fetishise contingency, but rather the observation that computation outlines the contours of a 'decision' as such, it renders the undecidability

20 Ashish Vaswani et al., "Attention Is all You Need," *Advances in Neural Information Processing Systems* 30 (2017) [Page range needed if this is a journal article.]

21 Toshihiko Hosoya et al., "Dynamic Predictive Coding by the Retina," in *Nature* 436, no. 7047 (2005): 71–77, doi: 10.1038/nature03689.

22 Deleuze, *Difference & Repetition*, 139.

of a proposition artefactual. Secondly, the suspension of any given procedure in a contextual embedding space, which is to say the suspending of a decision in a situation. Here diffusion alludes to the continuous space on which operations must be situated to comprise effective procedures, a reference to the distributed representations of deep learning models, which do not locate meaning in a given point in space but rather in the irreducible notion of a manifold. Indeed, a methodological innovation in latent diffusion models concerns a *denoising* process which is invoked during the learning phase, tasking the model with approximating an output iteratively. The effect is striking, as it produces intelligible forms only gradually, rendering compositionally complex scenes which emerge from a foggy haze of Gaussian noise. The intelligibility of an object in such a model can only ever be conceived in terms of this diffusion process, in which the figure and ground of experience exist in a continuous spectrum akin to a *gestalt*. If we identify algorithmic composition with recursive generativity, then we can say that neural computation is instead marked by a stochastic diffusivity. In a sense, these models offer a riposte to the earliest philosophical critique of AI, in which a phenomenological appeal is made by Dreyfus to the totality of a situation as a challenge to early symbolic approaches.[23] By contrast, the stochastic nature of distributed neural computation advances a nebulous holism with regards to the contents of experience. This insistence on diffusion in turn can be seen as a reference to the disperse nature of intelligence as an interactive mode of cognition which can only follow from a social view of inference. The limitations of generative AI in this regard are considerable; the interactive phase of reinforcement learning is often strictly bounded, producing a stillborn image of intelligence incapable of engaging in the kind of doxastic updating we should expect from discursive agents. Nevertheless, an aesthetics of diffusion permeates neural computation, manifesting in an emphasis on the geometricity of reasoning over formal logic.

3. Computation without Formalism

Conceived as an image of thought, computation brings into focus the tension between intuitionism and formalism at the heart of mathematics, a schism traceable to the rift between Hilbert and Brouwer in the early twentieth century. While Brouwer offered a cognitive account of mathematical reason, Hilbert endorsed a symbolic view rooted in axioms. On this point we should insist that computation has never been formal, it has always—at times unwittingly—sided with intuition in regards to mathematical reason. Contrary to the canonical model of a universal machine abiding by strict axiomatic rules, computational reason is more accurately characterised as an inferential schema bound to the thermodynamics of contingency. We should critique expressions of Turing orthodoxy

23 Hubert Dreyfus, *What Computers Still Can't Do: A Critique of Artificial Reason* (Cambridge, MA: MIT Press, 1992).

that reduce computation to mechanism as failing to account for the epistemic traction of a distinct mode of explanation, a properly *computational reason* which sits apart from classical logic or mathematical formalism. We can conceive of this distinction between the axiomatic and the inferential as rooted in the history of logic, with formalism aligned with the former and intuitionism oriented towards the latter. This is exemplified by the compatibility of Gentzen's system of Natural Deduction with the intuitionistic algebra of Heyting, as summarised by Danielle Macbeth in her survey of the former:

> In an axiomatic system, a list of axioms is provided… on the basis of which to deduce theorems. Axioms are judgments furnishing premises for inferences. In a natural deduction system one is provided not with axioms but instead with a variety of rules of inference governing the sorts of inferential moves from premises to conclusions that are legitimate in the system. In natural deduction, one must furnish the premises oneself; the rules only tell you how to go on.[24]

The inferential in this sense represents a time-bound, dynamic, and provisional schema which threatens to untether itself from the static immutable laws that characterise axiomaticity. Rather than reject axiomatic imperative outright, which would be a total disavowal of consistency in reasoning, the labour of computational theory has been to construct the minimal set of axioms conducive to maximising inferential freedom. Creativity here is to be located in the generation of new premises local to a particular procedure, or else new rules of inference local to a given proof, rather than the addition of fixed global laws in the form of axioms. Indeed, much of theoretical computer science in the last decade has been focused on the reduction of formalism to a single axiom with which to ground computational inference, a 'univalent' foundation which openly advertises itself as logically inconsistent.[25] It is only by assuming an inferential stance of this sort that computational theory can rid itself of the impoverished image of a blindly obedient rule-following automaton and begin to grasp the non-monotonicity and defeasibility of reasoning which we associate with intelligence. In short, we can say that the inferential view is geared towards notions of agency—an agent's ability to act in accordance with self-directed goals—which the axiomatic view cannot countenance.

We can see this tendency towards the inferential expressed in the notion of 'realizability,' originating in Kleene's attempt to provide a semantic theory adequate to an informal view of mathematics.[26] It was Kleene's express intent to fuse mathematics and computation by

24 Danielle Macbeth, *Realizing Reason: A Narrative of Truth and Knowing* (Oxford: OUP Oxford, 2014), 73.

25 Awodey, *Structuralism, Invariance, and Univalence*.

26 Stephen Kleene, "On the Interpretation of Intuitionistic Number Theory," *The Journal of Symbolic Logic* 10, no. 4 (1945): 109–124, doi: 10.2307/2269016.

synthesising intuitionistic logic with a computational theory of types, yielding a single notion which would challenge the dominant account of truth values in the semantics of formal languages put forward by Tarski. A range of realizability inspired theories emerged in the post-war period, developing into a fully-fledged foundation for computation, foregrounding effective procedures over static notions of truth, foremost amongst them the constructive type theory of Martin-Löf.[27] In this context, to *realize* a proposition is to provide a proof or program that produces an instance of its type as an output. A type no longer resembles a category but rather a means of collecting all the possible programs that output instances which accord with its corresponding proposition; the content of a concept is thus all the ways we have of justifying its propositional form, procedures which are said to *inhabit* the type. To assign a term to a type is no longer a banal act of classification, which would consign computation to acts of recognition alone, but rather is the very means of constructing a concept, of exhibiting a 'witness' to its proposition, an operation which for Martin-Löf is synonymous with judgement formation.[28] It is this operation which I call encoding and affirm as foundational to computation, a scheme in turn proffering a more expressive semantics for computational states. This is the source of the challenge to the dogmatic image of thought conceived as an affinity for truth; truth is sidelined in favour of a dynamic notion, which we can consider a program, in the broadest sense of the term, but more accurately describes the act of justifying a proposition, by virtue of realizing its corresponding type. If we imagine the propositional form of the concept *chair* as a means of support for certain kinds of bodies such that their spine is in an upright position, we can conceive of all the procedures that exhibit modes of chairhood as not merely instances of an abstract universal, but rather linguistic terms which furnish the concept *chair* with its intrinsic content. As such, the meaning of a concept is not synonymous with the proposition it presents, but rather is laid bare in how we engage in constructing and verifying its witnesses, namely the practices we invoke to justify its use. This is in effect a semantic theory proffering an entirely temporal, plastic, and inferential account of concepts as dynamic types.

The import of realizability is that it not only challenges the dominant Boolean interpretation which reduces computational states to binary truth values, but that it simultaneously broadens the expressivity of computation and its potential grasp of language. As a multi-valued logic, every proposition has a distinct meaning enacted by all its witnesses, each of which is conceived as a directed movement or the tracing of a path—a properly cognitive act that is engaged in *realizing* the concept. Moreover, it admits a semantic pluralism regarding which justifications one is willing to endorse as conforming to a proposition. Voltages on silicon are no longer interpreted by Boolean truth tables, but as epistemic acts

27 Per Martin-Löf, "Truth of a Proposition, Evidence of a Judgement, Validity of a Proof," *Synthese* (1987): 407–420, doi: 10.1007/BF00484985.

28 Per Martin-Löf, "On the Meanings of the Logical Constants and the Justifications of the Logical Laws," *Nordic Journal of Philosophical Logic* 1, no. 1 (1996): 11–60.

of encoding grounded in a realizability interpretation of logic, a theory which insists on the materiality of truth procedures. After all, to *realize* is to summon an effective method, a concretisation of thought bound to the finitude of space and time. In this scheme we find the language of constructivism mixed in with verificationist overtones, an impure mixture which locates computation at the nexus of the space of reasons and the realm of causes. We should be wary of interpreting the appeal to verification along strictly empiricist lines, insofar as our justified beliefs exhibit an autonomy in the generation of propositional form which is not strictly reducible to experience. One can just as easily interpret verification in terms that foreground inferential operations over the given as ground truth, but ultimately one should concede that a computationalist stance of this sort distinguishes itself from established positions in epistemology, in that it seeks a naturalised account of concepts as types bolstered by a semantics of computational states. This is a scheme which attempts to stake out an autonomous semantic theory, loosening its dependence from existing foundations. More accurately, realizability can be said to issue a challenge to the edifice of Tarski semantics, a framework which insists on a meta-linguistic apparatus to define truth and as such suffers from issues of existential regress: where to cash out meaning when all we have is a stack of languages each dependent on a higher level of arbitration to underpin its truth values.

Realizability sets meta-linguistics aside in favour of immanent procedures which yield truth only as a byproduct of isomorphisms induced by a plethora of discursive operations that guide our agreements and disputes. The encoding of syntax can be said to replace metalanguage as a general technique for the indexing of language. On this point I would follow Wittgenstein's observation that "we judge identity and agreement by the results of our calculating; that is why we cannot use agreement to explain calculating."[29] If we replace 'calculating' here with 'encoding,' a firmer computationalist position is apparent, in which the combined operations of encoding and embedding are the means by which the contents of experience are made intelligible, a process that Cantwell Smith calls "registration," which he considers "the most important task to which intelligence is devoted".[30] Conceived as a theory of encoding, computation exhibits a certain functional autonomy from both language (syntax) and mathematics (axioms), if only because it cannot be adequately explained by such frames of reference. While one can give a Gödelian account of encoding grounded in number, or else a neuroscientific rendering in terms of neural spike trains, I would maintain that a kernel theory of encoding remains distinct from these applications of the concept. It strikes me that a theoretical reconfiguration of automata and language of this sort is a pre-requisite to even begin to consider a grasp of natural language as within the epistemic purview of computational states, a labour which contemporary language models demand through their aptitude to engage in an infinite

29 Ludwig Wittgenstein, *Remarks on the Foundations of Mathematics* (Cambridge, MA: MIT Press, 1983): IV. 8

30 Cantwell Smith, *The Promise of Artificial Intelligence*, 35–36.

variety of language games, exhibiting a set of affordances which are not trivially reducible to statistical explanation alone.

The expressive limitations of axiomatics should cause us to reconsider our commitments to formalism in our interpretation of computational states, if we are to absorb AI into an explanatory framework which faithfully accounts for the epistemic faculties that computational agents can in principle possess. Here, I would consider the limitations of contemporary AI by way of an inferentialist critique regarding the role of normative commitments in shaping our linguistic performances. While it seems obvious that norms distinguish themselves from patterns by dint of their social nature, it is not clear at the outset what the pre-requisites are for an agent to qualify as partaking in normative behaviour. We can follow a broadly Sellarsian line of thinking, making an appeal to agency in the underpinning of said commitments, to construct an argument which places them centrally in our everyday locutions—an insistence on the "space of reasons" as constitutive of everyday speech acts.[31] In this sense, a language bearer must move beyond mere indexical strategies to develop commitments of the sort that propose novel patterns of concept use. This opens up a third line of critique, distinct from that of phenomenology (Dreyfus) or pragmatism (Brandom), insisting on the normative nature of inferential roles in reasoning. We can pose this challenge to AI in terms of constructing a world model integrating empirical, modal, and normative relations, which an agent can navigate according to commitments that in turn imply self-directed goals.

Taking this inferentialist perspective, one can begin to regard the problem of referential grounding—used by critics of AI as an extension of the phenomenological critique—as misconceived. We might consider the classical problem of symbolic grounding as transformed into what Mollo & Millière call the "vector grounding problem," which concerns the grounding of encodings in the form of vector embeddings.[32] We can attempt to distinguish between referential and inferential semantic competence in these models as pertaining to word-object associations (ostensive definition) and intra-linguistic relations respectively. But a neat delineation of this sort is difficult to maintain upon closer inspection. As Mollo & Millière note, some referential semantic competence is already evidenced in language models, with human colour perception a prime example, raising the prospect of referential grounding beyond the narrow confines of ostensive definition.[33] The authors appeal to "diagrammatic iconicity" as the structural resemblance of a linguistic sign to its referent and consider its pervasiveness in language use—the

31 Wilfrid Sellars, *Empiricism and the Philosophy of Mind* (Harvard: Harvard University Press, 1997), 76 (§36)

32 Dimitri Coelho Mollo and Raphaël Millière, "The Vector Grounding Problem," *arXiv preprint arXiv:2304.01481* (2023).

33 Mostafa Abdou et al., "Can Language Models Encode Perceptual Structure without Grounding? A Case Study in Color," *arXiv preprint arXiv:2109.06129* (2021).

ordering of events in narrative sequences reflect temporal relations, the principle of adjacency applies for terms whose referents are closely related, the use of subordination in clauses reflects conditionality between states-of-affairs, and so on. Even before we consider multi-modal models equipped with other sensory faculties, we can presume that our patterns of language-use encode all kinds of structural relations of this sort, that they in some way reflect the organisation of our common life-world beyond the strictures of formal logic. Mollo & Millière go on to make the case that the surface form of language and its meaning cannot be decoupled in deep learning models, by virtue of the fact that they exhibit a "distributional semantics," which has to be treated holistically across modalities.[34] Here, we can discern a practical distinction between syntax and encoding—the encoding of syntax renders language yet another structure among others to be embedded onto a site, in turn proffering a generic notion of structure, such as topology, as the basis for inference. Moreover, the decomposition of a vector space does not yield a form which is linguistically intelligible but only mathematically graspable. I would suggest that this impasse hints at the informal basis of these models, allowing us to approach the second tendency from within, namely computation as an affinity for modes of diffusion.

It is the ungrounded nature of neural computation, alienated from its host environment yet always contextually bound to a given operative site, that grants it the inferential freedom to enter into a fully indexical relation with language. The informal basis of such models is confirmed by their ability to understand analogy, syntactic ambiguity, and tone before mastering formal reasoning. Far from consigning computation to classes of formal grammar, large language models make the case that a grasp of natural language is possible without brute forcing a recursive enumeration of lexical and compositional rules attuned to every possible dialogical context. This presents a challenge to the strong Chomskyan thesis that the syntactic rules which form the kernel of universal grammar are not learnable from patterns of use alone. What makes such models a legitimate object of philosophical enquiry is the fact that they are not reducible to charges of "stochastic parroting," but rather elicit a re-evaluation of the notion of intelligibility.[35] The aporia can be summarised thus: It appears that models primed to compute probability distributions in the context of a next token prediction task do not produce utterances which are explainable in purely statistical terms. It is more accurate to say that the challenge of prediction has spawned a range of capacities which aid in its optimisation but are not reducible to the overarching goal. We can make an analogy with our own rational affordances—our capacity to reason is not reducible to the evolutionary challenge to reproduce, even if it emerges in response to and acts in support of that goal. Evidence for these affordances in AI come by way of benchmarking suites which show the emergence of specific abilities, such as those of novel

34 Mollo and Millère, "The Vector Grounding Problem."

35 Emily Bender et al., "On the Dangers of Stochastic Parrots: Can Language Models be too Big?," in *Proceedings of the 2021 ACM conference on Fairness, Accountability, and Transparency*, (2021): 610–623, doi: 10.1145/3442188.3445922.

conceptual composition, analogical reasoning, and the grasping of syntactic ambiguity, at larger scales.[36] Here, the use of the term 'emergence' should be approached critically but not altogether dismissively. If we conceive emergent properties as those properties of a system which are not explained away by the causal relations of its constituent parts, there is a case to be made for these forms of semantic competence to be treated as epistemic affordances that reach beyond the narrow domain of statistical token prediction. At the very least, it seems that a convincing argument for setting *a priori* theoretical limits on both the rational and referential capacities of machine learning remains elusive, even if the models remain quite obviously limited in their present form. Perhaps as a means of grasping the pragmatic limits of AI, one should instead shift the focus of enquiry to the question of interpretation and the precise manner in which it brings compositionality and grounding into relation.

4. Radical Interpretation

In Davidson's early work, an attempt is made to lay out the conditions for the learnability of language, with an emphasis on systematicity along three principal axes: syntactic and grammatical rules, the compositional nature of meaning, and infinite generativity from finite means.[37] Only by satisfying these conditions, the argument goes, can the interpretation of language proceed as the primary means of grounding linguistic meaning; this is the problem of radical interpretation, which for Davidson is to be treated as a universal condition of language. For the early Davidson, a semantic theory is necessarily synonymous with a theory of linguistic competence, and the latter hinges on a formal recursive structure by which we are able to exhibit infinite expressivity in our linguistic performances. As Williams has convincingly argued, Davidson's attempt at a formal truth-conditional semantic theory of natural language fails on account of an overwhelming argument in favour of the holistic nature of meaning which originates in Wittgenstein.[38] Williams combines this with an argument arising from the context sensitivity of utterances which reaches beyond the mere deployment of indexical terms. Advocating for semantic holism, Williams argues that "individual words have meaning only against the background of whole patterns of linguistic usage," such that "we don't first learn the meanings of words and then go on to grasp the meanings of sentences as constructed from those word-meanings."[39] For Williams, the infinite generativity of language is a symptom of the open-

36 See BIG-Bench and Aarohi Srivastava et al., "Beyond the Imitation Game: Quantifying and Extrapolating the Capabilities of Language Models," *arXiv preprint arXiv:2206.04615* (2022).
37 Donald Davidson, "Theories of Meaning and Learnable Languages," in *Inquiries into Truth and Interpretation* (Oxford: OUP, 1991), 3–17.
38 Meredith Williams, "Davidson's Challenge: Meaning and Logical form," in *Blind Obedience: The Structure and Content of Wittgenstein's Later Philosophy* (London: Routledge, 2009), 125–132.
39 Williams, *Blind Obedience*, 129.

ended nature of our language games as opposed to a formal recursive grammar. Far from exhibiting compositionality, natural language is often underarticulated and ambiguous, both syntactically and semantically. Taking the view from pragmatism, Williams rejects the autonomy of grammar from embedded speech acts, and locates infinite expressivity in constantly evolving patterns of use, as exhibited by her account of conceptual creativity:

> There are problems with how to introduce a new word that does not already draw on the expressive power of language. Ostensive definition is not an acceptable strategy. Introduction by way of definition is also beside the point. The only way to introduce new terms is by using them in an array of different sentences such that, when viewed holistically, they can be seen to show a pattern of usage that warrants a new truth sentence and perhaps the elimination of some others.[40]

As evidenced in this quote, Williams follows Wittgenstein in her scepticism as to the role of referential grounding in fixing meaning. The key question raised by the epistemically deflationary double blow of scepticism and pragmatism pertains to what qualifies as a truth sentence in the accompanying theory of language. Williams tracks Davidson's evolving scepticism regarding interpretation, finally settling into a cluster of positions in which communication is synonymous with varying degrees of misunderstanding, in which the notion of a stable shared language amongst language users is genuinely under threat. This defence of indeterminacy is typified by his account of Quine's claim regarding the "inscrutability of reference," a discussion which offers little hope to the prospect of anchoring meaning by referential means.[41] To this backdrop of scepticism, so characteristic of Wittgenstein, Williams suggests the problem of "normative similarity" as a means of considering the import of language games in fixing meaning, whilst avoiding a fully deflationary view of our epistemic affordances.[42] For Williams, the initiate learning scheme central to Wittgenstein's account of language games is the mechanism that provides the "normative bedrock" without which "there would be no space of reasons for the agent to enter."[43] On this view, a convergence of norms is a pre-requisite for the kind of discursive performances upon which mastery of language hinges, a process that occurs *in situ* as part of the learning experience. A Sellarsian interpretation might be that we must somehow come to recognise those metalinguistic functional roles that govern language use—sortals, objects, qualities, predicates, universals, and so on—before we can begin to demonstrate an understanding of concepts. Williams is perhaps correct in pointing out that Sellars lacks an adequate account of how this might take place, since he places

40 Williams, *Blind Obedience*, 136.

41 Donald Davidson, "The Inscrutability of Reference," in *Inquiries into Truth and Interpretation* (Oxford: OUP, 1991), 227–243.

42 Williams, *Blind Obedience*, 17.

43 Williams, *Blind Obedience*, 314.

little emphasis on the learning process. An interpretation of normative similarity which I would endorse is one which frames discourse as the generation of embedding spaces which serve as locales of thought. These spaces of implication pave the way for operations of convergence, invariance, and isomorphism, procedures which provide substance to our agreements and disputes, exposing incompatibilities and forming affinities of use. To hold that our discursive practices are guided by norms which construct the very embedding spaces that our linguistic performances presuppose is to portray our language games as inferential moves in this latent space of implication, proferring no immediate referential grounding in our environment. In this sense, the act of encoding precipitates the embedding of concepts which locates them in a logical space of reasons. This aligns with the informal view of computation under realizability semantics, which is committed to pushing truth values to the margins of its account of expressivity, implicitly endorsing a theory of truth as structural invariance under transformation. Such a correspondence theory of truth clearly has to address as its principal problem the issue of relativism, or in other words, the relation between mind and world has to be fleshed out in topological terms. Ultimately, one has to define the relation between indexical encodings and states of affairs in such a constructivist picture on pain of engaging in solipsistic thinking. How can the ungrounding of thought by computational reason faithfully construct a working notion of objectivity? One solution I would tentatively offer is the modal property of projectibility, which is to be taken as a topological notion embedded in space and time. Ladyman & Ross (L&R) offer an account in which "projection is related to counterfactual-supporting generalization by means of a special concept of perspective."[44] For L&R, a pattern is real *iff* "it is projectible under at least one physically possible perspective," going on to defend a form of objectivity in this mould.[45] This notion finds some alignment with the topological view of computation and strikes me as a promising basis on which to extend a theory of objectivity compatible with the constructive rendering of computational reason I explore here.

5. The Realizability of Worlds

Let us come back to the question of the art object and its intelligibility as means of advancing an argument relating the semantics of computation to the aesthetics of deep learning. The conception of art that I'm endorsing here is that of a practice engaged in constructing novel propositional forms, a conception aligned with the shift in cultural production that art critic Habib William Kherbek has termed 'propositional art.' For Kherbek, a propositional conception of art is to be found in a discourse that speaks in "interrogative rather than declarative tones" which trace "the fault lines of our own pre-

44 James Ladyman, Don Ross, and David Spurrett, *Every Thing Must Go: Metaphysics Naturalized* (Oxford: OUP, 2007), 224.

45 Ladyman, Ross, and Spurrett, *Every Thing Must Go*, 226.

suppositions and purported understandings."[46] In Amanda Beech's view, a propositional art "does not just speak to an external object but also [to] the terms in which it speaks."[47] As Beech reminds us, art has the potential "to intervene with its own principles and the imperative to redefine the rules of its game," as she exhorts us to consider "how art ought to think."[48] I would argue that the origin of this tendency is to be found in conceptual art as a historical movement collapsing the twin notions of composition and proposition, as exemplified by the indexical strategies of A&L. It is this conception of art as a propositional practice which is exposed by AI in its embedding of natural language into a multi-modal encoding tasked with synthetic composition. The encoding of syntax embeds language in a locale which declares the context sensitivity of thought by binding concepts to the site of their realisation. Under realizability semantics, the compositionality of language and the propositionality of form go hand in hand, sutured by the act of encoding. To think the dyad *art-language* is at once to commit to art as an intrinsically propositional form and to simultaneously refuse the dual *conceptual-perceptual* in favour of an account of intelligibility which fuses the two as integral to rendering form intelligible as such. This amounts to an insistence that the 'contents' of experience are necessarily already embedded in a conceptual space, the structure of which is continuously to be tested against what Quine once called "the tribunal of experience."[49] As the inferentialist John McDowell puts it, "the object of an experience, the state of affairs experienced as obtaining, is understood as part of a thinkable world."[50] For McDowell, there is no way of untangling impressions from justifications, or indeed concepts from intuitions, on the basis of a Kantian distinction between spontaneity and reception, it is precisely his project to lead us out of such a dualism. If we take 'world' to indicate a specific kind of site, a topological space whose construction follows from the operation of embedding, the realizability of a world thus becomes synonymous with a computational treatment of modality. Here the collapse of model and world—which is a rejection of meta-linguistics in favour of realizability semantics—offers the prospect of an integrated *world model*, a context integrating empirical, modal, and normative relations to be navigated by an inferential cognitive toolkit, a set of affordances which are ultimately provisional in nature.

The bricolage of techniques, heuristics, and tools which we put to use in our language games define us as rational agents that navigate continuous uncertainty; in this sense our modal reasoning is centred not on an axiomatic notion of possibility, but on the

46 Habib William Kherbek, *Entropia: Childhood of a Critic* (London: Abstract Supply), 12.
47 Amanda Beech, "Art's Intolerable Knowledge: Actually Existing Research," in *The Postresearch Condition*, ed. Henk Slager (Utrecht: Metropolis M Books, 2021), 51–55.
48 Beech, "Art's Intolerable Knowledge," 51.
49 Willard Van Orman Quine, "Two Dogmas of Empiricism," in *Perspectives in the Philosophy of Language: A Concise Anthology* (Peterborough, CA: Broadview, 2000), 189–210.
50 John McDowell, *Mind and World* (Harvard: Harvard University Press, 1996), 36.

realizability of worlds. If to compose a scene is to summon a world, then realizability can be said to be the modal property common to intelligible form. It is not in spite of this informal cognitive scaffolding that we exhibit intelligent behaviour, but rather that intelligence only shows its face when reason is ungrounded in this manner, clearing a site for the induction of novel embeddings. In this view the deracination of thought is synonymous with thought itself, it marks intelligence as an escape from acts of mimicry and recognition, pointedly rejecting the notion of AI as a mirror of human epistemology. Each time that we ask of computation that it serve as our mirror image—How is it that machines can suffer? How can they desire? How could they possibly create?—We deny and obscure the self-estrangement of thought that the artefactual elaboration of cognition issues forth as a challenge to our creative faculty of interpretation. To engage in the ungrounding of reason is to contend with the diffusion of thought, the suspension of judgement, and the opacity of interpretation—which amounts to what is perhaps the highest aim that philosophy and art could share, namely, to render intelligibility anew.

Bibliography

Abdou, Mostafa et al. "Can Language Models Encode Perceptual Structure without Grounding? A Case Study in Color." *arXiv preprint arXiv:2109.06129* (2021).

Awodey, Steve. "Structuralism, Invariance, and Univalence." *Philosophia Mathematica* 22, no. 1 (2014): 1–11, doi: 10.1093/philmat/nkt030.

Baby, Vincent. *Interview with Vera Molnár*. Paris: Manuella Editions, 2022.

Bailey, Robert. *Art & Language International: Conceptual Art between Art Worlds.* Durham, N.C: Duke University Press, 2016.

Beech, Amanda. "Art's Intolerable Knowledge: Actually Existing Research." In *The Postresearch Condition*, edited by Henk Slager, 51–55. Utrecht: Metropolis M Books, 2021.

Bender, Emily et al. "On the Dangers of Stochastic Parrots: Can Language Models be too Big?" *Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency* (2021): 610–623. doi: 10.1145/3442188.3445922.

Brandom, Robert. "Artificial Intelligence and Analytic Pragmatism." In *Between Saying and Doing: Towards an Analytic Pragmatism*, 69–92. Oxford: OUP, 2010.

Cantwell Smith, Brian. *The Promise of Artificial Intelligence: Reckoning and Judgement.* Cambridge, MA: MIT Press, 2019.

Cavia, AA. "The Topological Turn." In *Logiciel: Six Seminars on Computational Reason*, 107–145. Berlin: &&&, 2022.

Davidson, Donald. *Inquiries into Truth and Interpretation*. Oxford: OUP, 1991.

Dechter, Rina. "Learning while Searching in Constraint-Satisfaction Problems." *AAAI-86 Proceedings* (1986).

Deleuze, Gilles. “The Image of Thought” in *Difference & Repetition,* 129–167. London: Continuum, 2005.

Dreyfus, Hubert. *What Computers Still Can’t Do: A Critique of Artificial Reason.* Cambridge, MA: MIT Press, 1992.

Graw, Isabelle. “Conceptual Expression.” In *Art After Conceptual Art*, edited by Alexander Alberro, 121–135. Köln: König, 2006.

Hinton, Geoffrey et al. “A Theoretical Framework for Back-Propagation.” *Proceedings of the 1988 Connectionist Models Summer School* 1 (1988).

Hosoya, Toshihiko et al. “Dynamic Predictive Coding by the Retina.” *Nature* 436, no. 7047 (2005): 71–77. doi: 10.1038/nature03689.

Kherbek, Habib William. *Entropia: Childhood of a Critic*. London: Abstract Supply, 2022.

Kleene, Stephen. “On the Interpretation of Intuitionistic Number Theory.” *The Journal of Symbolic Logic* 10, no. 4 (1945): 109–124. doi: 10.2307/2269016.

Ladyman, James, Ross, Don and Spurrett, David. *Every Thing Must Go: Metaphysics Naturalized*. Oxford: OUP, 2007.

Macbeth, Danielle. *Realizing Reason: A Narrative of Truth and Knowing.* Oxford: OUP Oxford, 2014.

Martin-Löf, Per. “Truth of a Proposition, Evidence of a Judgement, Validity of a Proof.” *Synthese* (1987): 407–420. doi: 10.1007/BF00484985.

Martin-Löf, Per. “On the Meanings of the Logical Constants and the Justifications of the Logical Laws.” *Nordic Journal of Philosophical Logic* 1, no. 1 (1996): 11–60.

McDowell, John. *Mind and World*. Harvard: Harvard University Press, 1996.

Medosch, Armin. *New Tendencies: Art at the Threshold of the Information Revolution 1961-1978*. Cambridge, MA: MIT Press, 2016.

Mollo, Dimitri Coelho and Millière, Raphaël. “The Vector Grounding Problem.” *arXiv preprint arXiv:2304.01481* (2023).

Morellet, François. 1971, *Répartition aléatoire de 40 000 carrés suivant les chiffres pairs et impairs d’un annuaire de téléphone, 50% bleu, 50% rouge*, oil on canvas.

Quine, Willard Van Orman. “Two Dogmas of Empiricism.” In *Perspectives in thePhilosophy of Language: A Concise Anthology*, 189–210. Peterborough, CA: Broadview, 2000.

Rombach, Robin et al. “High-Resolution Image synthesis with Latent Diffusion Models.” *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition* (2022): 10684–10695. doi: 10.1109/CVPR52688.2022.01042.

Sellars, Wilfrid. *Empiricism and the Philosophy of Mind*. Harvard: Harvard University Press, 1997.

Srivastava et al.. “Beyond the Imitation Game: Quantifying and Extrapolating the Capabilities of Language Models,” *arXiv preprint arXiv:2206.04615* (2022).

Vaswani, Ashish et al. “Attention Is all you Need.” *Advances in Neural Information Processing Systems* 30 (2017).

Vickers, Steven. *Topology via Logic*. Cambridge: Cambridge University Press, 1989.

Williams, Meredith. *Blind Obedience: The Structure and Content of Wittgenstein's Later Philosophy*. London: Routledge, 2009.

Wittgenstein, Ludwig. *Remarks on the Foundations of Mathematics*. Cambridge, MA: MIT Press, 1983.

TECHNOPHANY
A Journal for Philosophy and Technology

Technophany Vol.3 No.2

Grand Theft Autoencoder

Keith Tilford

Abstract

The implementation of generative models in deep learning, particularly those of Text-to-Image Synthesis (T2I), are essentially an exaptation of the cognitive processes of the transcendental imagination Kant outlined in his notoriously opaque schematism chapter of CPR. While such engineering feats mirror the liberating force of photography's invention, they have also proven to be a significant engine for reproducing saturated ideologies of art pivoting on claims about what has been stolen by the machine. This paper argues that T2I presents an opportunity to instead reconsider what our models of the procedures of the imagination actually are or could be, and wagers that the interdisciplinary conceptual frameworks supporting machine learning enable us to recuperate from an "incommensurable" synthetic intelligence the necessary resources for revising our understanding of what creativity is and does, with pattern recognition providing the tools for a renewed elaboration of *techné* to pull a heist upon the transcendental itself.

Keywords: Predictive Processing, *Techné,* Pattern Recognition, Schema, Representational Redescription

ISSN 2773-0875

1. The Heist

In any storyline where theft is an element of the plot, it matters little whether the heist appears at the beginning or the end because the heist is always already taking place. Its objectives and its operativity are an evolution and development of means and invention, with the manipulation of form, matter, and intelligence doubling as loot and getaway van. As was already observed in ancient Greek culture,[1] the ability to achieve change in environmental circumstance toward advantage readily extends across the history of biological life, encoded conceptually for Western intellectual history as art, *techné*, craft, engineering, or for the 21st century with generative technologies and creativity. In the contemporary situation, new statistical machine learning algorithms have led to some mainstream suggestions that text to image synthesis AI models (T2I) are nothing short of the perpetrators of an art heist whose consequences achieve world historical proportions. In this context, we should approach the heist from the perspective of organized crime outlined by Hohimer in *The Home Invaders* to ask how we might have seen it coming:

> You can bank your life on three things. The outfit sent him. He knows every piece of jewelry in your house. And he is a professional. The mob keeps crews working around the nation and they never miss. They know exactly where they are hitting, and what they are getting. Their information is precise, there is no guess work. It comes from insurance executives, jewelry salesmen, auctioneers of estates. The same guy who sold you the diamond may be on the corner pay-phone before you get home.[2]

With Big Tech in the leading role of thief, generic humanity and the imagination are staged as victims largely unaware of what has been stolen beyond dubious claims concerning the ownership of "style." Is it possible in this circumstance to wager that something has been taken *for* intelligence and not from it? If at stake is a reconfiguration of aesthetic categories at the expense of their consistency vis-à-vis the deliberately obscure metaphysical assumptions about the nature of creativity encountered in both popular culture and the institutions of culture, the answer should surely be yes. In an unwitting complicity with the machine's heist, our access to the internet has been defined in part through lures of agreement in the (sometimes) casual depositing and labelling of images where user interface design implements a scrim of subterranean pathways known

1 See Marcel Detienne and Jean Pierre Vernant, *Cunning Intelligence in Greek Culture and Society,* trans. Janet Lloyd (University of Chicago Press, 1991).

2 Frank Hohimer, *The Home Invaders: Confessions of a Cat Burglar* (Chicago Review Press, 1975), xviii.

as dark patterns.[3] In this obsessive hoarding of loot the estimated number of images is in excess of 700 billion. Comparatively, the LAION 5B dataset adopted by current T2I technologies comprise only a small portion of this, with 5.85B CLIP-filtered image-text pairs. Yet this modicum will prove sufficiently complex for computation's abstract and synthetic imagination to perform an associative swipe through the emergent schema of connectionist networks that reflects more than the banal fact of images made by humans, freely available on the internet, that it imitates, mimics, transforms, or fakes. This is because the machinic copyist can be seen as having been designed all along from mimetically collected images of the biological brain at every level, stealing away the bulk of discoveries about organic vision systems and the syntactic elaboration of reasoning along the way. Computational Creativity, while predicated upon generative productions obtained from discoveries in pattern recognition research, has introduced novel forms of *mis*recognition—a misrecognition that it will be argued should include the false consciousness of internet natives duped by a contemporary social function of creativity.[4]

Creativity, having been subtracted in its modern form from its classical and theological constraints of *ex nihilo*, now provides administrative ideological support to the bulwark of common sense that presumes the inventive agencies of any given subject. This valence, occasionally sutured to notions of a 'will-to-form', gains traction only in the 20th century, metastasizing today through the imperatives of self-authorship in online behaviours, to which the empty structural place of artist or creative is readily occupied by generic T2I users. The ensuing critical response from "creative professionals," many of whom have had their work used in the training data, converges on a consensus that the capacity for art is discoverable in life alone. For those users that "already know the score," it is possible to find deferrals to conceptual practices with language as in the example of 'propositional attitudes' of a Lawrence Weiner or the "general social technique" that Duchamp's strategies highlight.

The Neural Network Zoo[5] is now also a zoo of aesthetic *types* where the forgery, the fake, and the counterfeit are all family, in the mafia sense of the word: collaborators but also conspirators perennially involved in *shady business*. Of course, as Plato should remind us, when it comes to images, we can never be sure whether or not we might just be getting *set up*. This is why for intelligence the heist should all already be old hat. The archives (and the

3 The term was first coined by Harry Brignull in 2010. For an extensive list of examples see Brignull's Deceptive Pattern Initiative Hall of Shame at https://www.deceptive.design/hall-of-shame

4 Not to leave out a generalized deception which we all must now contend with regarding AI images masquerading as documents with an origin external to the machine, as a recent study puts the human misclassification rate at 38.7%. See Zeyu Lu, Di Huang, Lei Bai, Xihui Liu, Jingjing Qu, and Wanli Ouyang, "Seeing is not always believing: A Quantitative Study on Human Perception of AI-Generated Images," *arXiv preprint arXiv:2304.13023* (2023).

5 Fjodor Van Veen and Stefan Leijnen, *The Neural Network Zoo* (2019), https://www.asimovinstitute.org/neural-network-zoo

markets) of both antiquity and modernity are saturated with copies, forged signatures, and faked originals, with the counterfeit document playing no insignificant role in ensuring a successful duping of both casual connoisseur and expert. Art historian Francis Halsall has suggested an information-theoretic evaluation of the artworld as a system structurally configured not unlike the "complex system of *distributed* representation"[6] of connectionist networks undergirding T2I models. It helps to explain the efficacy, in Halsall's example for instance, of John Myatt and John Drewe's forgery ring that netted approximately 2.5 million pounds through a meticulously crafted false provenance "because Drewe was able to redirect information and thus provide opportunities for the genuine fakes to be represented over the gallery system as authentic."[7] The timing of the media affair with the British Museum's *inside job* along with their simultaneous platforming of the international touring exhibition *The Art of Imitation* couldn't be more perfect. The assumption of a divide between mimicry and creative authenticity serves as a departure point not because T2I seriously disturbs an already agitated modernist trope of the relation between originals and copies (although it assuredly does), but because it forces consideration of a problem with even greater logical depth concerning how we externalize images through creative procedures to begin with, and what we consider sufficient criteria of explanation for images and their perception to be more generally. The psychology of vision and the study of illusions have often asked a question that it seems appropriate to revisit: "Can you trust your eyes?"

2. Inventory: The Image and Intelligence and Images of Intelligence

The item inventories in video games are notorious for their improbably bloated collection of resources, an abstract capacity analogous to those one finds in contemporary theories and ontologies of the image. This is the case as much for the "pictorial turn" addressed by W.J.T. Mitchell's *Picture Theory* as for the "aesthetic turn" in the 'French situation' of Patrick Vauday's *The Invention of the Visible* as neither depart in their investigations without first listing everything in the safe. Without being exhaustive, these inventories will at least include the contributions of those whose work since the 19th century initiates a certain formalism such as Herman von Helmoltz, Irwin Panofsky, Rudolf Arnheim, and E.H. Gombrich. Additionally, Jonathan Crary's homogenized epistemological landscape in *Techniques of the Observer*, Mitchell, or the philosophical anthropology of objectivity in Lorraine Daston and Peter Gallison, would be among shortlists providing current image theory with the salient features for critical attitudes towards networks, surveillance, Big

6 Francis Halsall, *Systems of Art: Art, History and Systems Theory* (Peter Lang, 2008), 156. See also Friedrich Teja Bach, "Forgery: The Art of Deception," in *Faking, Forging, Counterfeiting: Discredited Practices at the Margins of Mimesis,* ed. Daniel Becker, Annalisa Fischer, and Yola Schmitz (Transcript Verlag, 2018).

7 Halsall, *Systems of Art,* 156.

Data, etc., that could be caricatured as a 'diagrammatics of control'. In their construction, images are always a trace of techniques of production taken and to be obtained—copied, imitated, learned, or stolen. With Plato's Sophist we find that the non-being of the image also *is*, and that with the fashioning of images comes also the introduction of what Andrea Mecacci has noted is the "first degree of a possible technique of deception" enabling the proliferation of simulacra and doubles derived from a technically constructed match between appearance and sensation.[8] The image, to use Vernant's terminology, finds its "psychological career" only after Plato,[9] and the fake or counterfeit image, often under the aegis of kitsch, is crystalized in modern and contemporary visual practices, which include art as much as advertising.

The technological shifts "altering the conditions under which human vision articulates itself"[10] that Mitchell admits to not being the first to observe will lead directly to the 'postconceptual condition' of contemporary art as outlined by Peter Osborne, where the digital image becomes its own referent and the photographic becomes a general function within art.[11] Contemporary art will respond to such reconfigurations in-kind with interventions such as the methodologies and protocols suggested in Seth Price's *Dispersion* (recently celebrating its porcelain anniversary), Hito Steyerl's notion of 'poor images' with their questionable genealogies and capacities for 'creative degradation', or the nostalgia for pocket Polaroids one finds in Trevor Paglen that registers in outline a certain cultural consensus regarding how "[m]eat-eyes are far too inefficient to see what's going on anyway."[12] Such a consensus does not favour an ostensible superiority of machine vision but rather outlines a generalized suspicion of technology, although only Price seemed interested in explicitly manipulating the "social ontology" of images by aligning their construction in art with the discourses of suspicion and critique, anticipating an historical moment Halsall will christen in no unsubtle terms as "The Age of Dispersion."[13]

This dispersion, and "the conditions of ubiquitous image saturation" art historian David Joselit relates to its cause,[14] Halsall will also wager are analogous to the "distributed

8 Andrea Mecacci, "Aesthetics of Fake: An Overview," *Aisthesis: Pratiche, Linguaggi e Saperi de ll'Estetico* 9, no. 2 (2016): 60–61, https://doi.org/10.13128/Aisthesis-19416

9 See Kamelia Spassova, "J.P. Vernant on Plato's Mimetic Theory: Images, Doubles and Simulacra" *Platonic Investigations (Платоновские исследования)* 14, no. 1 (2021), https://doi.org/10.25985/PI.14.1.01, and Richard Neer, "Jean-Pierre Vernant and the History of the Image," *Arethusa* 43, no. 2 (2010), http://www.jstor.org/stable/44578325.

10 W.J.T. Mitchell, "The Pictorial Turn," *Artforum* 30, no. 7 (March 1992): 94.

11 Peter Osborne, "Infinite Exchange: The Social Ontology of the Photographic Image," *Philosophy of Photography* 1 (2010), https://doi.org/10.1386/pop.1.1.59/1. See also Koray Değirmenci, "The Ontology of Digital Photographs and Images," in *Art-Sanat Dergisi* 8 (2017).

12 Trevor Paglen, "Operational Images," *e-flux* 59 (2014): 2.

13 Francis Halsall, *Contemporary Art, Systems and the Aesthetics of Dispersion* (Taylor & Francis, 2023).

14 David Joselit, *After Art* (Princeton University Press, 2013), 88.

representations" of machine learning connectionist models. Implicitly, this will intersect with what, from within the purview of contemporary visual culture studies, are typically less visible coextensive historical trajectories in the psychology of vision that replace gestalt theory with pattern recognition and information-theoretic perspectives during the 20th century.[15] From here, and motivated by Helmholtz's proposal of a learning function according to 'unconscious inferences' in perception, knowledge of segmentation in the brain of local neural substrates for detection, discrimination, and recognition directly inspire image segmentation in the machine, where edges and features can be mapped onto categories, shaping the implementation of the more recent deep learning architectures that now produce AI imagery. These experiments traverse an elaboration of procedures that are not easily captured by rationalist descriptions of thinking as symbolic manipulation. As a 'practical intervention' into the assumptions of knowledge-acquisition defended by "symbolic AI" or "good old fashioned artificial intelligence" (GOFAI), connectionism establishes itself through an alignment with a different modality of manipulation dependent on the "emergent abilities" of a learning function that will come to find among its contemporary conceptual and theoretical armament the frameworks of 4E cognition (embodied, embedded, enactive, and extended). However, this 'paradigm shift' is not without its problematic contradictions, especially concerning assumptions of embodied knowledge as uniquely indicative of "what the computer can't do" that seem to be undermined in the contemporary situation of evolving implemented abilities and techniques in the 'disembodied machines' of deep learning.[16] The question remains open of how to devise an effective escape route out of GOFAI, Searle's Chinese Room, or Turing's Imitation Game and their 'symbolic capture'. Between 'propositional attitudes' and the 'non-inferential' (or 'not rule-governed') processes of "creative intelligence" now hijacked by the algorithm, can assessing what has been stolen into synthetic creative processes also provide a window of access into the intelligibility of what cognitive operations artistic procedures are performing?

15 On the 'clear and distinct' line from this to today's 'visionless machines', see especially Berkay Üstün, "From Gestalt to Pattern in Post-War American Aesthetic Theory: The Works of Rudolf Arnheim and György Kepes," *Uludağ Üniversitesi Fen-Edebiyat Fakültesi Sosyal Bilimler Dergisi* 24, no. 45 (2023).

16 See Hubert Dreyfus, *What Computers Still Can't Do: A Critique of Artificial Reason* (MIT Press; Revised Edition,1992). I am thinking here especially of how debates initiated by Dreyfus and others are situated in the dilemmas that Pietro Perconti and Alessio Plebe address in the history of deep learning regarding embodiment and 4E cognition against the backdrop of recent advances in AI. See Pietro Perconti and Alessio Plebe, "Deep Learning and Cognitive Science," *Cognition* 203 (2020): 104365, https://www.sciencedirect.com/science/article/abs/pii/S0010027720301840.

3. Technique

"The first pebble to crack a nut replaces the teeth."
- Michel J.F. Dubois

No heist is of great interest that makes too apparent how the job was done, and deception is a hard rule. In the history of fakes and forgeries the art of deception runs amok against the art of detection, with contemporary forensics now a formidable adversary supported by the instruments of science and AI. The prevalence of *fooling* over truth may appear now more weighted than ever, but does not present a significant break with the role of mimesis that historically posits a structural identity between art and nature, of which the contemporary cultural function of creativity bears a trace.[17] Derived from the role of genius in Kant where the rules of art are deemed inaccessible to the rules of intelligibility (famously by way of the schematism chapter in CPR then elaborated in CJ), the new metaphysics of nature he initiates will obscure—via German Romanticism's sway over the trajectories of artistic modernism—how artistic techniques are founded on modes of imitation, citation, and mimicry. Gombrich explained these in a distinctly Kantian flavor as the manipulation of schemas conventional to all practices of image-making, and the paintings of Nicolas Poussin, for instance, exemplify this as a deliberate and common practice.[18] Where artistic conventions could be characterized and inventoried, such schemas would also come to inform the 'troubling' productions of representational objectivity with scientific images in the 20th century.[19] If we depart from a critical position and follow Mitchell, the computational mastery of images appears analogous to what he saw in the manipulation of pictorial form as "the basis for control over others" in that deception in visual practices, such as in trompe-l'œil, doubles as an affordance for the lures, dupes, and illusions of advertising or even propaganda, simply because "pictures are made out of other pictures, not out of 'reality'."[20]

Perhaps then to address the problem of how deception is always at play in AI imagery we might ask: when did *planning* first begin? If we follow Dubois (who draws as heavily on André Leroi-Gourhan's *Gesture and Speech,* as Deleuze and Guattari do in *A Thousand Plateaus*) and consider only a certain trajectory of sapience in the seven million years of evolution to human minds, capacities for reasoning through the prosthesis of language

17 See Hans Blumenberg and Anna Wertz, "'Imitation of Nature': Toward a Prehistory of the Idea of the Creative Being," *Qui parle* 12, no. 1 (2000).

18 See Richard T Neer, "Poussin and the Ethics of Imitation," *Memoirs of the American Academy in Rome* 51 (2006).

19 See Lorraine Daston and Peter Galison, "The Image of Objectivity," *Representations* 40 (1992), doi:10.2307/2928741, and Lorraine Daston and Elizabeth Lunbeck, eds., *Histories of Scientific Observation* (University of Chicago Press, 2019).

20 W.J.T. Mitchell, *Picture Theory: Essays on Verbal and Visual Representation* (University of Chicago Press, 1995), 341–342.

are coextensive with the appearance of technique through processes of internalization and externalization, where linguistic function becomes transmissibly encoded in tools and sets of skills, including those of art.[21] In this case, the basis of any practice of deception and planning can also be understood according to the emergence of environmental simulations that Peter Gärdenfors has termed "detached representations" which "presupposes that the inner environment of the deceiver contains some form of *representation of the inner environment of the target individual.*" (original emphasis).[22] As abilities gained from a modelling function evidenced across biological life observable in particular with predator-prey relations, their technical externalization into images by humans develops according to logics—and according to the development of logic through detachment—where the artefact is but one instantiation of these procedures, further exapted from their externalization through the *techné* of art into the 'unarticulated knowledge' of technique as an object of Computational Creativity's research.

What is creativity's unarticulated knowledge? For machine learning, schemas and abilities of planning depart from the explicit rule-based interpretations of technique through a modelled capture of classical articulations of *techné* or the aporias of 'how things are done' from antiquity into the Aristotelian-inspired 'microcognitive' frameworks of patterns of neural activation processes discoverable in psychology and cognitive science. In a sense, the "emergent abilities" of AI are heir to certain understandings of creativity and intelligence dependent on a generic 'working' of material 'without symbolic exchange'. We could, apropos Jason Tuckwell's escape route, take this as an opportunity for fundamentally reconfiguring *techné* as a practical concern with procedures of indeterminate *deviations* from representational models and the Platonic Forms towards particular instances of activities interested only in its means as "the transformation of an efficient cause, directed upon the material."[23] In Tuckwell's parlance and under a Deleuzean aegis of the 'problematic', these enacted interventions enter a trajectory of "operating discrete workflows"[24] that generalize creativity in an embodied logic of escape from determinations in symbolic capture. This might provide one way to understand, pace the repetition of this aegis in Vauday, what is at stake in a 'politics of the image',[25] where

21 See Michel J.F Dubois, *Humans in the Making: In the Beginning was Technique* (John Wiley & Sons, 2020).

22 Peter Gärdenfors, "Cued and Detached Representations in Animal Cognition," *Behavioural Processes* 35, no. 1–3 (1995): 269.

23 Jason Tuckwell, *Creation and the Function of Art: Techné, Poiesis and the Problem of Aesthetics* (Bloomsbury Publishing, 2019), 122.

24 Tuckwell, *Creation and the Function of Art,* 55.

25 "A politics of images is understood in the sense of the exception that comes to perturb the reign of perceptive norms by switching between image regimes and by scrambling and contradicting received identifications. A deviation [écart] is the appropriate term for this change: it is a sidestep and a displacement that shows things as otherwise and shows something other. At the same time, this indicates a quartering [écartèlement] that stretches the scene of the visible to the point of a laceration that discloses its limits, oversights and deceptions. If it has the effect of rendering the invisible visible, it is

the image serves as pragmatic relay between the propaedeutics of subjective dissolution in a practical material distinguishing itself from the evacuation of the body by the structuring formalism of models that "regulate" particular deviations of workflows in production. Here, technology and craft are the appropriate caricatures of such regulation, since they capture, articulate, and imitate for the purposes of repetition the manner in which "*technē* is a functional agency or computor, because what it precisely engages in is *logistikós* (calculation), even though this can be understood via the more generic *epistasthai*: the exchange, in the broadest sense, of 'knowing how to do'."[26]

However, if creativity is figured only according to the generative constraints of embodied 'microcognitive' procedures of deviation by appeal to their attendant 'gut feelings', the articulation of technique is at risk of being obscured in a generic indeterminacy since it inverts an 'a priori' *function* of *techné* by flattening it onto immanence as the deviant escape from transcendental determination. Explicit indetermination does not resolve the problems of creativity in claiming they are only intelligible as an evasion of the procedures that make rules explicit through determinations. Where the articulation of artistic technique lapses—and to much fanfare—into simply *doing things to other things* by way of 'unmediated intuitive access' absent of determination, as Adrian Piper makes painfully clear, it would actually be impossible to have any empirical experience without such determinations (in her Kantian enumeration, those of quantity, quality, modality, relation, and the capacity of judgment).[27] In something of a reprise of her early essay "In Support of Meta-Art," Piper will polemicize this attitude, familiar to canonical artistic modernism as much as contemporary artistic practices, by noting that "at least according to Kant's technical definition of knowledge, artists do not know what they are doing" and that "the purposeful character of the artistic process" demands a "distinction between knowing that and knowing how – i.e. between knowledge by description or propositional knowledge on the one hand; and practical or applied knowledge by acquaintance on the other."[28]

The problems of skill acquisition and the articulation of the development of techniques situated in the relay between implicit and explicit forms of knowledge has remained a

---

not in order to accede to a transcendence of the unrepresentable but to give a legitimate place to what is excluded by the very institution of the stage of the visible. This is because the visible is never as pure as phenomenology desires it to be. It is the stage of a complex montage, an apparatus articulated by a system of configuration and nomination which does not make beings, things, places and relations visible without also occluding others. One image always hides another." Patrick Vauday, *The Invention of the Visible: The Image in Light of the Arts,* trans. Jared Bly, (Rowman & Littlefield, 2017), xxiv.

26 Tuckwell, *Creation and the Function of Art*, 117.

27 Adrian Piper, "Intuition and Concrete Particularity in Kant's Transcendental Aesthetic," in *Rediscovering Aesthetics,* ed. Francis Halsall, Julia Jansen, and Tony O'Connor (Stanford: Stanford University Press, 2008), 200.

28 Piper, "Intuition and Concrete Particularity in Kant's Transcendental Aesthetic," 198.

driving force in the history of machine learning, but is also manifest in divides since the late 19th century between rationalism and empiricism that converge on debates that contour what Joseph Rouse has referred to as the "practice industry" with Heidegger and Wittgenstein as philosophical precursors.[29] It could even be argued that, having no model of an external world, AI might even be seen as operating on the implicit knowledge of its background data set. If *techné* as deviation of efficient causality could be subsumed under any model, it would be that of *amnesia.* In Gilbert Ryle's classic argument, the performer of implicit know-how shows no indication that they "recite lessons" through the manipulation of symbols which would be some obscure "second set of shadowy operations."[30] Ryle's critical intervention concerned interpreting know-how as an activity that couldn't possibly acquiesce to being determined according to explicit rules, yet this only opens the door for us to consider know-how as a clandestine and shady operation itself. Apropos Wittgenstein, the 'effective mastery' of technique through acquisition of skill functions only insofar as there results a forgetting of determinable techniques.

All the same, while the heuristics of *techné* disguise their patterns, that deception is itself also a pattern. We could here consider how art, aesthetics, and creativity have historically constructed similar attitudes towards "process," with Serra's "Verb List" as an exemplar: it is something akin to a 'set of instructions without instructions', just as the actually engineered bike is the index of specific activities performed on a material that wouldn't require recitation of their rules each time we take a ride. To roll, to cut, to wrap, to cover, to smear, etc. To 'know how to do' with a material, as with pictures in Joselit's analysis of Price's methodology, is to engage in enacting and activating a force upon things or even people, highlighting a 'sinister principle of manipulation' as much as Mitchell concerning the digital image with a litany of performed operations that include encircling, binding, tying, hiding...All of which are devised to match or mimic "the behaviour of pictures within digital economies."[31] We could then consider evaluating the behaviour of pictures and what is done to them according to what in this problematic field Ryle refers us to as "mental-conduct concepts": "'logical', 'witty', 'observant', 'critical', 'experimental', 'quick-witted', 'cunning', 'wise', 'judicious' and 'scrupulous'."[32]

Lists of procedures or instructions germane to the fascination with systems from the 60s up to Price's *Dispersion* all emerge from within a technical space that is ultimately that

29 Joseph Rouse, "Two Concepts of Practices," in *The Practice Turn in Contemporary Theory,* ed. Cetina, Karin Knorr, Theodore R. Schatzki, and Eike Von Savigny (Routledge, 2005), 198.

30 Gilbert Ryle, *The Concept of Mind* (Routledge, 2009), 38. Ryle will also say that "[k]nowing *how*, then, is a disposition, but not a single-track disposition like a reflex or a habit. Its exercises are observances of rules or canons or the applications of criteria, but they are not tandem operations of theoretically avowing maxims and then putting them into practice." (34).

31 David Joselit, "What to Do with Pictures," *October* 138 (2011): 82 http://www.jstor.org/stable/41417908. Accessed 15 July 2023.

32 Ryle, *The Concept of Mind,* 14–15.

of a heuristics for artifice that grounds certain practices in art—where, as in William Wimsatt's work, "artificial things are products of design processes or, more generally, of selection processes."[33] Where *recognition* of patterns poses the problem of normativity, of rule, of criterion of correctness, John Haugeland has suggested that their apprehension is inversely non-propositional, which in his estimation is "the true import of the phrase 'you know one when you see one': recognition is essentially a *skill*. It can be easy or arduous to acquire; but once mastered, it can be performed reliably and consistently" (original emphasis).[34] A pattern (as *παράδειγμα* or paradigm, sample, for example) is what can be acted upon, in the absence of which there is only the noisy environment where pace Piper empirical experience of objects would be impossible. If pattern recognition, as Satosi Watanabe has shown, is an epistemological problem of how we go about discerning invariant properties through generalizing inferential procedures, it is because "[t]here is no fixed rule for the recombination by the imagination" that we defer the procedures to "certain guiding principles" of heuristics in the "general field" of memory.[35] But it is also a methodological one appropriate to what Don Ross first referred to as a "Rainforest Realism" in assessing what Dennett understood as Real Patterns to be an inquiry into fundamental ontology, which, opposite Quine, would not attempt to clear away tropes but rather proliferate them as possible physical perspectives.[36]

It is pattern recognition's transit between lower-order features and higher-order cognition that makes its exercise non-trivial.[37] Images matched to objects using rules against the background of techniques that can't be said to follow them explicitly, is the sense in which Wittgenstein may have expressed it. In a sense, this could be seen in Gombrich's perspective as the "principle of adapted stereotype" where "no attempt to create an image is exempt from the rhythm of schema and correction."[38] If *style* amounts to anything, it is a distortion (or deviation) through copying, and the synthetic integration and transformation of images and their components through 'stages of schema and correction'. Similarly for Peirce, the general features of ideas can both be seen as schema and a kind of stereotype, albeit in a form of caricature that, unlike the fixed knowledge of machine learning's eigenfaces, remains in continuous transformation by rules of connections,

33 William C. Wimsatt, "Heuristics and the Study of Human Behavior," in *Metatheory in Social Science: Pluralisms and Subjectivities,* ed. Donald W. Fiske and Richard A. Shweder (Chicago, IL: The University of Chicago Press, 1986), 294.

34 John Haugeland, *Having Thought: Essays in the Metaphysics of Mind* (Harvard University Press, 2000), 279.

35 Satosi Watanabe, *Pattern Recognition: Human and Mechanical* (Wiley, 1985), 56.

36 See Don Ross, "Rainforest Realism: A Dennettian Theory of Existence," in *Dennett's Philosophy: A Comprehensive Assessment*, ed. Don Ross, Andrew Brook, and David Thompson (MIT, 2000).

37 See Robert P.W. Duin and Elzbieta Pekalska, "The Science of Pattern Recognition. Achievements and Perspectives," in *Challenges for Computational Intelligence*, ed. Włodzisław Duch and Jacek Mańdziuk (Physica-Verlag 2007).

38 Ernst Hans Gombrich, *Art and Illusion* (New York: Pantheon Books, 1961), 58.

abductions, and anticipations.[39] In his classic work on vision, David Marr's claim is that "the apparent simplicity of the act of seeing" is undermined once we learn that there are rules and procedures that are "exactly what vision is about, and precisely what makes it complicated."[40]

If for Mitchell, the analyses of Foucault and Wittgenstein made images more difficult to articulate, we should consider how AI images manifest as 'representations of procedures of representation', and how T2I models have palpable consequences for positions such as his, following Nelson Goodman, that "[n]o amount of description [...] adds up to a depiction."[41] It is not difficult to move from here to the 'propositional attitudes' of conceptual and postconceptual artistic practices, as has already been noted. What is assumed to be the result of non-propositional and therefore not rule-governed *techné* turns out to be amenable to description, as clearly demonstrated by the algorithm. What, after all, is the reward in claiming that T2I generates images incommensurable with the "embodied procedures of art"? It could be said that Ernst Cassirer had already presaged an escape route from the incommensurability of the Kuhnian paradigm shift in the 1950s, since the stability of reality in science, its 'fixing' of images and images of itself, appears "only as a continually renewed illusion, a phantasmagoria, in which a new picture momentarily displaces all the earlier ones, only itself to disappear and be annihilated by another."[42] While this characterization may seem indicative of the 'shift', it is recuperated in how Cassirer refashions a more post-Kantian version of Helmholtz, who insisted vision and perception were learned rather than innate, to say that even if the object of knowledge is 'given *a priori*' it can only be apprehended in perception *in actu* according to a process of serial transformation (what for Kant would be the "time determinations" of the schematism).

Technique, confronted with the perceived difference of an incommensurability between paradigms systematically integrates towards methods for detecting invariant patterns that emerge across serial transformations it initiates through relational frames of reference. A concrete example, noted even by Mitchell in his remarks on Frank Miller's 1986 *The Dark Knight Returns*, is the technical lineage one finds in comic book illustration, which elaborates the tools and techniques of its diegetic space and does so according to the shaping of visual practices in every other domain of image production. This is performed and exaggerated to such an extent that the ability of the machine to replicate its schemas should not be seen as surprising. Miller, incidentally, had already developed

39 Christopher Hookway, "'... A Sort of Composite Photograph': Pragmatism, Ideas, and Schematism," *Transactions of the Charles S. Peirce Society* 38, no. 1/2 (2002).

40 David Marr, *Vision: A Computational Investigation Into the Human Representation and Processing of Visual Information* (MIT press, 2010), 30–31.

41 Nelson Goodman cited in Mitchell, *Picture Theory*, 152.

42 Ernst Cassirer, *Substance and Function* (Dover 1953), 266.

a method for creating 'poor images' in his later *Ronin* series as a direct response to the innovations of smooth printing on Baxter paper that eliminated the effects of a lineage of techniques derived from anticipating the low-quality results of traditional printing technologies. If we want to call this "regulation" of techniques craft instead of art, only a thoroughgoing self-deception could uphold the distinction. *Style*, insofar as there is such a thing, emerges through a traceable constellation of constraints and the manipulation of generic properties of schemas to which AI imitations appear, to borrow Panofsky's term of deceptive circumstance, pseudomorphic, in that given they arise from entirely different contexts that use shared schemas, the one is not *necessarily* in every case the imitation of the other, nor are they identical.[43] That both are distributed images authorizes that they are ontologically made up of the same 'stuff', which would also seem to make any claim that the patterns identifiable as images of art carry more metaphysical weight than images from the machine appear as unwarranted.

4. The Getaway

As with certain cuisine and mixology, it can sometimes be good to end on a sour note. A consequence of the public reaction to computational creativity in T2I that separate themselves out from these systems into an elsewhere that the authenticity of artistic procedures is said to inhabit unwittingly reinforce a fairly saturated romanticism that, in its efforts to preserve a particular image of the human, defaults into a pattern of behaviour isomorphic with what Piper, borrowing the term from Kant, refers to as *pseudorationality*. As a cognitive response to the phenomenal encounter with an object or image (in this case the abilities of AI as anomalous) the salient features of which cannot be discerned or mapped onto a subject's existing categories of determination, this demand of preservation rationalizes the object in an inverted mirror by eliciting a mode of self-deception. As Piper argues: "if a necessary condition of unified selfhood is its internal horizontal and vertical consistency, then the self is disposed to preserve that consistency—i.e. is disposed to literal self-preservation—against anything that threatens it."[44]

It should be pointed out that the *pseudo-* of pseudorationality is in no way irrational, but rather a fooling procedure of a fully rational cognition confronted with indeterminacy. In creativity's various guises, indetermination in the intervention into efficient causality is matched by an indetermination of interpretation committed to an opacity of empirical intuition as phenomenal truth, under the cover of 'liberated' imaginative and creative manipulations disturbing the regulative idea. Nothing in this description undermines the logic at play in maintaining the consistency of extant aesthetic categories, or the coherence

43 See Yve-Alain Bois, "On the Uses and Abuses of Look-alikes," *October* 154 (2015): 130.

44 Adrian M.S. Piper, *Rationality and the Structure of the Self, Volume I: The Humean Conception* (Berlin: APRA—Adrian Piper Research Archive—Foundation, 2013), 36.

of an identity of creative subjectivity, even when it admits of surprise. Maintaining the semantic opacity of works of art only to prevent access to an intelligibility of the cognitive acts that give rise to them is par for the course in contemporary art. This is perhaps why if *techné* is figured as capable of escape and deviation at every turn in its ambitions against capture by epistemological models, the battle has already been lost. Whatever art's 'immanent protocols', they work with and alongside the systems of which they are a part and that also craft its reception and distribution. Even the deviant heroine still 'plays by the rules' here. These systems and their knowledges are of a piece with the techniques of contemporary art that for Tom Holert are "processed, torqued, scrambled, and reconfigured" by it, even at the risk, when staged as 'research', of "epistemic gestures that indulge in mere posturing."[45] A domain of these knowledges would have to now include the image classification of art that has been going on quietly for decades[46]—aiding in the process of, as Osborne puts it, photography and the digital image "*driving* the historical development of art"[47]

Yet, rather than asking *if* statistical configurations from the machine are creative or not we might rather ask *why* human-made images are recognized according to cultural norms to be the product of forms of thought and the manipulation of material that are not themselves the result of statistical processes in the brain (or whether the generative *variations* of the computer can be a sufficient form of *deviation*)? To pose the question this way is already to wager that *techné* can be understood as an exaptation of cognition's pattern recognition abilities that externalizes and manipulates "thought patterns" or "images of thought"?[48] Of course, the transformation of images of thought is already a familiar trope for both art and philosophy…However there are additional resources more germane to Computational Creativity that attempt to address the brain's acts of deviation, such as the *zeitgeist* defining machine learning framework of Predictive Processing (PP) in cognitive science and philosophy of mind, which evaluates cognition as an anticipatory, statistical process of error-minimization and environmental action. Daniel Williams has recently provided a broad overview of PP in defence of the brain's dynamic modelling of the environment as a tool for self-organization that enables cognition to construct "generative models" where "their description as "models" should be construed quite literally. They are physical structures that structurally resemble their targets."[49] The 'detached representations' of

45 Tom Holert, *Knowledge Beside Itself: Contemporary Art's Epistemic Politics* (Sternberg, 2020), 59–60.
46 An inventory of these is provided in the appendix to Amanda Wasielewski, *Computational Formalism: Art History and Machine Learning* (MIT, 2023).
47 Peter Osborne, "Infinite Exchange: The Social Ontology of the Photographic Image," *Philosophy of Photography* 1, no.1 (2010): 61.
48 As Michel J.F. Dubois distils the concept: "Understanding the difference between the process and what it ends up producing, and then the fact that what is obtained can be displaced, leads to the definition of what in evolutionary biology is called an 'exaptation'." Dubois, *Humans in the Making,* 42.
49 Daniel Williams, "Predictive Processing and the Representation Wars," *Minds & Machines* 28 (2018): 155, https://doi.org/10.1007/s11023-017-9441-6.

Gärdenfors are essentially this. What would distinguish human from animal cognition or current AI here is an ability to constructively map activities onto different domains of problems, such that intelligence becomes a developing function of what Andy Clark, borrowing from the post-Piaget neuroconstructivism of Annette Karmiloff-Smith, refers to as "*transferring* the abstract principles used to solve one kind of problem to a related but different kind of problem" through a practice of "representational redescription."[50] These abilities in defense of the explicit rule are why, in Clark's example, the beaver cannot build "a truly *deviant* dam,"[51] just like the baboon for Gärdenfors would never think to use lipstick.[52] Getting back the cognitive loot taken by the machine will not be accomplished in court cases over intellectual property, but in the patterns of adjustment that steal back for intelligence what machine learning's understanding of creativity is. This is something that would involve, to use Clark's formula, "a speculation concerning a link between the ability to become consciously aware of the contents of our own mental states and the process of redescription."[53]

Although he was writing only of the techniques of poetry at the time, as Viktor Shklovsky observed, "[t]he better you comprehend an epoch, the better can you see that the images you believed to be created by a particular poet are actually borrowed from others and almost unchanged."[54] If AI images are only a generic copy of creative behaviour derived from semantic information and the synthesis of irrelevant concepts in latent space, it should be highlighted that the logic of copying styles and schemas as a form of theft (the history of the "swipe" in comics, for instance) is indicative of an attitude that tends to only hold water within a Western system of aesthetics. As Michael Lucken has shown, "modern Japanese art depends on a heuristic that fits into neither the classical scheme of imitation → individuation → creation, where creation is the result of the self's maturation process through a prolonged contact with its models, nor into the modern agenda of rejecting imitation → creation → individuation, where it is only after breaking from his models that the artist can expect to find his way."[55]

Adjusting to such perspectival shifts, apropos Rainforest Realism's condition of admitting counterfactual scenarios for the instantiation of patterns, not only allows for the possibility that there could be potentials for art in the exploration of latent space, but the analysis of the computationally implemented techniques also provides us with a survey

50 Andy Clark, "In Defense of Explicit Rules," in *Philosophy and Connectionist Theory,* ed. William Ramsey, David E. Rumelhart, and Stephen P. Stich (Lawrence Earlbaum Associates, 1991), 119.
51 Clark, "In Defense of Explicit Rules," 120.
52 Gärdenfors, "Cued and Detached Representations in Animal Cognition," 270.
53 Clark, "In Defense of Explicit Rules," 126.
54 Viktor Shklovsky, "Art as Device," in *Viktor Shklovsky: A Reader,* ed. Alexandra Berlina (Bloomsbury Publishing USA, 2017), 75.
55 Michael Lucken, *Imitation and Creativity in Japanese Arts: From Kishida Ryusei to Miyazaki Hayao* (Columbia University Press, 2016), 3.

of cognitive processes that are, quite literally, a representational redescription of creative artistic procedures. Machine learning is an interdisciplinary collage and assemblage of sometimes disparate images of the biological brain, and any critical and pragmatic account of Computational Creativity would need to acknowledge that research into AI generated imagery is as much about investigating how the computer 'sees' as it is about integrating existing models of human cognition, vision, and meaning. The experimental protocols suggested by Deleuze and Guattari, which include those of 'mimicking the Strata', might even seem attractive again in this light, since for them "there is no imagination outside of technique."[56] However, technique appears somewhat trivial when it is interested only in according with a vital principle of autopoietic *becoming* that has no objective other than itself. Intervention into efficient causality alone for the sake of intervention and deviation explain neither what the technique is, nor how it is used. As Dubois highlights, "[t]he four Aristotelian causes that lead to a result are indeed those needed to transmit a technical process; what Aristotle analysed is what language says."[57] The agent of technique remains constrained by their representational resources for what the techniques do, which is as true for the artist as it is for the 'prompt engineer' attempting to describe a depiction. This may also be testimony to the reason for the overwhelming banality of AI imagery, and why it so easily accommodates the criteria for kitsch. But to defer to the indeterminacy of the creative procedure as subtracted from those that isolate, classify, and manipulate features or adopt, distort, and synthesize schemas, is only to aid in safeguarding the 'secrets of art' by a policing of human art's unique and special status.

One objection that can be anticipated is that such a 'formalist' evaluation in recognition of the generic properties of contemporary art and their treatment by technique removes creativity from context and from the particular embodied deviations that gave rise to its objects and images, risking a homogenization of knowledges, if not their many erasures. Yet, in keeping with Paglen's suggestion (albeit somewhat tangential to his intentions) that our familiar aesthetic categories and theories of visual culture are ill-equipped to sufficiently evaluate AI imagery, this is nonetheless among the methods required if we are to "unlearn to see like humans."[58] That is, if by 'seeing like humans' we mean an affective schema of cognition determined by a refusal to grasp art, creativity, and the imagination as *already redescriptively artificial* by affirming instead, to borrow Deleuze's expression, the vital principle of creativity as a profound "complicity between nature and mind."[59] Certainly dismantling an anthropocentric comprehension of art is not something

56 Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* (Minnesota, 2005), 345.

57 Dubois, *Humans in the Making,* 186.

58 "The theoretical concepts we use to analyze visual culture are profoundly misleading when applied to the machinic landscape." Trevor Paglen, "Invisible Images: Your Pictures Are Looking at You," *Architectural Design* 89 no. 1 (2019): 24. https://doi.org/10.1002/ad.2383.

59 Gilles Deleuze, *Difference and Repetition* (Columbia University Press, 1994), 165.

that could be accomplished merely by supporting or engaging in a 'collaborative spirit' with science and technology.[60] This is only to say that we have now a new tool, one that introduces new techniques and, if adjusted critically, discloses something about technique *in general.* It would be premature to assert computation is incapable of creativity, recalling that for Ryle, "there is no particular overt or inner performance which could not have been accidentally or 'mechanically' executed by an idiot, a sleepwalker, a man in panic, absence of mind or delirium or even, sometimes, by a parrot."[61] AI may not have any inherent capacity for generating techniques, but it does generate computational abilities, which themselves arise from encoded techniques. Creativity is a 'diagrammatics' only as a pathway into a field of operations. If we don't make the attempt to determine and to *know what we are doing when we do what we know how to*, a possible consequence would be not knowing our way around, and the initializing paradox of any strategy of orientation is that whatever situation it explores will also change as an effect of the exploration.[62]

Encounters with uncertainty, contingency, or the 'xenophilic vectors' of anomalous or opaque appearances that can generate pseudorational behaviours of self-deception no doubt possess a certain utility, as Piper suggests, especially concerning the manner in which images can be *put to use.* If they can prove to be a means towards the indeterminacies of subjective dissolution, such dissolution would be consequential only to the extent it leads to greater and greater determinations, rather than leading away from them. Piper will double-down on this wager: "Looking, really looking at any object is hard work, and not just because we have so much else on our minds. It elicits enormous psychological resistance because the more deeply we penetrate into the hidden structure of the object, the more deeply we penetrate into the hidden structure of the self. The more fully and vividly we unpack the complex properties of the object, the more fully and vividly we take apart the complex structuring of the self." [63] Creative Computation may have a peculiar image of the brain, but we are not worse off for considering it for what it might possibly tell us about how humans actually think and act creatively, much in the way that for Helmholtz, our 'unconscious inferences' are not fully hidden, since it is possible to become consciously aware of them. We might also consider here a response from Paul Churchland to Hilary Putnam's suggestion that if "the world can be endlessly recarved into new and different objects and classes" that this should also be true for the mind and its "unimaginably vast" possible conceptual resources and frameworks, the recognition of which could provide an opportunity and occasion to develop "a new *cognitive* taxonomy."[64]

60 See John Beck and Ryan Bishop. *Technocrats of the Imagination: Art, Technology, and the Military-Industrial Avant-Garde* (Duke University Press, 2020).

61 Ryle, *The Concept of Mind*, 33.

62 See Werner Stegmaier, *What is Orientation?,* trans. Reinhard G. Müller (de Gruyter, 2019).

63 Piper, "Intuition and Concrete Particularity in Kant's Transcendental Aesthetic," 208–209.

64 Paul M. Churchland, "Activation Vectors versus Propositional Attitudes: How the Brain Represents Reality," *Philosophy and Phenomenological Research* 52, no. 2 (1992): 423. https://doi.org/10.2307/2107947.

Just because we know *how* we can use the key to open the door, insofar as it fits and turns, doesn't guarantee any understanding of the mechanisms of the lock *that* could tell us how to pick it…a knowledge and skill-acquisition that could prove very useful indeed, as a pattern generalizable across a class of locks which might guard anything from our chains to passages leading inside the enemy's castle.

Bibliography

Bach, Friedrich Teja. "Forgery: The Art of Deception." In *Faking, Forging, Counterfeiting: Discredited Practices at the Margins of Mimesis,* edited by Daniel Becker, Annalisa Fischer, and Yola Schmitz, 41–58. Transcript Verlag, 2018.

Beck, John, and Ryan Bishop. *Technocrats of the Imagination: Art, Technology, and the Military-Industrial Avant-Garde.* Duke University Press, 2020.

Blumenberg, Hans, and Anna Wertz. "'Imitation of Nature': Toward a Prehistory of the Idea of the Creative Being." *Qui parle* 12, no. 1 (2000): 17–54.

Bois, Yve-Alain. "On the Uses and Abuses of Look-alikes." *October* 154 (2015): 127–149.

Cassirer, Ernst. *Substance and Function.* Dover, 1953.

Churchland, Paul M. "Activation Vectors versus Propositional Attitudes: How the Brain Represents Reality." *Philosophy and Phenomenological Research* 52, no. 2 (1992): 419–24. https://doi.org/10.2307/2107947.

Clark, Andy. "In Defense of Explicit Rules." In *Philosophy and Connectionist Theory,* edited by William Ramsey, David E. Rumelhart, and Stephen P. Stich, 115–128. Lawrence Earlbaum Associates, 1991.

Daston, Lorraine, and Peter Galison. "The Image of Objectivity." *Representations* 40 (1992): 81–128. doi:10.2307/2928741.

Daston, Lorraine, and Elizabeth Lunbeck, eds. *Histories of Scientific Observation*. University of Chicago Press, 2019.

Değirmenci, Koray. "The Ontology of Digital Photographs and Images." *Art-Sanat Dergisi* 8 (July 2017): 553–571.

Deleuze, Gilles, and Félix Guattari. *A Thousand Plateaus: Capitalism and Schizophrenia*. Minnesota, 2005.

Deleuze, Gilles. *Difference and Repetition*. Columbia University Press, 1994.

Dreyfus, Hubert. *What Computers Still Can't Do: A Critique of Artificial Reason*. MIT Press, Revised Edition, 1992.

Dubois, Michel J.F. *Humans in the Making: In the Beginning was Technique*. John Wiley & Sons, 2020.

Duin, Robert P.W., and Elżbieta Pekalska. "The Science of Pattern Recognition: Achievements and Perspectives." In *Challenges for Computational Intelligence,* edited by Włodzisław Duch and Jacek Mańdziuk, 221–259. Physica-Verlag, 2007.

Gärdenfors, Peter. "Cued and Detached Representations in Animal Cognition." *Behavioural Processes* 35, no. 1–3 (1995): 263–273.

Gombrich, Ernst Hans. *Art and Illusion*. New York: Pantheon Books, 1961.

Halsall, Francis. *Systems of Art: Art, History and Systems Theory*. Peter Lang, 2008.

Halsall, Francis. *Contemporary Art, Systems and the Aesthetics of Dispersion*. Taylor & Francis, 2023.

Haugeland, John. *Having Thought: Essays in the Metaphysics of Mind.* Harvard University Press, 2000.

Hohimer, Frank. *The Home Invaders: Confessions of a Cat Burglar*. Chicago Review Press, 1975.

Holert, Tom. *Knowledge Beside Itself: Contemporary Art's Epistemic Politics*. Sternberg, 2020.

Hookway, Christopher. "'... A Sort of Composite Photograph': Pragmatism, Ideas, and Schematism." *Transactions of the Charles S. Peirce Society* 38, no. 1/2 (2002): 29–45.

Joselit, David. *After Art.* Princeton University Press, 2013.

Joselit, David. "What to Do with Pictures." *October* 138 (2011): 81–94. http://www.jstor.org/stable/41417908. Accessed 15 July 2023.

Leroi-Gourhan, André. *Gesture and Speech.* MIT Press, 1993.

Lu, Zeyu, Di Huang, Lei Bai, Xihui Liu, Jingjing Qu, and Wanli Ouyang. "Seeing is not always Believing: A Quantitative Study on Human Perception of AI-Generated Images." *arXiv preprint arXiv:2304.13023* (2023).

Lucken, Michael. *Imitation and Creativity in Japanese Arts: From Kishida Ryusei to Miyazaki Hayao.* Columbia University Press, 2016.

Marcel, Detienne and Jean Pierre Vernant. *Cunning Intelligence in Greek Culture and Society.* Translated by Janet Lloyd. University of Chicago Press, 1991.

Marr, David. *Vision: A Computational Investigation Into the Human Representation and Processing of Visual Information*. MIT Press, 2010.

Mecacci, Andrea. "Aesthetics of Fake. An Overview." *Aisthesis: Pratiche, Linguaggi e Saperi de ll'Estetico* 9 no. 2 (2016):59–69. https://doi.org/10.13128/Aisthesis-19416.

Mitchell, W.J. Thomas, *Picture Theory: Essays on Verbal and Visual Representation.* University of Chicago Press, 1995.

Neer, Richard. "Jean-Pierre Vernant and the History of the Image." *Arethusa* 43, no. 2 (2010): 181–95. http://www.jstor.org/stable/44578325.

Neer, Richard T. "Poussin and the Ethics of Imitation." *Memoirs of the American Academy in Rome* 51 (2006): 297–344.

Osborne, Peter. "Infinite Exchange: The Social Ontology of the Photographic Image." *Philosophy of Photography* 1 (2010): 59–68. doi:10.1386/pop.1.1.59/1.

Paglen, Trevor. "Invisible Images: Your Pictures Are Looking at You." *Architectural Design* 89 no. 1 (2019): 22–27. doi:10.1002/ad.2383.

Paglen, Trevor. "Operational images." *e-flux* 59 (2014): 1–3.

Perconti, Pietro, and Alessio Plebe. "Deep learning and cognitive science." *Cognition* 203 (2020): 104365. https://www.sciencedirect.com/science/article/abs/pii/S0010027720301840.

Piper, Adrian. "Intuition and Concrete Particularity in Kant's Transcendental Aesthetic." In *Rediscovering Aesthetics,* edited by Francis Halsall, Julia Jansen and Tony O'Connor, 193–209. Stanford: Stanford University Press, 2008.

Piper, Adrian M.S. *Rationality and the Structure of the Self, Volume I: The Humean Conception*. Berlin: APRA—Adrian Piper Research Archive—Foundation, 2013.

Ross, Don. "Rainforest Realism: A Dennettian Theory of Existence." In *Dennett's Philosophy: A Comprehensive Assessment,* edited by Don Ross, Andrew Brook, and David Thompson, 147–168. MIT Press, 2000.

Rouse, Joseph. "Two Concepts of Practices." In *The Practice Turn in Contemporary Theory*, edited by Karin Knorr Cetina, Theodore R. Schatzki, and Eike Von Savigny, 198–205. Routledge, 2005.

Ryle, Gilbert. *The Concept of Mind.* Routledge, 2009.

Shklovsky, Viktor. "Art as Device." In *Viktor Shklovsky: A Reader,* edited by Alexandra Berlina, 73–96. Bloomsbury Publishing USA, 2017.

Spassova, Kamelia. "J.P. Vernant on Plato's Mimetic Theory: Images, Doubles and Simulacra." *Platonic Investigations (Платоновские исследования)* 14, no. 1 (2021): 11–31, 10.25985/PI.14.1.01.

Stegmaier, Werner. *What is Orientation?* Translated by Reinhard G. Müller. de Gruyter, 2019.

Tuckwell, Jason. *Creation and the Function of Art: Techné, Poiesis and the Problem of Aesthetics*. Bloomsbury Publishing, 2019.

Üstün, Berkay. "From Gestalt to Pattern in Post-War American Aesthetic Theory: The Works of Rudolf Arnheim and György Kepes." *Uludağ Üniversitesi Fen-Edebiyat Fakültesi Sosyal Bilimler Dergisi* 24, no. 45 (2023): 597–610.

Van Veen, Fjodor and Stefan Leijnen. *The Neural Network Zoo.* 2019. https://www.asimovinstitute.org/neural-network-zoo

Vauday, Patrick. *The Invention of the Visible: The Image in Light of the Arts.* Translated by Jared Bly, Rowman & Littlefield, 2017.

Wasielewski, Amanda. *Computational Formalism: Art History and Machine Learning*. MIT, 2023.

Watanabe, Satosi. *Pattern Recognition: Human and Mechanical*. Wiley, 1985.

Williams, Daniel. "Predictive Processing and the Representation Wars." *Minds & Machines* 28 (2018): 141–172. https://doi.org/10.1007/s11023-017-9441-6.

Wimsatt, William C. "Heuristics and the Study of Human Behavior." In *Metatheory in Social Science: Pluralisms and Subjectivities,* edited by Donald W. Fiske and Richard A. Shweder, 292–314. Chicago, IL: The University of Chicago Press, 1986.

TECHNOPHANY
A Journal for Philosophy and Technology

Technophany Vol.3 No.2

From Continuous to Discrete to Continuous – Text-to-Image Models as Limit to Indeterminate Phantasy

Sebastian Rozenberg

Abstract

This essay analyses the interplay of indeterminacy and in the experience of images generated through text-to-image (T2I) models. Through an interdisciplinary approach, it uncovers three layers of indeterminacy: the computational indeterminacy inherent in text-to-image model processes, the indeterminacy of imagination in Husserl's concept of protean phantasy, and finally the visual indeterminacy that figures in meaning making in all images. Generated images pass through these stages of indeterminacy, transforming indeterminate phantasy into determined visual objects, resulting in a conflict of consciousness between potential and actual. A distinction emerges between artificial phantasy, characterized by quasi-experience, and artificial imagination, grounded in images both as training data and perceptual image objects. As mediators between indeterminacy and determination, T2I images appear as technical media that mediate multiple forms of indeterminacy, showing the circulation between phantasy and imagination, between continuous and discrete. The generated image marks the limit of the unlimited indeterminate imagination.

Keywords: AI-generated images, Husserl, Imagination, Image Theory, Indeterminacy, Media Phenomenology, Text-to-Image models

 Corresponding author: Sebastian Rozenberg, sebastian.rozenberg@liu.se

ISSN 2773-0875

Introduction

The effortless transformation of imagination into image is at the centre of the hype and discourse concerning the specific type of generative AI that is text-to-image (T2I) models. Midjourney, one of the most widely used models, places this transformation of imagination at the centre of its advertising, claiming that it brings "imagination into reality," that "imagination is the only limit," and that they are "expanding the imaginative powers of the human species."[1] I want to hold the opposite of this hyperbole, that the generated image marks the limit of the unlimited indeterminate imagination. The present text focuses on some particular indeterminacies present in and around images generated through T2I models, as exemplified in the most widely used and popularised models Stable Diffusion, Midjourney and Dall-E.[2] I argue that the images these models generate are indeterminate visually and perceptually, indeterminate in relation to imagination, and produced through processes relying on the indeterminacy of computation. These models also trigger conflicting concerns and questions regarding the function, naturalness, and independence of imagination, highlighting "processes of perception and imagination."[3] T2I models are based on description. As Jay David Bolter puts it, "the image cannot exist until the text is applied to the model."[4] As a descriptive practice it carries a close connection to Husserl's phenomenology and opens up for phenomenological engagement with technology and aesthetics, computation, and images. This article is concerned with the relationship between the indeterminacy of appearance in imagination (or phantasy, a distinction we will come to) and the determined nature of computationally generated image objects, as well as the constitutive indeterminacy of images from a visual perceptual perspective. In effect, I ask from what horizon the images generated by T2I models make themselves known and show themselves, and the shifts between indeterminacy and determinacy this entails. As several indeterminacies are discussed, indeterminacy is used as a general cross-disciplinary and conceptual term, referring "to the quality or state of not being precisely determined or definitely fixed."[5]

---

1 "Midjourney - Discord Servers," Discord, accessed 29 September 2023, https://discord.com/servers/midjourney-662267976984297473. "Midjourney," Midjourney, accessed 29 September 2023, https://www.midjourney.com/.

2 For a general overviews see the following surveys: Chenshuang Zhang et al., "Text-to-Image Diffusion Models in Generative AI: A Survey" (*arXiv*, 2 April 2023), http://arxiv.org/abs/2303.07909; Yihan Cao et al., "A Comprehensive Survey of AI-Generated Content (AIGC): A History of Generative AI from GAN to ChatGPT" (*arXiv*, 7 March 2023), http://arxiv.org/abs/2303.04226; Giorgio Franceschelli and Mirco Musolesi, "Creativity and Machine Learning: A Survey" (*arXiv*, 5 July 2022), http://arxiv.org/abs/2104.02726.

3 Sofian Audry, *Art in the Age of Machine Learning* (MIT Press, 2021), 70.

4 Jay David Bolter, "AI Generative Art as Algorithmic Remediation," *IMAGE* 37, no. 1 (May 2023): 203, https://doi.org/10.1453/1614-0885-1-2023-15472.

5 Aryeh Botwinick, "Interpretation and Indeterminacy," in *Indeterminacy: The Mapped, the Navigable, and the Uncharted*, ed. Jose V. Ciprut (Cambridge, MA: MIT Press, 2009), 79.

Accepting that images created through T21 models are median statistical renderings of their respective data set,[6] they can nevertheless—as a categorical process—be made to say something about the relation between human imagination and the images generated. In this sense they function as pensive images in Jacques Rancière's sense, images placed indeterminately between passive and active, and more precisely between notions of "the image as a duplicate of a thing and the image conceived as artistic operation."[7] In this way the images at hand are concrete articulations of a zone of indeterminacy between art and non-art, as well as activity and passivity. As images poised between instrumental statistical renderings or a new artistic medium, this is the very type of indeterminacy that characterises many public debates about the status of AI generated images today. Taking the integral role of technics in human becoming as a given,[8] I want to understand, as Joanna Zylinska puts it, "how humans can operate within the constraints of the apparatus that is part of us,"[9] with the generated images conceptualised as the way in which the human is plugged into the technical apparatus. This is also a way to approach Bernard Stiegler's claim that perception is subordinated to imagination, that "there would be no perception outside imagination, and vice versa, perception then being the imagination's projection screen."[10] For Husserl, as we will see, this is reversed; imagination is perception of a groundless imageless object. Rather than discussing AI generated images from the standpoint of creativity as such, I will expand upon the role of imagination in the experience and perception of synthetic machine generated images, from the perspective of indeterminacy. This is a media phenomenological concern, an inquiry into what is actually visible and what actually appears in synthetic images and the role of indeterminacy in both appearance and imagination in relation to images generated by T2I models.

While I agree with definitions of algorithms as automated information production rather than instances of computational creativity,[11] T2I models are also image machines, used in the creation of ever more images circulated and encountered by us in everyday life, producing appearances given to our consciousness directly. Correspondingly, while Galit Wellner's argument for digital imagination and a layered co-creation with AI models,[12] as well as Yuk Hui's suggestion to avoid an opposition between human and machine in

6 See Hito Steyerl, "Mean Images," *New Left Review*, no. 140-141 (June 2023).

7 Jacques Rancière, *The Emancipated Spectator* (London: Verso, 2009), 107.

8 See Bernard Stiegler, *Technics and Time*, trans. George Collins and Richard Beardsworth, Meridian: Crossing Aesthetics (Stanford, CA: Stanford University Press, 1998).

9 Joanna Zylinska, *AI Art: Machine Visions and Warped Dreams* (London: Open Humanities Press, 2020), 54, http://www.openhumanitiespress.org/books/titles/ai-art/.

10 Bernard Stiegler, *Technics and Time Vol 3: Cinematic Time and the Question of Malaise*, trans. Stephen Barker, Meridian: Crossing Aesthetics (Stanford, CA: Stanford University Press, 2011), 16.

11 Anna Longo, "Computational Creativity or Automated Information Production?," *Balkan Journal of Philosophy* 15, no. 1 (2023): 13–22, https://doi.org/10.5840/bjp20231513.

12 Galit Wellner, "Digital Imagination: Ihde's and Stiegler's Concepts of Imagination," *Foundations of Science* 27, no. 1 (March 2022): 189–204, https://doi.org/10.1007/s10699-020-09737-2.

questions of artificial imagination,[13] are both useful and constructive perspectives, it is exactly the working *with* the machine that is under question here, as a process and relationship between human imagination and artificial imagination. There is a vagueness and indeterminacy in our apprehension of the *process of production*, but the question is how this extends to our aesthetic experience of the output, the generated images. Concerned with the some of the same questions as this present paper, Shane Denson argues that computational images embody an "exteriorized form of imagination. These are schemata that enable and constrain the production of concrete images today, and they therefore exercise an inestimable power in determining what, today, there is to be seen."[14] This is an important perspective, and one that I am in agreement with, but my aim here is a more granular articulation. Just as "our appreciation of art depends in part on our appreciation of the process of art making,"[15] so our experience of AI images is dependent on our conception of the process behind and within the generative model. Therefore, part of the agenda of this paper is to trace the beginnings of a differentiation between artificial phantasy as indeterminate and artificial imagination as reliant on image objects. This distinction will serve to clarify the conflict of consciousness in the use of T2I models.

In what follows I conceive of the experience of T2I models as a simplified and reduced process consisting of three distinct steps: a phantasy which is expressed as a description in text, a prompt followed by the model's process of computing and generating an image or several images from this prompt, and finally the images themselves. All these steps are marked by different types of indeterminacy. From an outline of Don Ihde's and Stiegler's concepts of imagination, Wellner argues for a notion of co-creation, where AI models and humans work in and on different layers of the process.[16] As an externalisation of memory and cognition, this aligns with the way technologies have always functioned, and recent visions of artificial creativity are only the most recent examples of human entwinement with machines.[17] As a limited aspect of this entanglement I will look more closely at the relation between imagination, computation, and images, through the lens of indeterminacy.

The first part of the article looks at computational indeterminacy as underlying condition and horizon for T2I models. The second section goes on to discuss the indeterminacy

13 See Yuk Hui, "Imagination and the Infinite—A Critique of Artificial Imagination," *Balkan Journal of Philosophy* 15, no. 1 (2023), https://doi.org/10.5840/bjp20231512.

14 Shane Denson, "Artificial Imagination," *Cinephile: The University of British Columbia's Film Journal* 18, no. 1 (7 June 2024): 12.

15 Margaret A. Boden and Ernest A. Edmonds, *From Fingers to Digits: An Artificial Aesthetic* (The MIT Press, 2019), 91, https://doi.org/10.7551/mitpress/8817.001.0001.

16 See Galit Wellner, "Digital Imagination, Fantasy, AI Art," *Foundations of Science* 27, no. 4 (December 2022), https://doi.org/10.1007/s10699-020-09747-0.

17 Jan Løhmann Stephensen, "Artificial Creativity: Beyond the Human, or beyond Definition?," *Transformations: Journal of Media and Culture*, no. 36 (2022).

of imagination as it is defined in Husserl's mature account of phantasy. The third section outlines concepts of visual indeterminacy in relation to T2I generated images. This is followed by a discussion of the tension between imagination and phantasy, the role of these models in mediating between them, and how indeterminacy is both a necessary and complex element in the process. The interchange between indeterminacy and determination shapes the viewer's experience. In the next to last section I discuss the manner of appearing of T2I images, showing themselves *as* mediators between indeterminacy and determinacy. In the final section T2I generations are considered as technical media appearances that make us aware of the horizon of the models, at the same time as they mark a limit for the potential of imagination.

Computational Indeterminacy

Conceptualising the conditions of experience for computation itself, Beatrice Fazi considers how computation requires both physical, sensible indeterminacy, as well as conceptual indeterminacy "in order to develop their full potential for actualisation."[18] Computation in her view entails and constitutes a fundamental type of indeterminacy, it is "a process of determining indeterminacy."[19] In a schematic understanding, this is what image generation models do—they are given a textual prompt and determine an absolute result of this, presented as an image output. Fazi describes computation as a process of organisation, measuring, quantification, rationalisation, and arranging the world "via logico-quantitative means."[20] The crucial part here is that indeterminacy, internal to computational processing—the determining of indeterminacy—"is inscribed into the formal and mathematical definition of an algorithmic procedure and that, as such, does not have to simulate the indeterminacies of life or lived experience."[21] In this sense it is the opposite of both imagination and image consciousness. As such, it is separated from human modes of abstraction; "there is no common phenomenological and existential ground" between human abstraction and computational abstraction.[22] They operate on different registers. This indeterminacy is representative of a strictly discrete and computational formalism, beyond human engagement. I see a paradoxical relation in the process of T2I models, where this indeterminacy and determining aspect of computation

18 M. Beatrice Fazi, *Contingent Computation: Abstraction, Experience, and Indeterminacy in Computational Aesthetics*, Media Philosophy (Lanham: Rowman & Littlefield International, 2018), 14.

19 Fazi, *Contingent Computation*, 1.

20 M. Beatrice Fazi, "Digital Aesthetics: The Discrete and the Continuous," *Theory, Culture & Society* 36, no. 1 (1 January 2019): 15, https://doi.org/10.1177/0263276418770243.

21 David Beer, "Explorations in the Indeterminacy of Computation: An Interview with M. Beatrice Fazi," *Theory, Culture & Society* 38, no. 7-8 (December 2021): 291, https://doi.org/10.1177/0263276420957054.

22 Beer, 308.

is the basic step, a passing from continuous to discrete to continuous, from indeterminate to determinate to indeterminate. Fazi describes a "deadlock between the continuity of sensation and of lived experience…and the discreteness of digital technologies,"[23] which has an analogue in T2I models. The user imagines a prompt, a sensuous perceptual object, which is processed formally and logically in the model and generated as an image, which is given to the user again as a sensuous perceptual object, given to image consciousness. I argue that it is precisely as an articulation of this deadlock that the relationship between indeterminate phantasy and determined output of a generative image model plays out. This is aesthetics then precisely as "rapport between determination and indetermination," [24] as Fazi states, but from the opposite perspective to hers. I approach this from the viewpoint of sensible human experience of the determination performed by and passing through the computational, a phenomenological perspective on the "indeterminacy of the digital discrete."[25] Digital aesthetics on this view is a formal process of computation beyond the sensible perceptual grasp of humans. T2I model generated images have passed through exactly such a process, which from a phenomenological perspective becomes part of their manner of appearing. I argue that the generated images show themselves as a circular process between indeterminacy and determination. This is a process where a conventional understanding of abstraction and concreteness is also turned on its head, as the determined image is an abstraction of the memory of the model—the data set. Fazi writes: "To be abstract, in computer science, involves moving away from the particularity of lived experience."[26] The determination of indeterminacy in computation is abstract in the sense of not relating to lived experience, as beyond the phenomenological. Computation is "an abstractive procedure of determination that always confronts indeterminacy."[27] T2I generation is in this computational sense an abstraction of indetermination, where abstraction means a generalisation as well as a reformulation of the relation between concrete and abstract. This is also true in a very concrete sense, where the task of generative models like Stable Diffusion is to determine the indeterminate, as they function by removing successive layers of noise from an image of random noise, until it matches the manifold of vectors corresponding with the text input.[28] The model clears away noise until a high-quality image is generated—it turns indeterminate noise into determined image. The generative process marks a movement from the discrete computation of vectors in latent space, to the continuous and sensible image in pixel space. The actual relations between vectors in the latent space is indeterminate—the compressed vectors cannot be easily mapped to understandable features[29]—but the actual generated image is

23 Beer, 292.
24 Beer, 293.
25 Fazi, "Digital Aesthetics", 20.
26 Fazi, "Digital Aesthetics," 17.
27 Fazi, *Contingent Computation*, 5.
28 Robin Rombach et al., "High-Resolution Image Synthesis with Latent Diffusion Models" (*arXiv*, 13 April 2022), http://arxiv.org/abs/2112.10752.
29 See Andrea Asperti and Valerio Tonelli, "Comparing the Latent Space of Generative Models," *Neu-*

determined by seed number, iterations, and training data.

From a phenomenological perspective, I think it is productive to frame these modes as the front and back of the generated image, where the computational process forms the back, its absent side, of which we can be aware but not experience simultaneously.[30] The front of the image (object) is accessible on the screen, and can be visually contrastive and indeterminate, but more importantly the invisible back of the image consists not only of an image file, but a machine-learning (ML) model and its process, including the training data. The generated image is an abstraction of the memory that is the data set, simultaneously an abstraction and determination of the prompt, the imagined description of a phantasy object. To determine the possible implications of this passing from continuous to discrete to continuous, from indeterminate to determinate to indeterminate, we must first look closer at the step before the generative computational operation, the indeterminacy of imagination.

Indeterminacy of Imagination

Prior to the indeterminacy of the T2I model's computation is the creation of a prompt, the use of an act of imagination to conceive what the generated image should be. These descriptions function as the indeterminate translation between imagination and image. Roland Meyer argues that prompts are more than descriptions, they are operative: "They do not describe what already exists, even if only in the imagination, but are meant to produce what they describe (and what did not exist before their description)."[31] They determine the description and are determined by the description. Already in Immanuel Kant, indetermination is closely linked to imagination. For Kant, the indeterminate, as in the indeterminate use of concepts, is what sustains the free play of faculties, proceeding by association of ideas and metaphor, not following causal determinations.[32] Much later, Vilém Flusser defines imagination more simply as "the specific ability to produce and to decode images."[33] In this sense T2I models would be only partly capable of imagination, as they can produce images, but not reliably decode them.[34] In a recent

ral Computing and Applications 35, no. 4 (February 2023), https://doi.org/10.1007/s00521-022-07890-2.

30 Edmund Husserl, *Logical Investigations Vol 2*, trans. Dermot Moran, vol. 2, International Library of Philosophy (London; New York: Routledge, 2001), 211.

31 Roland Meyer, "The New Value of the Archive. AI Image Generation and the Visual Economy of 'Style'," *IMAGE* 37, no. 1 (2023): 102.

32 Salim Kemal, *Kant's Aesthetic Theory: An Introduction*, 2nd ed. (New York: St. Martin's Press, 1997), 47.

33 Vilém Flusser, *Towards a Philosophy of Photography* (London: Reaktion Books, 2000), 83.

34 See Gabriel Pereira and Bruno Moreschi, "Artificial Intelligence and Institutional Critique 2.0: Unexpected Ways of Seeing with Computer Vision," *AI & SOCIETY* 36, (2021) https://doi.org/10.1007/s00146-020-01059-y.

article Hui argues that "imagination is already fundamentally artificial. As is patent, the word imagination already carries the term 'image' in it, as is also the case for the word in German *Einbildungskraft*, einbilden precisely means the force of producing images."[35] In his writing on imagination, Husserl eschewed the more commonly used *Einbildungskraft*, for *Phantasie*, phantasy, which avoids associations to a view of imagination as supported by mental images.[36] Imagination in this sense is "presentation by means of an image."[37] While Stiegler sees imagination as *Einbildungskraft*, as constituted through mental images,[38] and conceives the "'objective image' as an object that serves as a basis for imagination,"[39] phantasy is a quasi-perception,[40] an act of consciousness of objects not perceived as real, and based on neither mental nor objective images. This is the nullity of phantasy, it "does not present an actually existing perception, even though it seems to."[41] The phantasy act is "experienced as a simulation of a possible perception" or a distinct "act of consciousness that constitutes a direct sensory awareness of objects, i.e., an awareness that is unmediated by images."[42]

Just as Kant's schema is opposed or in an indeterminate relation to images, so Husserl's phantasy requires no images, neither physical nor mental. It is differentiated from image consciousness, where imagination is activated and made possible with and through a material image. In phantasy, "we experience phantasms and objectifying apprehensions" [43] and nothing given to image consciousness.[44] Phantasy is for Husserl in this sense a vague and indeterminate sphere, "certainly without full determinacy."[45] It is also quasi-actual, in regard to both space and time as well as "its indeterminate world horizon, and its own horizons of indeterminacy in the things themselves."[46] Phantasy is not bound by the form of the external world. This marks a constitutive difference to T2I generated images, as they *are* bound by the form of the world, in the sense that the training data, the images that form its world, determine the horizon of the image output. Phantasy is a

35 Hui, "Imagination and the Infinite—A Critique of Artificial Imagination," 7.
36 Julia Jansen, "Husserl," in *The Routledge Handbook of Philosophy of Imagination*, ed. Amy Kind, Routledge Handbooks in Philosophy (London New York: Routledge, 2017).
37 Edmund Husserl, *Phantasy, Image Consciousness, and Memory: 1898-1925*, trans. John B. Brough, Edmund Husserl Collected Works, Vol. 11 (Dordrecht: Springer, 2005), 89.
38 Stiegler, *Technics and Time,* 3.
39 Galit Wellner, "Digital Imagination: Ihde's and Stiegler's Concepts of Imagination," *Foundations of Science* 27, no. 1 (March 2022): 199, https://doi.org/10.1007/s10699-020-09737-2.
40 Husserl, *Phantasy, Image Consciousness, and Memory*, 415.
41 Paul Crowther, *The Phenomenology of Aesthetic Consciousness and Phantasy: Working with Husserl*, Routledge Research in Aesthetics (New York, NY: Routledge, 2022), 9.
42 Jansen, "Husserl," 70.
43 Husserl, *Phantasy, Image Consciousness, and Memory*, 86.
44 Husserl conceives of image consciousness as a threefold experience constituted by the physical image, the image object and the image subject. Husserl, *Phantasy, Image Consciousness, and Memory*, 41.
45 Husserl, 387.
46 Husserl, 639.

profoundly indeterminate and unstable dimension, separate from perception.[47] Phantasy objects for Husserl are also indeterminate in the sense that they are protean in character, changing colour and form, presenting "something so vague, so ghostly, that it could not occur to us to posit it in the sphere of actual perception and imaging."[48] They are unclear phantoms, with undefined surface and unsteady contours. The question to ask regards the relationship between the vague and indeterminate act of phantasy, and the resulting digital image object, after a phantasy is given to a T2I model as description and prompt. Husserl's recurring example of a phantasy of a centaur is clarifying. Phantasy has an optional character, an "unconditioned arbitrariness."[49] While a perceptual object, within "the horizon of perception", has a predelineation made up of memories and expectations, a space and environment in other words, the quasi-reality of a centaur has no such fixed points or content. Imagining a centaur "that quasi lives and exists" as a phantasy object, means to accept it as a quasi-reality, "to restrict the optional character of further phantasying by means of a constant intention aimed at harmony. It means, therefore, to create precisely a world that can be a harmonious world for this centaur."[50] But this harmonious background to the phantasised centaur, "a space, a time, a surrounding world in which it exists", is nevertheless part of it only as an indeterminate horizon.[51] This is not a fixed harmony, rather a continuous eidetic variation, as phantasy objects are not bound by "the spatio-temporal and causal rules that perceived objects are subject to. They may change color, shape, location, size, etc. in an instant and for no apparent reason. They may appear and disappear without further ado."[52] Phantasy here *is* free variation, an "arbitrary process of engaging pure, irreal possibilities in an entirely open and indeterminate manner, in principle ad infinitum, requiring no cessation."[53] But, the image object that results from the input of phantasy as prompt is absolutely fixed within the causal perceptual rules of an image. The indeterminate horizon of phantasy is transformed into a determined image object, through a passing from continuous phantasy to discrete determining computation. As Husserl notes, phantasising the centaur and making "the imagining into the object of a perception are two very different things."[54]

Husserl's descriptions of phantasy appear closely related to the processes of T2I models. The quasi-world of the phantasy centaur is described as "indeterminate in infinitely many

47 See Stefano Micali, "Phenomenology of Unclear Phantasy," *Husserl Studies* 36, no. 3 (October 2020), https://doi.org/10.1007/s10743-020-09271-w.
48 Husserl, *Phantasy, Image Consciousness, and Memory*, 64.
49 Husserl, 642.
50 Husserl, 642.
51 Husserl, 642.
52 Jansen, "Husserl," 71.
53 Andreea Smaranda Aldea, 'Imagination and Its Critical Dimension', in *The New Yearbook for Phenomenology and Phenomenological Philosophy. Volume 17*, ed. Timothy Burns et al. (London: Routledge, 2019), 216.
54 Husserl, *Phantasy, Image Consciousness, and Memory*, 218.

ways,"[55] but that which can make it determined is free and unrestricted, i.e. any variation is possible as long as it "corresponds to the essential style of a world horizon" and can "come together harmoniously and constitute the unity of the thing and the unitary connections among such unities." This discloses infinite possibilities, which are conceived as steps, where each step both limits and opens up "unrestricted possibilities in the same style."[56]

This integrated process of generating variations of an image in T2I models is isomorphic to the indeterminacy of phantasy, where the different variations of the phantasy can replace each other, corresponding to the way in which Husserl describes different phantasies pushing each other aside: "now I see a white-bearded and white-haired centaur, now a flaxen-haired centaur, now a corpulent centaur raising its arms, [.....] and so on."[57] The difference is that in phantasy these are all appearances "without full determinacy," as this vague sphere is generally one of "indeterminacy in the appearance."[58] The possibilities presented in phantasy are always indeterminate "as far as the degree of clarity and obscurity is concerned."[59] In the generated image, these possibilities are fully determined, that is a particular image itself is unchanging and fixed. The *degree* of clarity itself in the image is never visually indeterminate, but the determined obscurity can present as visual indeterminacy.

As empty appearances without instigators, phantasy in Husserl's account is de-naturalised,[60] specifically set apart from image consciousness as well as external supports or prostheses. In the computational process of a T2I model, the de-naturalised indeterminacy of phantasy is determined as a digital object. But now, as an image, it displays a different type of indeterminacy. So, in prompting a T2I model with a certain phrase, a description of a free phantasy of mine, the image, or as is often the case images, present me with an actual presence in image consciousness. As such, as a fixed image with content and form absolutely determined in relation to the indeterminate phantasy act, it presents us with a third type of indeterminacy, visual indeterminacy.

Visual Indeterminacy

Visual indeterminacy, indeterminacy as the logic of both images in general and AI images in particular, is the third indeterminacy after that of computation and of phantasy. This

55 Husserl, 642.
56 Husserl, 643.
57 Husserl, 387–88.
58 Husserl, 387–88.
59 Husserl, 663.
60 Julia Jansen, "Imagination De-Naturalized: Phantasy, the Imaginary, and Imaginative Ontology," in *The Oxford Handbook of the History of Phenomenology*, ed. Dan Zahavi, Vol. 1 (Oxford University Press, 2018), 687, https://doi.org/10.1093/oxfordhb/9780198755340.013.33.

denotes images with varying degrees of abstraction, fuzziness or non-recognizability. Robert Pepperell defines visual indeterminacy as "when we are presented with images that are vivid and detailed yet resist easy or immediate identification, that is, when perceptual data cannot be integrated with cognitive data."[61] These are images that demand more meaning making work from the viewer, images that make us "positively aware of the act of seeing" in a way we are typically not.[62] Importantly, Pepperell also stresses that the experience of an indeterminate image is "a momentary state of contradiction" as the spectator must reconcile a certainty of the presence of familiar perceptible objects with their disappearance: "and so moving a step closer to seeing the world as it is (objectless) rather than as perceived (object-full)."[63] Here, similarities to the quasi-perception of Husserl's phantasy are apparent. There is a lack of objects in the indeterminate image, as there is a lack of image objects in phantasy. Aaron Hertzmann extends this to AI images, to argue that a certain fuzziness and visual indeterminacy is a prominent feature in images produced through generative adversarial network models.[64] Today's T2I models can generate images that are largely photorealistic, with a convincing implied optical perspective,[65] as well as more classically abstract or blurred representations. This seems to me in many ways still a valid description of the aesthetics of these images: "Visual indeterminacy describes images that appear to depict real scenes, but on closer examination, defy coherent spatial interpretation."[66] Alice Barale describes this type of indeterminacy connected to aesthetic pleasure and in comparison to twentieth century artworks: "When faced with these pictures, with their uncertain outlines and missing details, humans recognize their own uncertainty in understanding and classifying things."[67] More relevant still to the indeterminacy of both images and imagination is her contention that human viewers of certain AI images identify with the errors, malformities, or simply indeterminacies of the images, emphasising the movement between imagination and perception. [68] This corresponds to what Junichi Murata describes as the "circular

61 Robert Pepperell, "Art, Perception and Indeterminacy," *Contemporary Aesthetics* 5 (2007): 11.

62 Robert Pepperell, "Seeing without Objects: Visual Indeterminacy and Art," *Leonardo* 39, no. 5 (October 2006): 394–400, https://doi.org/10.1162/leon.2006.39.5.394.

63 Pepperell, "Seeing without Objects: Visual Indeterminacy and Art," 399.

64 See Aaron Hertzmann, "Visual Indeterminacy in GAN Art," *Leonardo* 53, no. 4 (July 2020), https://doi.org/10.1162/leon_a_01930.

65 See Daniel Chávez Heras and Tobias Blanke, "On Machine Vision and Photographic Imagination," *AI & SOCIETY* 36, no. 4 (December 2021), https://doi.org/10.1007/s00146-020-01091-y.

66 Hertzmann, "Visual Indeterminacy in GAN Art," 424. There are many examples of related concepts of visual indeterminacy in AI or technical images. See for example Erwin Feyersinger, Lukas Kohmann, and Michael Pelzer, "Fuzzy Ingenuity," *IMAGE* 37, no. 1 (May 2023), https://doi.org/10.1453/1614-0885-1-2023-15464; Jens Schröter, "The AI Image, the Dream, and the Statistical Unconscious," *IMAGE* 37, no. 1 (May 2023), https://doi.org/10.1453/1614-0885-1-2023-15460; and Shane Denson, *Discorrelated Images* (Durham: Duke University Press, 2020).

67 Alice Barale, "Latent Spaces: What AI Art Can Tell Us About Aesthetic Experience," *ODRADEK. Studies in Philosophy of Literature, Aesthetics, and New Media Theories* 8, no. 1 (2022): 112.

68 Alice Barale, "Portraits of Non-Existent People: AI Art and (Human) Imagination," *Aesthetica*

movement between the determinacy and the indeterminacy of images," a movement present in both everyday perception and imagination as well as artistic production.[69]

In Gottfried Boehm's image theory, indeterminacy is also a constitutive part in the experience of images. Certain types of blurring or vagueness are key characteristics of images in general, and constitutes an iconic difference, it's what makes images stand out from other perceptions. And this type of indeterminacy in both image and horizon is currently part of the principle of T2I generated images. Extending Husserl's apperception Boehm states that "in every perception of 'something', an exciting, an 'impossible' synthesis of the visible and invisible, of the thematically identifiable and the non-thematic horizon takes place."[70] That which is visually contrastive forms a relationship with that which is not visible at all in the image. Boehm describes the way in which:

> […] the perceived object distinguishes itself fundamentally from its representation. The most important difference has to do with the implication of the invisible in the visible. Images, too, present fronts exclusively. Whatever they look like, we look at colors and shapes that show themselves to us that mean "something". Of course, what is missing from them is their backs.[71]

This places the question of visual indeterminacy within the question of indeterminacy of horizon, as "our awareness of the background always determines the manner in which we perceive the object in the foreground."[72] Here, awareness of the background is the sense in which the T2I model figures as an indeterminate horizon, the form of the world of the image.

This indeterminacy, understood with Husserl as part of image consciousness, as intuiting "in" the image, is an example of a perceptual phantasy, as opposed to reproductive phantasy, which is phantasy without instigator, not relying on perception or image.[73]

Preprint, no. 120 (2022): 7, https://doi.org/10.7413/0393-8522103.

69 Junichi Murata, "The Indeterminacy of Images: An Approach to a Phenomenology of the Imagination," in *Phenomenology: Japanese and American Perspectives*, ed. Burt C. Hopkins, vol. 36, Contributions to Phenomenology (Dordrecht: Springer Netherlands, 1999), 183, https://doi.org/10.1007/978-94-017-2610-8.

70 Gottfried Boehm, 'Indeterminacy: On the Logic of the Image', in *Dynamics and Performativity of Imagination*, ed. Bernd Huppauf and Christoph Wulf (New York: Routledge, 2009), 227.

71 Boehm, 227.

72 Saulius Geniusas, *The Origins of the Horizon in Husserl's Phenomenology*, (Dordrecht: Springer Netherlands, 2012), 6, https://doi.org/10.1007/978-94-007-4644-2.

73 Husserl, *Phantasy, Image Consciousness, and Memory*, 605.

Describing his conception of a general "logic of images," Boehm uses the phrase qualitative transformation,[74] the same phrase which Fazi opposes to "the logico-quantitative operations of computational structures themselves."[75] In the qualitative transformation of images:

> …the factual is transformed into the imaginary, and a surplus of meaning results that allows mere material (color, stucco, canvas, glass, etc.) to appear as a meaningful view… Indeterminacy is indispensable here, since it creates those spaces for free play and potentialities that enable the factual to show itself and at the same time to show something.[76]

The potential of the image which Boehm describes here is a potential made possible through its lack of determination, as vague forms or blurring are open to different meanings and perceptual experiences, indeterminacy "becomes a surplus of meaning."[77] Clive Cazeaux makes a similar argument, further emphasising indeterminacy as a foundational aspect of images in general: "the purpose of an image is to show potentiality, to create a sense of the possible…Indeterminacy is integral to what it means to be an image, since it is the lack of determinacy that leaves room for the suggestion of possibilities."[78] The visual indeterminacy described by Hertzmann and Barale is a way in which the indeterminacy of phantasy is repeated visually in the generated image. The indeterminacy of images themselves is productive, but it is located in the physical image, not in phantasy.

Artificial Phantasy?

Thus far we are dealing with a nexus of indeterminacies, several types of indeterminacy of different orders of magnitude. First, the determination of indeterminacy in the computational process of the model generating the images. Second, the indeterminacy of imagination itself, its quasi character and indeterminate horizon. Third, the indeterminacy of all images, as a foundational aspect of image consciousness. What then are the implications of this indeterminacy for T2I images in particular? A differentiation between artificial phantasy and artificial imagination seems necessary in order to articulate the conflict of consciousness that occurs in the experience of using T2I models. Imagination relies on images, whereas phantasy "is in *opposition* to the existing world,

74 Boehm, "Indeterminacy: On the Logic of the Image," 228.
75 Fazi, "Digital Aesthetics," 22.
76 Boehm, "Indeterminacy: On the Logic of the Image," 228.
77 Boehm, 222.
78 Clive Cazeaux, "Image and Indeterminacy in Heidegger's Schematism," *Ergo: an Open Access Journal of Philosophy* 7, no. 0 (22 October 2021), https://doi.org/10.3998/ergo.1132.

while perception, memory, and expectation relate to *the way things are*."[79] As previously stressed, the "world of pure phantasy is another world, one that is radically separated from the world of the perceptual presence,"[80] i.e. separated from image-consciousness. Where Wellner's digital imagination requires "the exteriorization of the production of possibilities, leaving the user with the task of selecting, arranging and linking the various possibilities in surprising ways,"[81] and conceives of models as tools that function in layers, my focus on indeterminacy in phantasy and image focuses on the internal relationship between these modes of perception and consciousness, as mediated through T2I models. In their specific incarnations, after the passage through computational determining, that is after being an experience for computation, each generated synthetic image *is* fixed. That means the image is determined, given to image consciousness not as unclear or vague phantasy, but as an absolute actuality. This statistically rendered actual, while governed by the indeterminacy of computation in its process—resulting in contingencies regarding exactly what background is rendered for example—can also retain its iconic indeterminacy to some degree, but its phantasy is a clear and determined *Einbildung*. As a contained image object, it appears with the fuzzy logic of images that affords potential meanings and perceptions, but in relation to the unclear phantasy provided as prompt, it is wholly fixed. It stands as an image object ready for inspection,[82] free of the distortion of phantasy, as well as cleared of the noise of the seed image. After the passing into determined image object, the logic of AI leaves "the production of meaning to humans. It is difficult for these algorithms to decide which variation is meaningful."[83] The phantasy is determined, but the result is not determined *for* the model only, it is determined in pixel space, as a rendered representation. The logic of the image is given to human perception, not machine. The visual determinacy, a result of the model's determining process—noise to image—provides the ground for human production of meaning.

Stiegler, Wellner argues, "seeks the political-cultural constraints that do not enable us to recognize more variations."[84] As an attitude open to infinite variations, phantasy consciousness is a consciousness of the *as-if,* a consciousness that according to Husserl negates actual experience,[85] and it is this *as-if* that is deprived of its particular indeterminacy with T21 models. Husserl makes a distinction regarding everyday phantasies, arguing that they are "phantasies 'into,' phantasying a figment into a portion of intuitively experienced

79 Tanja Todorovic, "The Manifold Role of Phantasie in Husserl's Philosophy," *Filozofija i Drustvo* 32, no. 2 (2021): 247, https://doi.org/10.2298/FID2102246T.

80 Micali, "Phenomenology of Unclear Phantasy."

81 Wellner, "Digital Imagination," 202.

82 Andreea Smaranda Aldea and Julia Jansen, "We Have Only Just Begun: On the Reach of the Imagination and the Depths of Conscious Life," *Husserl Studies* 36, no. 3 (October 2020): 207, https://doi.org/10.1007/s10743-020-09276-5.

83 Wellner, "Digital Imagination," 201.

84 Wellner, 201.

85 Husserl, *Phantasy, Image Consciousness, and Memory*, 614.

reality."[86] The process of using a T2I model functions as such a phantasying into, bringing phantasy into actuality, determining the phantasy in relation to reality. All phantasies can be posited into reality: "Assume that this centaur exists, and so on; in that case, I am displacing the centaur into the nexus of reality." [87] I believe this points towards the positive aspects of the determining of phantasy's vague sphere, as it allows for valuation and judgement of a different order, as connected to aesthetic consciousness. Husserl writes: "As soon as we…can throw bridges between what is actual and what is phantasied. I can compare the two, distinguish them. I can value them in relation to one another."[88] And in relation to each other, they present as conflicting appearances, as the oscillation and passing between indeterminacy and determination, between discrete and continuous.

We perceive the appearance of our phantasy mediated through these T2I models, doubly prompted by indeterminate phantasies. This leads to what Husserl calls a "consciousness of conflict," as every determination of vague phantasy, "every transforming within the mode of phantasy of what is given and intuited in actual experience, leads to a consciousness of conflict,"[89] i.e. a conflict between actual and potential. Here this conflict is extended, the image as a product of externalised digital imagination in conflict with the unclear phantasy object – it marks the limit of the indeterminate and thus unlimited phantasy. It becomes an externalisation of the conflict of consciousness, as the "intentional object of the experience" shifts from internal indeterminate phantasy, to externally generated physical image.[90] I believe this points towards the complexity of the viewer's experience. The viewer is confronted with the tension between potential and actuality, and this conflict is amplified by the models role in mediating the transition.

The indeterminacy of phantasy also seems to carry a degree of necessity, introducing a necessary measure of indeterminacy for T2I models. When image generative models are trained on generated data—i.e. fixed, determined images—what Alemohammad et. al. call "autophagous (self-consuming)" loops occur, and the quality as well as diversity of the generated images starts to degrade, producing less precise, realistic, and coherent images.[91] In other words, just as the "the indeterminacy of the horizon is a necessary feature of perception," [92] the circulation between indeterminate and determinate is necessary for

86 Husserl, 610.
87 Husserl, 467.
88 Husserl, 467.
89 Husserl, 639.
90 Husserl, 397.
91 Sina Alemohammad et al., "Self-Consuming Generative Models Go MAD," (*arXiv*, 4 July 2023), http://arxiv.org/abs/2307.01850.
92 Steven G. Crowell, "Determinable Indeterminacy: A Note on the Phenomenology of Horizons," in *The Significance of Indeterminacy: Perspectives from Asian and Continental Philosophy*, ed. Robert H. Scott and Gregory S. Moss, Routledge Studies in Contemporary Philosophy 110 (New York: Routledge; Taylor & Francis, 2019), 128.

the functioning of the model, the transformation between continuous and discrete is constitutive for the generation of new images. The image marks the *necessary* conflict between determination and indetermination of phantasy, computation, and images.

The Appearance of T2I Models and the Limit to Indeterminate Phantasy

Through an interdisciplinary inquiry, encompassing philosophy of computation, phenomenology, and image theory, I have highlighted the relations and operations between several layers of indeterminacy present in T2I models, emphasising the determining of indeterminacy in computational processes, the indeterminacy of Husserl's phantasy, and the foundational indeterminacy inherent in all images. Following this, I introduced a distinction between artificial phantasy as an indeterminate and quasi-experiential aspect, not dependant on images, and artificial imagination which relies on image objects. T2I images effectively bridge this distinction, by transforming phantasy into determined images. These images are in turn marked by a specific visual indeterminacy that can be understood as part of their manner of appearing as AI generated image. T2I models effectively mediate between phantasy and imagination, and in a sense between continuous experience and discrete computation.

A conflict arises from the transition between indeterminate phantasy and determined but visually indeterminate images. The viewer of these images is confronted with the tension between the potential and actual, between continuous phantasy and discrete determination, and this conflict is amplified by our knowledge of the algorithmic model mediating the transition. Where imagination is a quasi-experience, the experience of these images is one of actual presence of an image object, actualised but also determined. The background is filled out, and it is no longer a phantasy object, but a picture. Once the image is generated, it passes from imageless unclear phantasy to the world of actual experience, to a fixed image object given in image consciousness. In their appearance as sensible images T2I images are made visible from/against a particular horizon and through a particular medium, here doubly and indeterminately so. Both the free variation and open horizon of phantasy, as well as the determining horizon of computation, training data and the parameters of the model. From a media phenomenological perspective, the way T2I images are apprehended, the visual indeterminacy, the consistency and knowledge of the computational process, reveals the indeterminate essence of the images themselves.
Every part of the T2I generation process is marked by oscillations between indeterminacy and determinacy, where the generated image marks the limit of the unlimited indeterminate imagination. The generated image can in turn be the instigator for *Einbildungskraft*, for further imagination and variation, but its determined character restricts protean phantasy rather than fuelling it. So, while the process of generating images in variations gives

the appearance of protean changeability, it restricts the actual protean appearance of phantasy. Synthetic T2I generated images are thus indeterminately placed between the protean indeterminacy of phantasy, and the exact statistical rendering of the computational process, presenting something of this conflict to the viewer.

Through the prompt, indeterminate phantasy passes through the indeterminacy of the computational model, the latent space, and into a determined image object. But this image object mirrors the indeterminacy of phantasy in its visual indeterminacies. If "computation is a process of determining indeterminacy"[93] then one of the indeterminacies here is on a different register from what Fazi argues, as the model's computation determines the indeterminacy of phantasy (in the form of a descriptive prompt), but simultaneously produces a visual indeterminacy given to image consciousness. This process of making the indeterminate determinate is isomorphic to some degree to what Fazi describes as "continuous, infinite movement of experiential, lived dynamics into what is static and finite, such as the digital machine,"[94] but as a static computationally generated output the resulting image has the appearance of lived dynamics, as part of its visual indeterminacy. In their oscillation between continuous and discrete, as well as indeterminate and determinate, T2I images also take on a mediative role, just as phantasy itself mediates between "the world of the sensible and the possibility for reflectivity."[95] While our phantasy consciousness is shaped by the fact that it is aimed at description of the phantasy object, and further with the aim of tasking a T2I model with generating an image based on this, the openness to potential this might seem to engender conflicts with the fact that the indeterminacy of phantasy is determined and closed off in the generated image. But the potential indeterminacy of the generated image, through the wrong type of clarity, wrong amount of fingers,[96] a blurring or smearing of shapes or lines, for example, brings the appearance of this indeterminacy back to our consciousness. As images, that in Pepperell's definition, make us aware of the act of seeing, the visual indeterminacy they present is part of their appearance as computationally generated images. In this sense T2I generated images can be defined as technical media images, that from a media phenomenological perspective appear as themselves and show their potentiality through indeterminacy. These images contain a fundamental indeterminacy precisely in their oscillatory process between indeterminacy and determination. That is their manner of appearing. As Emmanuel Alloa notes, "the capacity of the medium for being determined…is conditioned by its formal indeterminacy"[97] As medial objects, mediating

93 Fazi, "Digital Aesthetics," 21.
94 Fazi, 8.
95 Todorovic, "The Manifold Role of Phantasie in Husserl's Philosophy," 252.
96 See Amanda Wasielewski, '"Midjourney Can't Count"', *IMAGE* 37, no. 1 (May 2023), https://doi.org/10.1453/1614-0885-1-2023-15454.
97 Emmanuel Alloa, *Looking through Images: A Phenomenology of Visual Media*, trans. Nils F. Schott (New York: Columbia University Press, 2021), 84.

between different forms of indeterminacy, they have "the capacity for taking the shape of something that one is not."[98] The phantasy is mediated as prompt which is mediated as noise determined into a generated image, which in turn is visually indeterminate. As a technical *and* visual medium, T2I models become figures "of the possible as such," their indeterminacy indicating "a fundamental potentiality."[99] Our perception of generated images is not neutral, we are, as Barale argues, aware of their origins in a generative model. "Therefore," she writes, "we perceive it as showing, in a certain measure, the way the AI "sees" the world"[100] This can be understood with Alloa, in the sense that every appearance "appears through something else,"[101] where this appearance as something that gives the meaning to the appearance. Appearance, Alloa notes, "is more than an optical impression; it has a consistency of its own."[102] I believe the consistency here is that of phantasy, which clashes with the computational determination. The visual indeterminacy of the generated image points our perceptual attention towards the way in which the image appears.[103] Their manner of appearing is the mediacy of the limited phantasy. They appear as images constituted by the passage from indeterminate to determined to indeterminate again, as abstract compression. It is abstraction as a generalisation and formalisation of both phantasy and training data images. The model's image generation functions as a discretisation, abstraction, and compression of the lived experience that is the indeterminate phantasy. Their manner of appearing is abstract in the sense of presenting the images in their own power of appearance, by presenting the relations between indeterminacy and determinacy, and presenting the indeterminacy between continuous and discrete that appears in T2I generated images. In other words, T2I models are also models of the relation between indeterminate phantasy and a preformatted and exteriorised imagination, a mediation of this relation between the vague and the fixed. It is important here to underscore that these stages of determined and undetermined are not equal in magnitude. The preformatting of the digital platforms and machines, the discrete, is a much larger power than both the input and the output. In this sense the discrete computational imagination, of T2I models for example, often exert an unbalanced force on the users, publics, and communities that make up their technical ensemble.

Following Fazi's assertion that the determining of the indeterminate in computational processes is the self-actualisation of computation, I argue that the generated image *appears through* computational self-actualisation and determination.[104] The mediacy of the generated image is double, comprising both the mediation of the dataset as well as

98 Alloa, 84.
99 Alloa, 84.
100 Barale, "Portraits of Non-Existent People," 14.
101 Emmanuel Alloa, "What Is Diaphenomenology? A Sketch," in *Phenomenology and Experience*, ed. Antonio Cimino and Cees Leijenhorst (Brill, 2018), 27, https://doi.org/10.1163/9789004391031_003.
102 Alloa, 17.
103 Crowther, *The Phenomenology of Aesthetic Consciousness and Phantasy*, 26.
104 Fazi, *Contingent Computation*, 205.

the mediation of the immediacy of phantasy—the passage between indeterminate and determinate. Indeterminacy here is "the absence of limit,"[105] and the generated image as determined phantasy marks the imposing of absolute limits to the potential of phantasy. Their manner of appearing presents as a sensibility of indeterminacy, showing the necessary and constructive conflict between determination and indeterminacy in T2I models.

Bibliography

Aldea, Andreea Smaranda. "Imagination and Its Critical Dimension." In *The New Yearbook for Phenomenology and Phenomenological Philosophy. Volume 17*, edited by Timothy Burns, Thomas Szanto, Alessandro Salice, Maxime Doyon, and Augustin Dumont, 204–224. London: Routledge, 2019.

Aldea, Andreea Smaranda, and Julia Jansen. "We Have Only Just Begun: On the Reach of the Imagination and the Depths of Conscious Life." *Husserl Studies* 36, no. 3 (October 2020): 205–11. https://doi.org/10.1007/s10743-020-09276-5.

Alemohammad, Sina, et al. "Self-Consuming Generative Models Go MAD." *arXiv*, 4 July 2023. http://arxiv.org/abs/2307.01850.

Alloa, Emmanuel. *Looking through Images: A Phenomenology of Visual Media*. Translated by Nils F. Schott. New York: Columbia University Press, 2021.

——— "What Is Diaphenomenology? A Sketch." In *Phenomenology and Experience*, edited by Antonio Cimino and Cees Leijenhorst, 12–27. Brill, 2018. https://doi.org/10.1163/9789004391031_003.

Asperti, Andrea, and Valerio Tonelli. "Comparing the Latent Space of Generative Models." *Neural Computing and Applications* 35, no. 4 (February 2023): 3155–72. https://doi.org/10.1007/s00521-022-07890-2.

Audry, Sofian. *Art in the Age of Machine Learning*. MIT Press, 2021.

Barale, Alice. "Latent Spaces: What AI Art Can Tell Us About Aesthetic Experience." *ODRADEK. Studies in Philosophy of Literature, Aesthetics, and New Media Theories* 8, no. 1 (2022): 111–137.

——— "Portraits of Non-Existent People: AI Art and (Human) Imagination." *Aesthetica Preprint*, no. 120 (2022): 7–21. https://doi.org/10.7413/0393-8522103.

Beer, David. "Explorations in the Indeterminacy of Computation: An Interview with M. Beatrice Fazi." *Theory, Culture & Society* 38, no. 7-8, (December 2021): 289–308. https://doi.org/10.1177/0263276420957054.

Boden, Margaret A., and Ernest A. Edmonds. *From Fingers to Digits: An Artificial*

105 Gregory S. Moss, "The Emerging Philosophical Recognition of the Significance of Indeterminacy," in *The Significance of Indeterminacy: Perspectives from Asian and Continental Philosophy*, ed. Robert H. Scott and Gregory S. Moss, Routledge Studies in Contemporary Philosophy 110 (New York: Routledge; Taylor & Francis, 2019), 5.

Aesthetic. The MIT Press, 2019. https://doi.org/10.7551/mitpress/8817.001.0001.

Boehm, Gottfried. "Indeterminacy: On the Logic of the Image." In *Dynamics and Performativity of Imagination*, edited by Bernd Huppauf and Christoph Wulf, 219–229. New York: Routledge, 2009.

Bolter, Jay David. "AI Generative Art as Algorithmic Remediation." *IMAGE* 37, no. 1 (May 2023): 195–207. https://doi.org/10.1453/1614-0885-1-2023-15472.

Botwinick, Aryeh. "Interpretation and Indeterminacy." In *Indeterminacy: The Mapped, the Navigable, and the Uncharted*, edited by Jose V. Ciprut, 79–100. Cambridge, MA: MIT Press, 2009.

Cao, Yihan, Siyu Li, Yixin Liu, Zhiling Yan, Yutong Dai, Philip S. Yu, and Lichao Sun. "A Comprehensive Survey of AI-Generated Content (AIGC): A History of Generative AI from GAN to ChatGPT." *arXiv*, 7 March 2023. http://arxiv.org/abs/2303.04226.

Cazeaux, Clive. "Image and Indeterminacy in Heidegger's Schematism." *Ergo an Open Access Journal of Philosophy* 7, no. 0 (22 October 2021): 937-960. https://doi.org/10.3998/ergo.1132.

Chávez Heras, Daniel, and Tobias Blanke. "On Machine Vision and Photographic Imagination." *AI & SOCIETY* 36, no. 4 (December 2021): 1153–65. https://doi.org/10.1007/s00146-020-01091-y.

Crowell, Steven G. "Determinable Indeterminacy: A Note on the Phenomenology of Horizons." In *The Significance of Indeterminacy: Perspectives from Asian and Continental Philosophy*, edited by Robert H. Scott and Gregory S. Moss, 127–147. Routledge Studies in Contemporary Philosophy 110. New York: Routledge, Taylor & Francis, 2019.

Crowther, Paul. *The Phenomenology of Aesthetic Consciousness and Phantasy: Working with Husserl*. Routledge Research in Aesthetics. New York, NY: Routledge, 2022.

Denson, Shane. *Discorrelated Images*. Durham: Duke University Press, 2020.

——— "Artificial Imagination," *Cinephile: The University of British Columbia's Film Journal* 18:1 (2024): 6–13.

Discord. "Midjourney - Discord Servers." Accessed 29 September 2023. https://discord.com/servers/midjourney-662267976984297473.

Fazi, M. Beatrice. *Contingent Computation: Abstraction, Experience, and Indeterminacy in Computational Aesthetics*. Media Philosophy. Lanham: Rowman & Littlefield International, 2018.

——— "Digital Aesthetics: The Discrete and the Continuous." *Theory, Culture & Society* 36, no. 1 (January 2019): 3–26. https://doi.org/10.1177/0263276418770243.

Feyersinger, Erwin, Lukas Kohmann, and Michael Pelzer. "Fuzzy Ingenuity." *IMAGE* 37, no. 1 (May 2023): 135–49. https://doi.org/10.1453/1614-0885-1-2023-15464.

Flusser, Vilém. *Towards a Philosophy of Photography*. London: Reaktion Books, 2000.

Franceschelli, Giorgio, and Mirco Musolesi. "Creativity and Machine Learning: A Survey." *arXiv*, 5 July 2022. http://arxiv.org/abs/2104.02726.

Geniusas, Saulius. *The Origins of the Horizon in Husserl's Phenomenology*. Vol. 67. Contributions to Phenomenology. Dordrecht: Springer Netherlands, 2012. https://doi.org/10.1007/978-94-007-4644-2.

Hertzmann, Aaron. "Visual Indeterminacy in GAN Art." *Leonardo* 53, no. 4 (July 2020): 424–28. https://doi.org/10.1162/leon_a_01930.

Hui, Yuk. "Imagination and the Infinite—A Critique of Artificial Imagination." *Balkan Journal of Philosophy* 15, no. 1 (2023): 5–12. https://doi.org/10.5840/bjp20231512.

Husserl, Edmund. *Logical Investigations Vol 2*. Translated by Dermot Moran. Vol. 2. 2 vols. International Library of Philosophy. London; New York: Routledge, 2001.

——— *Phantasy, Image Consciousness, and Memory: 1898-1925*. Translated by John B. Brough. Edmund Husserl Collected Works, Vol. 11. Dordrecht: Springer, 2005.

Jansen, Julia. "Husserl." In *The Routledge Handbook of Philosophy of Imagination*, edited by Amy Kind, 69–81. Routledge Handbooks in Philosophy. London New York: Routledge, 2017.

——— "Imagination De-Naturalized: Phantasy, the Imaginary, and Imaginative Ontology." In *The Oxford Handbook of the History of Phenomenology*, edited by Dan Zahavi, 676–695. Vol. 1. Oxford University Press, 2018. https://doi.org/10.1093/oxfordhb/9780198755340.013.33.

Kemal, Salim. *Kant's Aesthetic Theory: An Introduction*. 2nd ed. New York: St. Martin's Press, 1997.

Løhmann Stephensen, Jan. "Artificial Creativity: Beyond the Human, or beyond Definition?" *Transformations: Journal of Media and Culture*, no. 36 (2022): 19–37.

Longo, Anna. "Computational Creativity or Automated Information Production?" *Balkan Journal of Philosophy* 15, no. 1 (2023): 13–22. https://doi.org/10.5840/bjp20231513.

Meyer, Roland. "The New Value of the Archive. AI Image Generation and the Visual Economy of 'Style'." *IMAGE* 37, no. 1 (2023): 100–111.

Micali, Stefano. "Phenomenology of Unclear Phantasy." *Husserl Studies* 36, no. 3 (October 2020): 227–40. https://doi.org/10.1007/s10743-020-09271-w.

Midjourney. "Midjourney." Accessed 29 September 2023. https://www.midjourney.com/.

Moss, Gregory S. "The Emerging Philosophical Recognition of the Significance of Indeterminacy." In *The Significance of Indeterminacy: Perspectives from Asian and Continental Philosophy*, edited by Robert H. Scott and Gregory S. Moss, 1–47. Routledge Studies in Contemporary Philosophy 110. New York: Routledge, Taylor & Francis, 2019.

Murata, Junichi. "The Indeterminacy of Images: An Approach to a Phenomenology of the Imagination." In *Phenomenology: Japanese and American Perspectives*, edited by Burt C. Hopkins, 169–183. Contributions to Phenomenology Vol. 36. Dordrecht: Springer Netherlands, 1999. https://doi.org/10.1007/978-94-017-2610-8.

Pepperell, Robert. "Art, Perception and Indeterminacy." *Contemporary Aesthetics* 5 (2007): 11.

——— "Seeing without Objects: Visual Indeterminacy and Art." *Leonardo* 39, no. 5 (October 2006): 394–400. https://doi.org/10.1162/leon.2006.39.5.394.

Pereira, Gabriel, and Bruno Moreschi. "Artificial Intelligence and Institutional Critique 2.0: Unexpected Ways of Seeing with Computer Vision." *AI & SOCIETY*, 14 September 2020. https://doi.org/10.1007/s00146-020-01059-y.

Rancière, Jacques. *The Emancipated Spectator*. London: Verso, 2009.

Rombach, Robin, Andreas Blattmann, Dominik Lorenz, Patrick Esser, and Björn Ommer. "High-Resolution Image Synthesis with Latent Diffusion Models." arXiv, 13 April 2022. http://arxiv.org/abs/2112.10752.

Schröter, Jens. "The AI Image, the Dream, and the Statistical Unconscious." *IMAGE* 37, no. 1 (May 2023): 112–20. https://doi.org/10.1453/1614-0885-1-2023-15460.

Steyerl, Hito. "Mean Images." *New Left Review*, no. 140-141 (June 2023): 82–97.

Stiegler, Bernard. *Technics and Time*. Translated by George Collins and Richard Beardsworth. Meridian, Crossing Aesthetics Stanford, CA: Stanford University Press, 1998.

——— *Technics and Time Vol 3: Cinematic Time and the Question of Malaise*. Translated by Stephen Barker. Meridian, Crossing Aesthetics. Stanford, CA: Stanford University Press, 2011.

Todorovic, Tanja. "The Manifold Role of Phantasie in Husserl's Philosophy." *Filozofija i Drustvo* 32, no. 2 (2021): 246–60. https://doi.org/10.2298/FID2102246T.

Wasielewski, Amanda. "Midjourney Can't Count." *IMAGE* 37, no. 1 (May 2023): 71–82. https://doi.org/10.1453/1614-0885-1-2023-15454.

Wellner, Galit. "Digital Imagination: Ihde's and Stiegler's Concepts of Imagination." *Foundations of Science* 27, no. 1 (March 2022): 189–204. https://doi.org/10.1007/s10699-020-09737-2.

——— "Digital Imagination, Fantasy, AI Art." *Foundations of Science* 27, no. 4 (December 2022): 1445–51. https://doi.org/10.1007/s10699-020-09747-0.

Zhang, Chenshuang, Chaoning Zhang, Mengchun Zhang, and In So Kweon. "Text-to-Image Diffusion Models in Generative AI: A Survey." *arXiv*, 2 April 2023. http://arxiv.org/abs/2303.07909.

Zylinska, Joanna. *AI Art: Machine Visions and Warped Dreams*. London: Open Humanities Press, 2020. http://www.openhumanitiespress.org/books/titles/ai-art/.

Creativity, Co-evolution and Co-production: The Machine as Art and as Artist

Renzo Filinich and Christo Doherty

Abstract

With the understanding that art and technology continue to experience a (rapidly escalating) historical rapprochement, but also with the understanding that our comprehension of art and technology has tended to be constrained by scientific rigour and calculative thinking by one side, or has tended to change to the extreme from the lyrical: the objective of this article is to provide a reflective look for artists, humanists, scientists, and engineers to consider these developments from the broader perspective they deserve, while maintaining a focus on what should be the emerging core of this topic; the relationship between art, technology, and science. The state of the art in mechatronics and computing today is such that we can now begin to speak comfortably of the machine as artists, and we can begin to hope, too, that an aesthetic sensibility on the part of the machine might help generate an intelligent, more friendly, and responsive machine agency overall. The principle of the inhuman emphasises that the questions of ontology are not questions of being as subject, of being as consciousness, of being as Dasein, of being as body, of being as language, of being as human, or of being as power, but of being as being. Finally, the ontological principle hypothesizes that all beings are ontologically on an equal footing or that all are to the extent that they make a difference. However, until now not much has been said about "algorithmic entities". From the above, it is clear that there are still many unanswered questions, for example: How to raise the question of techno-diversity when intellectuals yearn for a general artificial intelligence? We must go back to history to orient ourselves in our current situation with a sense of distance. Will it be possible to find strategies to free ourselves from this apocalyptic end of technological singularity and reopen the question of the creative future in machines in relation to humans?

Keywords: Individuation, organology, art, creativity, machine

 Corresponding author: Renzo Filinich, renzo.filinich@wits.ac.za

ISSN 2773-0875

1. Machinic Individuation

This article proposes a processual, neomaterialist, and relational vision of technical objects, understanding us as assemblages of dynamic relations that entangle the psychic, social, natural, and cultural creative process with machines. It proposes a perspective of technology beyond the culture/nature distinction and creativity beyond the expression that assumes a supposed human interiority. For this purpose, the following relevant theoretical frameworks were used: the relational techno-aesthetic perspectives of Gilbert Simondon and Bernard Stiegler.

If we delve into the history of media arts in the last 30 years, numerous artists have developed works with "algorithmic" and "reactive" components. That is to say, the display-operation of the work at any time depends on the activities of the viewers. Several of the works described in recent times cross over artificial life and genetic algorithms: they incorporate similar structures, for example *Máquina Cóndor* (2006, in process)[1] by Chilean artist Demian Schopf[2] or *Crisálida* (2002)[3] by the Bolivian multimedia artist Aruma (pseudonym of Sandra de Berduccy).[4] Several others are described in this type of work that allow visitors to influence or make judgments that shape what the next visitors will see. On the other hand, rather than being object-oriented, the interdisciplinarity of these kinds of works can be practice-oriented in the sense that where a disciplinary division of labour persists, cross-disciplinary collaboration is idealised as a value in itself, and one that outweighs any particular art project. Nowadays, commentaries on art-technology, for

1 The machine generates online text based on : a) Real-time searches in 12 newspapers for 333 keywords related to war and economy, b) Online consultation and analysis of the buying and selling values of currencies of former African colonies, of the Middle East, of the countries where Operation Condor took place, and of natural resources important for the Chilean economy, and c) intercalation of 9 words—coming from the lexicon of surgery, anatomy, and forensic medicine—in the first stanza of a "memento mori" by Luis de Góngora. The arrangement of these 9 words depends on the searches and economic analysis set out in A and B.

2 Demian Schopf is a Chilean visual artist, essayist and university professor, who in 2007 won the Altazor Award for his work *Máquina Cóndor* (2006, in process).

3 *Crisálida* (2002) is part of a research and creation project of the author inside the inter-Andean valleys of Bolivia, investigating traditional textile techniques from the Andes and experimenting with circuits, conductive threads, fibre optics, and LEDs. Crisálida is an interactive installation, made with fibre optics and jute. By placing her finger on a sensor, the visitor is surrounded by the light emitted from her own heart rate in *Crisálida*, integrating with the machine's logic from a rhythmic connection. In the rhythm of the pulsation, we are transported inside the technical object and coincide with it in time. The breathing in my chest superimposes the pulsation of *Crisálida* without homogenising; we are in a rhythm, still without a fixed image, without predetermined content, in which we make the effort to remain in continuity with a logic of organic/inorganic coordination.

4 Aruma carries out research and epistemic revitalization work, producing works that recover the modes of production of Andean textiles from practices embedded in their communities, to highlight the aesthetic and thought logic involved in the expressive modes of the weavers. Using the backstrap loom technique and weaving since the age of 12, Aruma is interested in video, programming, and performance, generating crossovers between these practices.

example, sometimes portray the microsocial collaborative endeavour between artists and machines as a crucible for creativity and as itself a focal value.

The emergence of cybernetics in the 1940s and 1950s coincided with a period of political and social upheaval in many countries, which led artists and intellectuals to explore new forms of expression and critique. For example, Latin American artists, such as Juan Downey in the 70s, Rafael Lozano-Hemmer in the 90s, and Gilberto Esparza in the 2000s, have also explored cybernetic concepts in their work, using technology and media to create new forms of expression and critique. Many of these artists have drawn on the political and social context of Latin America to create artworks that address issues such as censorship, surveillance, and authoritarianism.

In sum, cybernetic concepts have played a significant role in the development of art since the mid-20th century, inspiring artists to create new forms of expression that are aligned with the dynamic and complex nature of modern life. These artworks often incorporate technology and interactive elements, seeking to create new forms of social interaction and consciousness that are responsive to the principles of cybernetics.

These kinds of systems can have different scales, from a local network to a planetary system such as the terrestrial technosphere. Now we want to ask what might be the implications of this redefinition of (the relationship between) machine and ecology. Applying such questions in this field can contribute to the redefinition of the relationship between machine and ecology: Is the matter also the message in this exchange? How does the agency condition of graspable materialities come together with the immaterial nature of the digital or electronic signal? Are the capacities of our bodies the object or the subject of the action? With the help of our newly acquired knowledge of life processes at the technological level, from ecologies to molecular biology, we can exercise an increasing degree of control over the manipulation of living biological systems, as the technosphere ("man-made") and the biosphere ("nature") which are increasingly indistinguishable. The ability to cut and paste genes from different organisms, the prospect of engineering artificial genes, and the possibility of coercing functional living tissue (outside an organism) to grow and behave according to human-determined plans are just a few examples of this merger. Artists are now exploring the new knowledge and tools offered by modern biology to manipulate and create living and semi-living works of art. A striking example of this approach, recently introduced into the South African context, are the biological 'collaborations' by the artist Leora Farber working with bacteria and yeast to create biofibers- resembling human skin, which are then used to produce casts critiquing colonial histories[5].

5 Leora Farber, "The Scientific Lab as Studio/The Studio as Scientific Lab," in *Proceedings of the 2nd Arts Research African Conference*, 14–16 September, 2022, https://doi.org/10.54223/10539/35903.

When we consider machines as art and as artists, it is important to recognize that they are not simply tools or instruments, but active participants in the creative process. By using machines to generate creative outputs, artists are opening up new possibilities for exploration and expression, and creating a new form of co-evolution and co-production between humans and machines. The concept of technological singularity,[6] in which artificial intelligence reaches a point of self-improvement and surpasses human intelligence, has been a topic of concern for many researchers and thinkers in the field of artificial intelligence.

The criticisms proposed in this article are a response to how artificial agents (machines, algorithms) manifest themselves in an irreducible way through engagement with nature, forming open dynamic systems, from an individuation perspective.[7] This perspective is added to Stiegler's notion of *organology*[8] as a condition of human and technological constitution. To address this relationship, this article traces the art-machine-nature relationship, considering the work *Qatipana*[9] in its processes of ontogenesis[10] and epiphylogenesis in this becoming.[11] In this spirit, by addressing the notion of *hybrid ecology,* this article hopes to provide a philosophical foundation for a new understanding of natural and artificial creativity based on a notion of relational individuation that encompasses both human and non-human creativity. Through concepts of cultural techniques (scriptural, figurative, and computational), integrated with a self-representative potential, this article will attempt to show how these material relations contribute to generating a more substantial vision on some of the fundamental questions between natural and artificial systems.

Creativity, coevolution, and co-production are all important concepts in the realm of art being produced today, particularly when considering the role of machines as both art objects and artists.[12] Creativity is the ability to generate novel ideas or solutions, often

6 Matthew O'Lemmon, "The Technological Singularity as the Emergence of a Collective Consciousness: An Anthropological Perspective," *Bulletin of Science, Technology and Society* 40, no. 1-2 (2020), 16. It is important to note that the idea of technological singularity remains highly speculative and controversial. While there are rapid advancements in AI and other technologies, the timeline and nature of a potential singularity are far from certain. As a result, discussions about the singularity often involve a wide range of viewpoints, from enthusiastic proponents to cautious sceptics.

7 Brian Massumi, "Technical Mentality Revisited: Brian Massumi on Gilbert Simondon," *Parrhesia* 7 (2009), 37.

8 Bernard Stiegler, "Elements for a General Organology," *Derrida Today* 13, no. 1 (2020): 72–94.

9 See https://qatipana.org/

10 Gilbert Simondon, "The Position of the Problem of Ontogenesis," trans. Gregory Flanders, *Parrhesia* 7 (2009), 6.

11 Bernard Stiegler, *La Técnica y el Tiempo I: El Pecado de Epimeteo*, trans. B. Morales Bastos (Argitaletxe Hiru, 2002), 135.

12 For example, A3 K3, by Dragan Ilic (2017), is an interactive play experience created with machine technology and audience participation. Ilic uses an elaborate Brain Computer Interface (BCI) system, in which he controls a high-tech robot with his brain, through reader technology. The artist

through a process of imagination and exploration. This ability is not exclusive to humans, as machines can also be programmed to generate creative outputs, such as music, art, or writing. In fact, some argue that machines can even surpass human creativity,[13] as machines are capable of generating an almost infinite number of possibilities and combinations. Strictly speaking, a technical object is never out of date, since it can be actualized by a human being. This actualization involves more than mere usage. Technical objects can be used for other purposes than intended. This abuse of the object would reduce it to mere means without understanding the inner logic of it. An ethical attitude towards techniques is interested in the praxis of machines and attempts to accompany its genesis via analogy. On the other hand, co-evolution refers to the way in which two or more entities influence each other's development over time. In the context of art and machines, this can refer to the way in which artists and machines collaborate to create something new and unique. For example, an artist may use machine learning algorithms to generate novel ideas or forms, and then use their particular creative skills to shape those outputs into a final product. In another stage, co-production refers to the process of collaborative creation, where two or more entities work together to produce a single output. In the context of art and machines, this can refer to the way in which artists and machines work together to produce a final work of art. For example, a machine may generate a piece of music, and an artist may use that music as inspiration for a visual art piece, resulting in a co-produced work of art.[14]

Let's start this analysis by observing normative dichotomies (body/extension, real/prosthetic, mind/body, material/immaterial), which over time become indefinable. The focus of attention can travel from one result to another: from separation to relatedness, from integrity to hybridity. On the one hand, it is possible to provide specific

---

and the public draw and paint with the help of the robot on a vertical and horizontal canvas. The robotic arm is equipped with DI drawing devices that grasps, holds and manipulates various art media. Ilic thus provides a context in which people can improve and increase their art-making skills. Another example is the Neurotransmitter 3000, by Daniel de Bruin (2016), is a seven-meter-high construction that is controlled by biometric data. The author states that he wanted to change the usual one-sided relationship: a situation in which the body is overwhelmed by physical impressions, but the machine itself remains indifferent, unattended to what the body is going through. Therefore, Neurotransmitter 3000 should be more intimate, more reciprocal. Using sensors attached to the passenger's body that measure their heart rate, muscle tension, body temperature and orientation and gravity, the data is translated into variations in movement. And so, humans and machines intensify their bond. They meet again in a shared in-between space, where human responsiveness becomes the input for a bionic conversation.

13 J. Augustus Bacigalupi, "Creativity: Transcending the Cybernetic Mode via the Virtuality of Relevant Noise," Angelaki 28, no. 3 (2023), 86.

14 For example we have the works of Taryn Southern, a musician and content creator, who collaborated with AI to compose her album "I AM AI." The album includes songs where AI played a significant role in the creative process and DuettoBot, a collaborative AI project between musician Benoît Carré and AI researcher François Pachet, creates AI-generated music that can be played alongside a live musician.

phenomenological and physiological explanations for the informational kinaesthetic automaticity experience.[15] On the other hand, the immaterial, relational and performative nature of these experiences—the way in which they arise through human practices affordances/performances in threshold conditions and resort to subjective forms of psychic turning—overcome any phenomenological and physiological explanations. This type of analysis requires an understanding of body-technology relationships as personal, mutable, contextualised, and technically specified. Fundamentally, these types of relationships are explainable only through their performance. When performing the tension between the body and the machine, human and non-human from the organological individuation perspective established by Simondon and Stiegler, one can observe ways of inhabiting alternative forms of incarnation.

This distinction is mainly heuristic, that is, tentative and pragmatic, and the purpose of separating mediation from media will be to clarify the relationship between them. This ontological definition allows us to propose a genealogy of the machine as a processual and creative medium, which understands it in its material infrastructure and as a vector of communication,[16] through analysing the process of cybernetization and the expanded concepts of art from the 1960s. For example, one of the key Latin American figures in the development of cybernetic art was the Argentine artist Gyula Kosice, who founded the Madi movement in the 1940s. The Madi movement sought to create a new language of art that responded cybernetically to nature as well as to the fluid dynamics of modern life, drawing inspiration from cybernetic concepts such as feedback, information and interaction. Often incorporating technology and interactive logic, Kosice's artworks sought to create new expressive modes of spatiotemporal experience that drew from the principles of cybernetics. Another important figure in the development of cybernetic art in Latin America was the Brazilian artist Hélio Oiticica, associated with the Neo-concrete movement in the 1950s and 1960s. Oiticica's artworks, which included immersive installations, participatory events, and multimedia experiments, were inspired by the cybernetic concepts of feedback, communication, and self-organisation. Oiticica thought of his artistic production as a proposal to create new forms of social interaction and consciousness under the principles of cybernetics.
In this context, it is important to talk about *hybrid ecologies,*[17] hybrid from a symbiotic

15 About this phenomenon Jaana Parviainen tells us: "Precisely in the way we intuitively knew as infants on the basis of our tactile-kinesthetic experiences, and knew without the aid of scare quotes, of qualitative happenings and vitality affects. Such knowing is a manner or perhaps better, a style—of cognition that may be difficult for some adults to acknowledge since it is nonlinguistic and nonpropositional and, just as significantly, has no solid object on which it fastens" (Jaana Parviainen, "Bodily Knowledge: Epistemological Reflections on Dance," *Dance Research Journal* 34, no. 1 (2002): 14).

16 See the analysis by Yuk Hui, "Modulation after Control," *New Formations: A Journal of Culture/Theory/Politics* 84–85 (2015)

17 The term hybrid ecology is appealed to in order to shed new light on the condition of philos-

sense between the biological (organic individuals), the historical (culture) and the technological (artificial agents), and 'ecological' from an *organological* sense. From the latter, the term tries to reveal that we are at the dawn of what Stiegler describes as a new organological era (Stiegler, 2018). One of the key epistemological questions that Stiegler's *general organology* raises is the relationship between the organic and the inorganic and the necessity to consider the hegemony of a modern scientific thought that is at the root of the deep crisis of epistemological, ecological, and technological diversity that we face. Yuk Hui points out in this regard:

> Scientific thought wants to improve the capacity of the senses, while philosophical thought wants to develop other senses. It is in art where both can come together. Therefore, the relationship between art and technology is not yet determined.[18]

In recognition of that which is "not yet determined," this notion of *hybrid ecology* is based on a deep and sustained commitment to art, the biological, physical and computational sciences, which operate in conjunction with anthropological, philosophical and artistic modes of investigation. In some aspects this essay is related to the question made by Yuk Hui: What happens if we don't just ask ourselves how technology transforms the concept of art, but try to do the opposite and ask ourselves how art can transform technology?[19] By establishing this question as a turning point, we are able to see if it will allow us to look at a new field of possibilities and to return to address the relationship between art, technology, and nature. This question suggests that it is time to go beyond the prevailing techniques of computing and its complexity to accommodate the open and living processes of the world.

One of the key epistemological questions that this research raises is the relationship between the organic and the organological.[20] On the other hand, we have the hegemony of modern scientific thought that leads us to a deep crisis in epistemological, ecological,

---

ophising in view of the "organic evolution" of digital machines on a planetary scale, which today would be equivalent to a "general ecology" as is proposed by Erich Hörl in Erich Hörl and James A. Burton, *General Ecology: The New Ecological Paradigm* (London: Bloomsbury Academic, 2017).

18 Yuk Hui, *Art and Cosmotechnics* (Minneapolis: University of Minnesota Press, 2021), 62, https://doi.org/10.5749/j.ctv1qgnq42.

19 Yuk Hui, *Art and Cosmotechnics,* 222.

20 Bernard Stiegler, "General Ecology, Economy, and Organology," in *General Ecology: The New Ecological Paradigm*, ed. Erich Hörl and James Burton, trans. Daniel Ross (Bloomsbury Publishing, 2017), 133. The fundamentals of a *general organology*, that is, a theory of the articulation of bodily, artificial, and social organs, is set forth in Stiegler. In addition to primary memory as the genetic information expressed in DNA and secondary memory acquired epigenetically through a complex nervous system, there is also tertiary memory, which Stiegler names *epiphylogenetic*. In this sense, for Stiegler organology refers specifically to the formation of organizational techniques, including writing, art, clothing, tools, and machines.

and technological diversity, relegating practices that are far from what is understood as rational under this epistemic approach. First of all, we observe Gilbert Simondon's thought in these operational relations between the living and the technological. In the first instance, Simondon raises the possibility of a psychic-collective individuation through information; in that it is produced, as manifested when dealing with the structure of his main thesis, within biological individuation, Simondon shows how information can be used and transformed into energy for the constitution of a biological reality and a psychic reality. We can assume, therefore, that the question of language as a defining and differentiating instance of the human and the social does not interest him; at this point, he allows us to observe the processes and operational relationships in the media arts from an "informational transduction" of the téchnē-lógos-cosmos as an organological process of knowledge[21]. At the same time, Stiegler's concept of *organology* is relevant at this point, in terms of the limits that representation can entail for the conformation and expression of psychic reality—the theme of this linguistic turn—which for the purposes of this project is something that we take as a matter of study within the creative processes involved with artificial agents:

> Intelligence, here, whether in its "natural" or "artificial" forms, but I prefer to say in its organic or organological forms, is the achievement of a goal or an objective. There is no need for this goal to be a conscious representation, as Francisco Varela shows in a drawing in which he ridicules this type of "representational" hypothesis. However, what is involved with noetic intelligence is, in principle, access to consciousness, to the extent that it has the ability to access what Heidegger called *the how*: Heidegger is himself someone who deconstructs the metaphysics of the representation.[22]

Secondly, this article seeks to open a question about the ways in which science has observed—and intervened—into the living. How do information and visualisation technologies shape these hybrid relationships between humans and non-humans that take place in scientific inquiry? Shaping not only the images, but also the visualisation and ordering instruments themselves, such as microscopes, botanical atlases, museums, and photographs, to demonstrate that the natural sciences have developed hand in hand with a primacy of vision, which created the forms of linkage with the living as an object of study. In this long genealogy of naturalistic visual knowledge, epistemological changes modified the relationships between the techno-scientific and the living. Since the mid-twentieth

21 Simondon, "The Position of the Problem of Ontogenesis," 11.

22 Bernard Stiegler, "Artificial Stupidity and Artificial Intelligence in the Anthropocene," speech given on November 23, 2018, Institute of Ereignis, Shanghai, trans. Daniel Ross, 1, accessed July 14, 2024, https://www.academia.edu/37849763/Bernard_Stiegler_Artificial_Stupidity_and_Artificial_Intelligence_in_the_Anthropocene_2018

century, the rise of cybernetics and biotechnology have evidenced a shift towards design: in the life sciences it is no longer a question of investigating how natural processes work, but rather how one can act with these elements in a different way. In parallel, the ecological collapse—what scientists and intellectuals agree to call the Anthropocene—accounts for a paradigm shift, where the modern categories of "culture" and "nature" collapse, and confronts us with questions about the interspecies networks that shape our planet. Within the limits of this process of analysis of the creation of works with artificial agents, we critically reflect on these issues of science and the living by criticising the use of visualisation and design technologies used in the field of life sciences, revealing and reflecting on these processes (and other works that address similar issues), which involve the manipulation of the living, either through scientific procedures with techniques from other times or currently in force.

On the other hand, for Simondon, the revolt of minority groups against technology in the name of culture misinterprets the role of the technological, since he sees a rationality in technology that transcends the limits of cultural difference. More importantly, Simondon is hopeful that the deepening and increasing awareness of technology provides us with new perspectives for resolving the problem of alienation and antagonism between culture and technology. However, the issue is much more complicated than Simondon's optimism admits. In this process of both colonisation and modernisation, technological differences also maintain and reinforce power differences. In this context, addressing this issue from Simondon's perspective of individuation shows us that the relationship between nature and technology has a moral root that has been uprooted by planetary industrialisation. From there, the possibility of a renewed relationship between art, technology, and nature will be considered.[23]

Additionally, the audiovisual production industry generates various types of contamination, whether it is the accumulation of materials forcibly removed to access the minerals, or the materials left over from the chemical processes used for its processing, or the toxic residues drained by the accumulation of materials and technological devices beyond the useful life programmed for them, conforming their own medial geology.[24] Taking into account

23 Observing the discipline of art as the possibility of offering diversity in this relationship, proposing and reconstituting emerging modes of integration between a machine and a living being, under the focus of a technodiversity or a purposeful cosmotechnical reality. Yuk Hui, *Art and Cosmotechnics,* 211.

24 Jussi Parikka, N. Katherine Hayles, Peter Krapp, Rita Raley, and Samuel Weber, eds., *A Geology of Media* (Minneapolis: University of Minnesota Press, 2015), 98. The violent transformation imposed on the trajectory of minerals, since their introduction into devices and human technological cycles, can be analysed from the perspective proposed by Parikka, for the development of a new materialism based on media theory and in view of its own geology. One that "can be seen as the intensive excavation of where (and when) the materiality of the media really is", from a perspective that collapses the deep time of its geological formation, the immediacy of its use and obsolescence, its integration into information technologies, and information and its future permanence as waste.

these concepts of individuation, organology, and hybrid ecologies, it becomes plausible to observe and analyse the current technological milestones from a reconsideration of the current state of our culture in relation to nature and technology: what defines nature and technology as an immanent, extensive, and unique prosthesis of the human being.

As a result of these observations on the development of works operating with artificial agents, we can observe that the relationship of the human being with technology should not be seen in terms of slavery.[25] Even though Flusser raises serious doubts about the humanist notion of agency, he also recognizes that machinic entanglement facilitates new kinds of action, which he sees as collaborations. Flusser even goes so far as to suggest that "this is a new type of function in which human beings are neither the constant nor the variable, but in which human beings and apparatus merge into one unit."[26] Flusser is writing about photographers, evoking the camera as a fivefold essential modern device (positioning, looking through the lens, pressing the shutter, taking the photo, developing) that takes human labour beyond the sphere of mere work, towards which we could call playful co-creation. But it could be said that his argument extends to other forms of human creativity. Flusser understands the creative activity of the photographer as an execution of the machine's program, which involves making a selection from the range of options determined by the machine's algorithm. We could suggest that this algorithmic relationship on which humans depend is not only updated in post-industrial society, but that it has been fundamental for the constitution of society and of the human as a technical being. This algorithmic relationship traces a fundamental relation to previous human relationships with technical objects such as fire, sticks, and stones.[27] The daily functioning of human beings also depends on the execution of a program: a sequence of possibilities enabled by various couplings of adenine, cytosine, guanine, and thymine, that is, DNA. As we have argued above, this proposition related to creativity and AI, should not be taken as a postulation of a meaningless technological or biological determinism, which would remove from humans any possibility of action as artists, critics or spectators, and any responsibility for the actions we carry out. On the contrary, accepting our affinity with other living beings across the evolutionary spectrum and recognizing that our human lives are subject to biochemical reactions that we do not fully control undermines the humanist parameters of the debate on creativity, art, and artificial intelligence.[28]

25 Cf. Gilbert Simondon, *Du Mode d'Existence des Objets Techniques* (Paris: Aubier, 2012).

26 Vilém Flusser, *El Universo de las Imágenes Técnicas: Elogio de la Superficialidad* (Buenos Aires: Caja Negra, 2015), 27.

27 Stiegler, *La Técnica y el Tiempo I,* 7.

28 On this aspect we can take the notion of epiphylogenesis coined under Stiegler's anthropo-technical theorization, on the co-evolution of brains and tools, he invites us to think about a space of deanthropologization to account for a new relationship that must be defined between individuals and machines that foregrounds and emphasizes that there has never been anything called "the human." For him there are only processes of differentiation that historically make humans who they are, and do so in different ways, or the quasi-causality of becoming human, which operates through

2. Techno-organology in *Qatipana*

We can start by mentioning that a system can be defined in multiple ways, one of its oldest meanings being that which determines it as an ordered set of reasoning that explains certain phenomena. This is how Condillac defined the concept of system as early as the 18th century in his *Treatise on Systems*: "a system is nothing more than the arrangement of different parts of an art or science in an order where they all support each other, and where the latter are explained by the former. Those that explain the others are called *Principles*; and the system is all the more perfect, if the principles are few."[29]
With the emergence of cybernetics and the invention of "thinking machines"[30], the concept of system mutates to account for different modes of information exchange where living organisms or computational systems have the same information structure. But this second meaning of the concept of system does not annul the first given by Condillac; on the contrary, cybernetics considers the concept of system as a way of explaining phenomena that make the difference between the living, the organic, and the machinic less significant. In this way, everything can be understood from the point of view of a system made up of an input through which the information enters, through a mediating stage that analyses and processes the information, and the output that generates a response[31].

This aspect and attribute of "autoregulation" in a technical system was already reflected in Simondon´s *On the Mode of Existence of Technical Objects* and that is why Bellert—when trying to define the concept of the cybernetic system in the *Cahiers de Royaumont* (1965) dedicated to the concept of information a colloquium where Wiener and Simondon, among others, were present—points out that the great merit of cybernetics is that "this science makes possible an analysis, based on common principles, of various apparently different issues, such as bio-organisms and techno-organisms."[32]

What happens then when an artwork demands to be understood as the interaction between a natural system and a machine? A starting point is through the analysis of the various elements that make up the system, in order to determine their characteristics and their role within it. *Qatipana* consists of three fundamental elements that constitute what we can call its techno-organism if we adopt Bellert's formula: i) a surveillance camera located in the observatory of a natural phenomenon (in this case, an ecosystem under observation), which transmits live through the web (input), ii) a perceptron that processes

progressively differentiating environments and techniques.

29 E. Bonnot de Condillac, *Traité des Systèmes* (Paris: Ch. Houel, 1798), 8.

30 Norbert Wiener, "L'homme et la Machine," in *Le Concept d'Information dans la Science Contemporaine*, ed. Martial Guéroult (Paris: Paris: Gauthier-Villars; Les Éditions de Minuit, 1965), 110.

31 Ludwig von Bertalanffy, *General System Theory: Foundations, Development, Applications* (New York: Braziller, 1968), 17.

32 Stanisław Bellert, "La Formalisation de la Notion du Système Cybernétique," in *Le Concept d'Information dans la Science Contemporaine* (Éditions de Minuit, 1965), 403.

the information that the camera transmits, and iii) a real-time data visualisation generated by the interaction between the information collected by the camera and the perceptron that feeds on the said information (output).

In this sense, *Qatipana* offers ways to rethink the relationship between technology, human beings and nature in the contemporary world. *Qatipana* is thus an artificial intelligence platform that is fed information in real time from a camera installed in the Peruvian jungle. By recognizing patterns in these images, *Qatipana* produces an abstract three-dimensional form that is nothing more than an accumulation of algorithmic processes,[33] machinic information, and visual patterns that originate in nature. The human being as a spectator, then, is called here to recognize (himself) or be surprised (himself) in front of that abstraction. This work is problematized mainly through Simondon's notions of individuation and Stiegler's organology. The latter seems especially important, since it allows us to glimpse other non-human biological times that still inhabit the Peruvian jungle and recognizes a ontological flow in nature, and informs the evolution of *Qatipana*—which in Quechua means continuous movement.

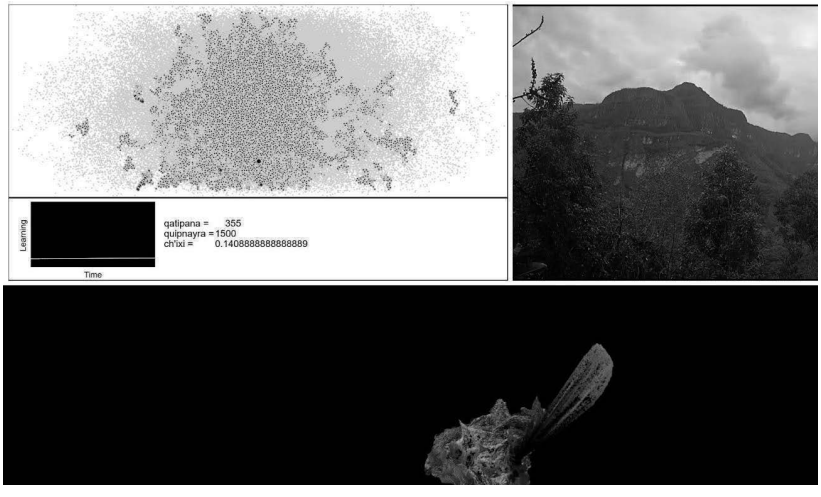


Fig. 1: The system Qatipana, the work is designed to be projected on 3 screens where the 3 ecological conditions are observed (organic, organic/inorganic, and culturally calculable)

33 The algorithm in *Qatipana* is made up of 1500 perceptrons. These perceptrons are trained to trigger information in dark areas (areas where light does not reach and the image cannot be defined), this allows providing a non-representational meaning to the learning of the work and with this, we provide a sense of other mediations and learning from the usual use of machine learning (entropy information metadata).

As we show in figure 1, the ecosystem is observed through a surveillance camera. A surveillance camera, unlike old recording cameras, can make a live transmission through a video signal that is currently digital. Normally, this surveillance camera is located in a fixed place so its movement is limited: left-right-up-down, and although it does not require an operator, the remote system can intervene if necessary to execute these movements. A camera of this type can also have a zoom that approaches an object that requires better visibility, a zoom that in certain cameras can be equipped with a facial or movement recognition system.

The surveillance camera—*Qatipana's* input—is an active entity that captures light information from the natural landscape in front of the lens. This capture of information works as a flow that enters the system permanently as it is transmitted live on the web. The characteristic of a surveillance camera is that it generates "the possibility of obtaining a vision without looking, where the video camera is controlled by a computer, the latter assuming for the machine, and not for any viewer, the ability to analyse the environment, the automatic interpretation of the meaning of events."[34] This situation described by Paul Virilio is precisely what happens in *Qatipana*, that is, the camera directs its mechanical eye at an ecosystem, but this mechanical eye does not actually have the gaze provided by a human spectator who interprets and processes said information, since it is the perceptron that is in charge of processing the data that the surveillance camera transmits.

What *Qatipana* brings into play in this part of the system is a questioning of the traditional concept of creativity[35] that is always associated with a thinking human subject, also the artwork revolves around the concepts and processes of becoming and individuation through a hybrid system of information flow which, even though not the kind of dispositive systems theory was designed to read, offers some valuable empirical insights to test some key aspects of Simondon's information processing systems; this artwork aims to observe an algorithmic cycle performed by the cognitive system of an AI agent observing a living ecosystem. We are talking about coordinating and adopting the gaze to the devices, a process that began with the invention of the first visual prostheses such as the telescope or the microscope that allowed the limitations of the human eye to be overcome by expanding its visual field. With the invention of photography and cinema, it also becomes possible to generate an external memory of what is seen by these mechanical eyes.

34 Paul Virilio, *La Machine de Vision* (Paris: Galilée, 1988), 125.

35 Trevor Paglen, "Invisible Images: Your Pictures Are Looking at You," *Architectural Design* 89 (2019): 22–27, https://doi.org/10.1002/ad.2383. Incorporating this article with Stiegler's notion of organology to account for the new relationships that must be defined between individuals and algorithms, where classic concepts such as human creativity must be reviewed. Currently the creation of images is not limited to human visualization, because as code they can be processed by algorithms which do not need to "see."

This distinction is important because it is what allows us to attend to our own pharmacological situation[36], from which we have been evolving together with the technical-aesthetic devices (interfaces). Similarly, the acceleration also produced by digital information contributes to the externalization of the user's cognitive apparatus, precisely because it exceeds the limits of their cognition. If we add to this the amplification capacity of the informational content of algorithms (and its transformative potential), the scenario becomes even more conflictive. Information and its dissemination is so wide and diverse that a cognitive capacity such as that of the human being cannot fully synthesize it, generating an active externalism, assuming that the human organism is linked to an external entity in a bidirectional interaction, thus creating a coupled system that can be seen "as a cognitive system in its own right"[37] in its psychic apparatus, which we call an agency of organic-technical-digital assemblages.

In *Qatipana*, not only is the ability to see through a mechanical eye of a camera what is at stake, but also the processing or analysis of what is seen nowadays.[38] This processing is carried out through a perceptron and not from a human subject that contributes their point of view, calling into question an entire perspectivist regime that sustains the eye as the centre from which the world is thought and analysed. Therefore, it is the entire perceptive process that is technologized or delegated to devices, which accounts for the profound transformations that technology brings and that forces us to redefine the traditional concepts of seeing or looking.

In this sense, this artwork advocates a shift from thinking of new media as a set of discrete objects to understanding media, old and new, in terms of the interconnected and dynamic processes of mediation.[39] It also describes what is at stake in this shift from thinking of technological media solely as things within our grasp and also to acknowledging our

36 Bernard Stiegler, *Taking Care of Youth and the Generations*, trans. Stephen Barker (Stanford, CA: Stanford University Press, 2010), 72.

37 Andy Clark and David Chalmers, "The Extended Mind," *Analysis* 58, no. 1 (1998), 8.

38 Jean-Louis Déotte, "Le Milieu des Appareils," *Appareil* 1 (2008), 3. We can elucidate that these changes of seeing arise with the invention of perspective in the Renaissance, it inaugurates an era that we will call focalization, that is, space begins to be constructed and thought from an observer, or more precisely from the eye of the observer. The eye thus acquires a fundamental role, because from there, that is, from a certain point of view in the space and consequently the image is constructed. But perspective is not limited to the perceptive apparatus, but later other projective apparatuses emerged such as the photographic or cinematographic apparatus that will configure various periods of the gaze. All of these should be considered projective devices in the sense that a space and an image are projected from a point of view that constructs or builds the world.

39 On this point, Malabou is right to point out that contemporary digital machines are no longer mechanisms like those of the 18th century; they are recursive machines that employ non-linear causality to arrive at their *telos*. It is in that sense that they behave like organisms. See Catherine Malabou, *Morphing Intelligence: From IQ Measurement to Artificial Brains*, trans. Carolyn Shread (New York: Columbia University Press, 2019), 90.

entanglement with these media on both a sociocultural and biological level.[40] This argument will lead us to ask the following question: if the media cannot be completely externalised from the issues or "users", then how could "we" engage with "them" differently? We must also consider the political and ethical implications of such commitments.[41]

This dematerialization of the machine was already identified by Pontus Hultén, who actually speaks, in the title of his 1968 exhibition, of the "end of the mechanical age." This tension is highlighted very early in the introductory text to the exhibition: the mechanical age is fully experiencing its culminating phase but it is already seeing the symptoms of its near end, this on the threshold of the 1970s, and what will it see confirmed, such as this phenomenon of importance of mechanics is progressively eroded by advances in electronics, electromechanics, chemistry, biotechnology, and, in particular, software. For the theorist Jack Burnham, this exhibition by Pontus Hultén drew a demarcation line between "earlier 'machine art' and what might be defined as 'information systems and technology'."[42]

On the other hand, the idea of a general artificial intelligence (GAI), which would be capable of performing any intellectual task that a human being can, has long been a topic of fascination for many intellectuals and researchers in the field of machine learning. However, the pursuit of a GAI raises important questions about creativity and the potential consequences of homogenising our technological landscape. To raise the question of creativity in this context, one approach could be to start by acknowledging the potential benefits of a general AI, such as increased efficiency and productivity, improved decision-making, and new opportunities for innovation. However, it is important to recognize that a single, dominant form of AI could also have negative consequences,

40 An artifact's line of development appears to reveal the implications of a preexisting essence that unfolds with each improvement in its technical basis. Paths of development can be traced resembling the evolutionary progress of biological species. But in fact changes respond not just to objective conditions but to the purposes of the dominant actors. Designs are complicated by the multiplicity of interests they serve. The interventions of influential actors intersect and interact with unpredictable consequences. The result may block some familiar affordances and bring out others that lie undetected until new contexts support them or new actors discover them.

41 In this way, technology can be integrated with nature and human nature. The struggles for environmental technology, free expression on the Internet and humane, democratic and safe work are not extrinsic impositions of a purely technical essence, but rather respond to the tendency of technical development to innovate synergisms of natural, human and technical dimensions. Revealing the potentials waiting to be realized.

42 Jack Burnham, "Art and Technology: The Panacea That Failed," in *The Myths of Information*, ed. Kathleen Woodward (Madison: Coda Press, 1980), 203–204. Burnham distinguishes between "the earlier 'machine art' and what might be defined as 'information technology and systems,'" then goes on to elaborate: "The latter includes artists' use of computers and display systems online, laser and plasma technology, environments controlled by light and audio sensors, all levels of video technology, colour copy duplication systems, strobe-light programmed and projected environments using sophisticated consoles, and artificially controlled ecological sites."

such as exacerbating existing inequalities and reducing the diversity of perspectives and approaches to problem-solving.

Observing this GAI phenomenon under the auratic condition of graspable materials refers to the sensory and affective qualities of physical objects that are experienced through touch, sight, sound, and other senses. These qualities, such as texture, weight, colour, and temperature, are often associated with a sense of uniqueness, authenticity, and presence, which are collectively referred to as the "agency" of an object. In the same way, the immaterial nature of the digital or electronic signal refers to the fact that digital information, such as binary code or electromagnetic waves, is not directly perceptible through our senses but must be translated into a visible or audible form through a computer or other digital device.

When these two different modes of experience are brought together in digital media, it creates a unique relationship between the material and immaterial. For example, a physical object, such as a sculpture or painting, can be digitised and reproduced as an electronic signal, which can be transmitted and experienced through a computer screen or other digital device. In this way, the agency of the physical object is transformed into a new form that can be experienced in a different way. This raises a question about the nature of embodiment and the relationship between our bodies and digital media. Are the capacities of our bodies the object or the subject of the action? The answer may depend on the specific context and perspective. In some cases, digital media may be seen as an extension of our embodied experience, allowing us to access new forms of knowledge, communication, and expression. In other cases, digital media may be seen as a form of disembodiment, in which the physical body is marginalised or ignored in favour of the virtual. In sum, the relationship between the agency condition of graspable materials and the immaterial nature of the digital or electronic signal raise a reflection about the nature of embodiment and the role of digital media in shaping our experiences of the world. While digital media can offer new forms of communication and expression, it is important to consider the ways in which it can also impact our relationship with the physical world and our sense of embodiment.

3. From Natural Cognitive Process to Artificial Cognition in *Qatipana*

The perceptron was developed by Frank Rosenblatt at the Cornell Aeronautical Laboratory and as a result of this research he published a report where he describes the main potentialities of this new invention. The perceptron is thus defined as "a device possessing such human-like functions as perception, recognition, concept formation, and

the ability to generalise from experience."[43]

In the context of *Qatipana*, the perceptron is a techno-organ that has functions similar to those of humans, which allows it to perceive, recognize and of course learn, thus generating new knowledge that enhances the experience. In other words, the perceptron contemplates the totality of the perception process that is not limited to the eye, which in this case is a mechanical eye (the surveillance camera), but rather the process of understanding the image-data is delegated to the perceptron and this one it takes the decisions of the informational process to trigger as output, after this output it returns to its initial state. This indicates a self-regulation process that until the mid-20th century was only intended for biological processes. This is an example of what Stiegler means when he states that it is necessary to develop: "a general organology, that is, a reflection on the relationships between organisms, artificial organs and social organisations."[44]

Thus, the hybrid ecosystem of *Qatipana* reflects the technological society, the ubiquitous invasion of the interior, the collection of personal data and the ease of perpetual storage. Ultimately, it leads us to an anthropological problem. This stored information is ultimately discrete recordings (traces) of actions and language that constitute the makeup of cognitive psyches and communities. These data "traces" can be manipulated, shaped, reassembled, or even destroyed. Hence Stiegler states that "there is therefore an urgent need for a politics of memory"[45]. For his part, Norbert Wiener (co-creator of cybernetics) produced writings that address with rigour and depth the sociopolitical impact of scientific practices on the body, psyche, and community[46].

For Stiegler, organisms and what he calls artificial organs are deeply intertwined; the nature-technique dichotomy makes no sense to the extent that there is no state of nature that is not modelled by a certain technique.[47] *Qatipana* seeks precisely to highlight these types of issues, and questions the look as something exclusively human because today we share certain capacities that were our own with these artificial organisms that have human functions, as Rosenblatt points out. Thinking about the relationship we have with these new artificial entities that think or imitate the human, as Turing points out, is essential to understand our cognitive individuation in a contemporary world. [48] Among the

43 Frank Rosenblatt, *The Perceptron: A Perceiving and Recognizing Automaton* (Cornell Aeronautical Laboratory, 1957), 1.

44 Bernard Stiegler, Économie de l'Hypermatériel et Psychopouvoir (Paris: Mille et Une Nuits, 2008), 90.

45 Bernard Stiegler, *Technique and Time I: The Sin of Epimetheus*, trans. Beatriz. Morales Bastos (Argitaletxe Hiru, 2002), 276.

46 Norbert Wiener, *Cybernetics or Control and Communication in the Animal and the Machine* (Cambridge, MA: The MIT Press, 2019), https://doi.org/10.7551/mitpress/11810.001.0001.

47 Bernard Stiegler, "Elements for a General Organology," *Derrida Today* 13, no. 1 (2020): 82.

48 Alan Turing, "Can Digital Computers Think? (1951)," in *The Essential Turing*, ed. B. Jack Cope-

thinkers who contributed to the birth of AI in the 20th century, Alan Turing stands out, who defined what computing was,[49] and devised a test to replace the question of whether a machine could actually think, the famous and controversial Test of Turing[50]. This is precisely radically opposed to Cartesian considerations regarding thought, language and mechanisms, since it assumes that a programmed machine can speak and pass said test. Turing proposes that any programmed or digital machine capable of imitating the inputs and outputs of the brain is, as a matter of fact, intelligent, and is so regardless of the materials that implement the machine or its mechanisms. In particular, Turing states that "if any particular machine can be described as a brain, we have only to program our digital machine to imitate it and it too will be a brain"[51]. That is, it is postulated that intelligence is a byproduct of the computable function of a machine, regardless of its material, and that the key to creating intelligence consists of designing digital machines that imitate what a brain does.

Taking into account this observation about a self-regulating machinic system. If, as Virilio points out, the surveillance camera is an eye without a gaze, what happens when an artificial gaze is added to that eye? Can we continue talking about a gaze? Isn't it rather necessary to reconsider that concept which seems centred on an anthropocentric point of view?

The 'look' or gaze, refers not only to the perception of the objective data, nor simply to the recognition of patterns, but also "includes misrecognition, fantasy, dream, and hallucination"[52] Undoubtedly, the artificial gaze also makes mistakes or hallucinates, as Trevor Paglen's work in *Shoshone Falls, Hough Transform* demonstrates.[53] Although the latter speaks of "invisible images"[54] to account for how today data-images that are pure information do not need to be visible in order to be analysed by an algorithm, perhaps it

land (Oxford: Oxford University Press, 2004; online edition, Oxford Academic, November 12, 2020), 476 https://doi.org/10.1093/oso/9780198250791.003.0019.

49 Alan Turing, "On Computable Numbers, with an Application to the Entscheidungsproblem," *Proceedings of the London Mathematical Society* 42, no. 2 (1936): 235.

50 Alan Turing, "Computing Machinery and Intelligence," *Mind* 59, no. 236 (October 1950), 436.

51 Alan Turing, "Can Digital Computers Think?," in *The Turing Test: Verbal Behaviour as the Hallmark of Intelligence*, ed. S. Shieber (Cambridge, MA: MIT Press, 2004), 112.

52 W. J. T. Mitchell, *Image Science: Iconology, Visual Culture, and Media Aesthetics* (London: University of Chicago Press, 2015), 27.

53 The work is based on a photograph by 19th-century photographer Timothy O'Sullivan, who famously took a photo of these falls on an inspection mission for the United States War Department. His images of this waterfall are some of his most iconic works and some of the best known images in Western landscape photography. Paglen's image is a close-up of the falls, with two computer vision algorithms overlaid. An algorithm searches for points that imply the existence of underlying lines, a computer vision technique used in self-driving cars and robotics in general. The second algorithm is finding shapes in the waterfall that it thinks are faces.

54 Paglen, "Invisible Images: Your Pictures Are Looking at You," 23–24.

would be more accurate to speak of a diverse visibility that is governed not so much by the sensible world, but rather by data analysis.[55]

In this way, from the field of artistic production with digital media, the following question arises: how do these new perception devices reconstruct the artist's gaze in their artistic productions today? As a possible answer, it is suggested to rethink the components of media art and the image as a transmaterial process[56] that is, as assemblies that co-constitute us within its information assets, its algorithms, the textual properties of the code, the interactivity and the interfaces. In this sense, understanding the relationship between the artist and the technical medium is essential to avoid misunderstandings or alignments in the co-creative process with machines and to open up new fields of research for the production of contemporary art. For example, looking for new creativity perspectives, facing the transversality that the hybridization between artist, medium, and interface can offer, their social and production meanings on this new techno-ecological condition that could be substantially improved in the media arts.[57]

The third element that makes up the techno-organology of *Qatipana* is data visualisation, a fundamental element since it allows the data processed by the perceptron to be translated to a visual scale. Paul Virilio already points out that we pass "from vision to visualisation,"[58] and this takes on greater meaning when we consider the change in scale that we are facing today, when the volumes of information increasingly exceed human processing power.[59] That is why both scientists and sociologists or historians, for example Lev Manovich who conducts cultural studies through software, require visualisation in order to "see" the results of data processing. We may be closer now than ever to having machines that can see. What we do have are machines that in various ways interpret and transport the light

55 Artistic and cultural techniques are no longer types of objects or processes, but rather complementary methods of stylizing our use of signs. These were understood in terms of significant structures or codification, typically applying models derived from linguistics and rhetoric. This telescope became the human plane. In parallel, this phenomenon reduced the constitution of the human plane to the question of the human subject (if not to its effective construction, then the impossibility of it or its subversion).

56 Anna Munster, "Transmateriality: Toward an Energetics of Signal in Contemporary Mediatic Assemblages," *Cultural Studies Review* 20, no. 1 (March 2014), 158.

57 Invention can be seen as a process of signification that arises from saturation and an emerging problem. It is in the collective, both at the level of imagination and production as well as exchange and appropriation. Inventive objects/practices carry genetic and cognitive, affective and significant loads. Therefore, techno-aesthetic objects are directly related to technical and aesthetic invention, where creative imagination is the ability to invent techno-aesthetic objects, a communication capacity resulting from mediation processes between subjects and media.

58 Virilio, *La Machine de Vision*, 39.

59 Neuropsychology also proposes that our human consciousness is an interface that restricts perceptual 'information' to what we can handle/deal with – i.e. that we, as humans, already perceive volumes of information that exceed human processing power. It can be postulated that this is why we dream, to try to make sense (in a subconscious way) of that excess on a daily basis.

data captured by a camera or sensor. And while this kind of thing is normally considered in terms of 'artificial visual perception' it remains questionable whether the algorithmic and topological signaletics of even the most sophisticated optoelectronic technologies approximate perception. What is not in doubt is the rapid exponentiation of these kinds of machines in every domain, most obviously in day-to-day interactions with smartphones, cloud computing and entertainment media.

Visualisation should be understood as a procedure that allows the human eye to understand the results of certain analyses that the software performs with a quantity of information that is beyond the capacity of an individual to analyse. Thus, from technological mediations between humans and algorithms, techno-aesthetic objects emerge as an extension of the natural/cultural world, being key points of convergence and their positioning occurs through an action with a view to inserting them into aesthetic compositions. Aesthetics allows us to go beyond technological procedures, since technology is the means by which a certain aesthetic is produced. Aesthetics and technology are united by a continuous spectrum. Two thoughts intersect in the construction of the techno-aesthetic object: a thought that longs to give shape—the technical one, and a thought that extends into the totality—the aesthetic.

Qatipana feeds on the information that the security camera provides in real time at all hours. This information flow is analysed by the perceptron and this treatment is finally taken to a visualisation which translates the non-visible machinic analysis (since it is datum) into a pattern visible to the human eye.[60] From this point of view, data visualisation should be understood as a mode of human-machine interaction, since it establishes a communication bridge between the two. Similarly studying this type of image allows us to speak of info-aesthetics to the extent that "info-aesthetics also tries to study how the use of computers and the explosion of information change the very notion of form (for example, new forms are often variable, emergent, distributed and not directly observable)."[61]

Qatipana's data visualisation is a form in motion, as it is constantly nourished by the interaction between the data provided by the camera in real time and the processing of that information by the perceptron. It is not a visualisation in a fixed state, it is more like a kind of organism in constant mutation. From this perspective, the work highlights how the natural system, which is captured by the surveillance camera, is transformed into

60 The transductive process in the *Qatipana* algorithm (perceptron) is based on capturing data from the camera in observation of a landscape (pixels). This data undergoes a transformation according to daylight. The algorithm reacts to the shadow and the night (enactive process) and this is when the activity increases and is sent over the network to a digital image that is in constant morphogenesis receiving this data, this shows us the process of individuation and invention that Simondon postulates through biological systems and their relationship with the informational environment.

61 Lev Manovich and Everardo Reyes, "Info-Aesthetics," in *100 Notions for Digital Art*, ed. M. Veyrat (Paris: Les Éditions de l'Immatériel, 2014), 1.

information and processed by the perceptron, to finally acquire a new form, this time digital through the visualisation, but also of an organic nature to the extent that it is in constant mutation and transformation in the manner of natural systems.[62] In this sense, technicality arises from tendencies, powers, and capacities to produce or suffer an effect in a certain way; it is not found in an isolated technical individual, but in collective agencies that occur at different levels and layers. Technicality is situated as a moment of evolution that breaks with a sense of stable adaptation and search for balance in the world, to be situated in the successive resolutions of the tensions of a metastable system in constant transformation. In this context,"Simondon defines technicality as a result of a mismatch of being, a fundamental phase of the mode of existence constituted by the subject and the world"[63] that is, technicalism is inserted in a procedural thought constituted of different phases of momentary stabilities in a dynamic system.[64]

In short, *Qatipana* starts from optical-visual elements and ends in data visualisation. This means that with this work, we went from a predominance of seeing generated by optical devices that have predominated since the Renaissance with the invention of perspective, to an era of visualisation, understood as the time in which seeing passes into the background, since the algorithms that process digital images do not need to see to process information. It is a new type of visuality that has lost its original relationship with the visual, understood as optical, or Stiegler's organological point of view, to the extent that optical devices, such as the lens of a camera, can be understood as extensions or externalisations of human organs; in this sense, the camera in *Qatipana* is an externalisation of the human eye. On the contrary, visualisation breaks with this organological model because it does not refer to a perception, to seeing, but rather to a perception that we could call auxiliary, since the algorithm does not need to see the data that is processed. If, however, you want to make the human individual intervene, you need visualisation so that said treatment is understandable, that is, visualizable.

62 In fact, if the body and the environment are transductive correlates, they cannot be considered separate from each other, which means that the *Qatipana* concept of hybridity, taken as a model for the epiphylogenesis of the human being, outlines a return to the original condition of human technogenesis: the recursion that joins together bark and flint. In addition, starting from this original condition, this research proposes to reconstruct a different culture, one that, unlike Stiegler's proposals for technically supported (tertiary) memory, never cuts its links with incarnation as the hinge that connects the body and the environment, the zoological and the technical.

63 Liliana da Escóssia, *Relação Homem-Técnica e Processo de Individuação* (São Cristóvão, SE: UFS Editora; Aracaju: Fundação Oviêdo Teixeira, 1999), 55.

64 See Andreia Machado Oliveira, *Corpos Associados: Interatividade e Tecnicidade nas Paisagens da Arte*, Doctoral Thesis (Porto Alegre: UFRG, 2010).

Fig. 2: Morphogenesis of the Qatipana algorithm in its informational individuation process

In this way, the complete subjectivation/objectification of individuals requires both individual and collective individuations, and thus allows us to observe a possible proposal for a psychic-socio-technological individuation for the social and artistic field. The term "individuation" refers to ontogenic genesis, and the developmental transformations that allow something to become distinctly different from its environment by taking on a form.[65] In the case of interfaces like *Qatipana,* this argument combines Simondon's notion of transduction with the historical and cultural genealogy of an identity in the process of (co)constitution, as an interpretation of logic to a transfigured identity of technical and social systems. This is necessary in order to understand the processes of hominization and projection of external organs with digital technologies,[66] or at least to try. This look

65 Gilbert Simondon and Andrew Iliadis, "Form, Information, and Potentials," *Philosophy Today* 63, no. 3 (2019): 579.

66 Bernard Stiegler, "Elements for a General Organology," *Derrida Today* 13, no. 1 (2020): 78.

allows us to contrast models of building these production processes, under a rationality or way of thinking in a cosmo-eco-political sense. From this approach the model becomes the conduit through which, once again, metaphysics is seen from the perspective of technological entities, and art (Ars) is seen from the perspective of life.

4. Conclusion

As has been shown throughout this essay, Stiegler's work seeks to relate the notions of organology, in which he assumes that this organological process can lead to the interlocking of the subject and the object and lead to a loss of information. This process, however, leads to a pharmacological condition, and it is precisely this condition, brought from a conjunction between the noetic and the prosthetic, that leads us to a possibility of opening and of new individuations. For Simondon, this field delves into what he calls technical thinking, which dismantles and reconstructs the functioning of beings, elucidating their structures; where technical thought "operates" together with its associated medium (milieu). From this scheme, the inventive question arises in Simondon, which in turn connotes for him "becoming," since Simondon takes the position that things cannot be taken for granted, but rather come to be. What is constructed are fundamentally perspectives or paradigms, and the corresponding positions of the creative subject in its relationship with technical objects.

There are no guarantees that we can completely avoid the potential negative consequences of massive technological planetary industrialization,[67] but there are strategies we can adopt to mitigate these risks and re-open the question of the creative future of machines in relation to humans. One approach is to prioritise research and development in areas such as explainable AI, human-AI collaboration, and ethical considerations in AI. By developing AI systems that are transparent, accountable, and work in tandem with human operators, we can help ensure that AI is aligned with human values and goals, and that it complements rather than replaces human capabilities. One question that guides this article arises from observing the current processes of creating works with AI. This suggests that it is perhaps relevant to compare current claims about the "magnificence" and the incomprehensibility of AI with the arguments about the arts and new media.[68] In addition to invisibility and ubiquity, it is the alleged power of new media (and technology in general)

67 What is characteristic of our contemporary age, according to Stiegler, is the systematic industrialization of human memory and cognition through digital technologies, a process with dramatic implications for individual human psyches as well as collectives. In our hyperindustrial societies, even the life of the mind is thoroughly technicized and industrialized and this happens in the context of an increasingly totalitarian capitalism.

68 Andrew Pickering, "Art, Science and Experiment," *MaHKUscript: Journal of Fine Art Research* 1, no. 1 (2016): 1.

that lends itself to this analogy. Furthermore, it seems impossible to know the full extent, content, and effects of new media. Who can touch all the content on the World Wide Web or know the real size of the Internet or mobile networks? Who can read and review all time-based online interactions? Who can expertly transition from social networking site analytics to cell phone novels to database algorithm hardware? Is it possible to get a global picture of the new media? On the other hand, Yuk Hui (2021) mentions that, nowadays, the discussion about art and technology has become more and more common, and invites us to reflect on what the "and" means here[69]. Thinking about that "and" perhaps means providing a new reading, which has a transforming power, so that from a reflection on our current situation we can imagine radical openings. This openness can bring reflections on *anthropotechnical* processes in the world and their relationships with reality. The concepts of pharmakon and organology generate a genealogy of the sensitive, where the bio-human, the technological and the social form the aesthetic and desire. According to Stiegler, there is no "human nature" without technique and vice versa.[70] We are part of processes of technical-technological individuation, where culture "becomes present" through technical objects and knowledge from the past that shape the present. Today it is necessary to focus on questioning the role of art,[71] in view of the limitation of the organic and the evolution of machine intelligence. Beyond the mere proliferation of technological devices and systems, said diversity involves rediscovering forgotten techniques, as well as new ways of approaching technology based on different purposes and ways of experiencing (ourselves) in the world. It is thus that, from this perspective, the relationship between artificial agents and their natural environment is deduced, and the organological genesis of these agents that are subject to potential changes conjugated with their metastable equilibrium is analysed. In this sense, their capacity for invention is evident (transindividual individuation and referred to the psycho-socio-technological), together with the information that the artificial agents integrate into their receptor-system and their "relational configurations." This allows us to conceive new ways of inorganic organisation together with its associated medium, organic "milieu," such as the proposal of works that present this type of relationship.[72]

From there, one could raise questions about alternative models of AI development and deployment that prioritise diversity and inclusivity. For example, rather than focusing solely on the development of a single, all-encompassing AI, media activists could explore the potential benefits of developing multiple, specialised AIs that are tailored to different tasks and domains. Additionally, it is important to consider the potential social and

69 Hui, *Art and Cosmotechnics*, 49.

70 Bernard Stiegler, *La Técnica y el Tiempo I*, 223.

71 These roles of art practice as technique can address the ontological link in a technological world from different conceptual approaches, highlighting the distinction between mediation and media to clarify their relationship.

72 Some examples could be news sorting algorithms and social media bots, which influence the information citizens see; the credit scoring algorithms that determine lending decisions; online pricing algorithms that determine the cost of products differentially among consumers, etc.

ethical implications of an AI, such as issues related to privacy, bias, and accountability. By engaging in thoughtful discussions and debates about these issues, we can help ensure that the development of AI is guided by a commitment to techno-diversity, ethical considerations, and social responsibility.

In sum, in this article we are interested in observing how the radical determination and the contrast with nature and technology, the organic and the non-living, the human mind and the general vision of the unattainable today called Artificial Intelligence, can have different scales from a local grid to a planetary system. Now we want to ask ourselves what could be the implications of this redefinition of magnitudes, (the relationship between) machine and ecology, with opening questions in this field such as: How to think about the relationship between ecological, technological and aesthetic modes of existence? How are they different in terms of structures and operations? How do they participate in a form of coevolution? How might it be possible to reduce the fragmentation of human knowledge and experience by promoting integration, in particular the reintegration of technical developments into cultural understanding? From this perspective that knowledge of human culture necessarily goes through knowledge of technologies, Simondon[73] intentionally relates the word culture to the word cultivar, the plant and animal cultivation techniques of humans acting to modify the environment through technical gestures. In principle, there is no conflict between culture and technique; they oppose when one of the parties is in a static position, in which self-regulation dynamics do not occur, in which both are changed: positively as a transformation, negatively as a hazard. To Simondon, "[...] 'Culture' is the set of techniques of direct human manipulation that each human group uses to perpetuate itself in stability"[74], and culture may be in sync with technique or against it or vice-versa, which we see in most cases. Culture positively regulates the social when it appears as a regulator of social values upon appropriating technological knowledge and negatively upon denying and alienating such knowledge. With the help of our newly acquired knowledge of life processes at the technological level, from ecologies to molecular biology, we can exercise an increasing degree of control over the manipulation of living biological systems, as the technosphere ("man-made") and the biosphere ("nature") are increasingly indistinguishable. The ability to cut and paste genes from different organisms, the prospect of engineering artificial genes, and the possibility of coercing functional living tissue (outside an organism) to grow and behave according to human-determined plans are just a few examples of this merger. However, what happens to these operational relationships from a creative individuation? Artists are now exploring the new knowledge and tools offered by modern biology to manipulate and create living and semi-living works of art. The idea of a possible techno-ecology, an

73 See Gilbert Simondon "Cultura y Técnica." Translated by Margarita Martinez. In *Amar a las Máquinas: Cultura y Técnica en Gilbert Simondon*, ed. Javier Blanco, Diego Parente, Pablo Rodríguez and Andrés Vaccar (Buenos Aires: Prometeo Libros, 2015).

74 Gilbert Simondon, *Du Mode d'existence des Objets Techniques* (Paris: Aubier, 2012), 33.

ecology of machines, is proposed in this article, indicating the need to take into account the combination and recursion, reflexivity and continuity, at any scale, from science to art, understanding that we are going to continue finding cycles and patterns of repetition of "the system" that deals with itself.

Bibliography

Bacigalupi, Augustus J. "Creativity." *Angelaki* 28, no. 3 (2023): 78–94. DOI:10.1080/0969725X.2023.2216550.

Bellert, Stanisław. "La Formalisation de la Notion du Système Cybernétique." In *Le Concept d'Information dans la Science Contemporaine*, edited by Martial Guéroult, 402–415. Paris: Gauthier-Villars; Éditions de Minuit, 1965.

Bertalanffy, Ludwig von. *General System Theory: Foundations, Development, Applications*. New York: Braziller, 1968.

Burnham, Jack. "Art and Technology: The Panacea That Failed." In *The Myths of Information*, edited by Kathleen Woodward, 200–220. Madison: Coda Press, 1980.

Clark, Andy and David Chalmers. "The Extended Mind." *Analysis* 58, no. 1 (1998): 7–19. www.jstor.org/stable/3328150.

Condillac, E. Bonnot de. *Traité des Systèmes*. Paris: Ch. Houel, 1798.

Déotte, Jean-Louis. "Le Milieu des Appareils." *Appareil* 1 (2008): 1–11. Online edition, February 9, 2008. Accessed July 30, 2024. http://journals.openedition.org/appareil/75. https://doi.org/10.4000/appareil.75.

Escóssia, Liliana da. *Relação Homem-Técnica e processo de Individuação*. São Cristóvão, SE: Editora UFS; Aracaju: Fundação Oviêdo Teixeira, 1999.

Farber, Leora. "The Scientific Lab as Studio/The Studio as Scientific Lab." *Proceedings of the 2nd Arts Research African Conference.* 14–16 September, 2022. https://doi.org/10.54223/10539/35903.

Flusser, Vilém. *El Universo de las Imágenes Técnicas: Elogio de la Superficialidad*. Buenos Aires: Caja Negra, 2015.

Hörl, Erich, and James A. Burton. *General Ecology: The New Ecological Paradigm*. London: Bloomsbury Academic, 2017.

Hui, Yuk. *Art and Cosmotechnics*. University of Minnesota Press, 2021. https://doi.org/10.5749/j.ctv1qgnq42.

Malabou, Catherine. *Morphing Intelligence: From IQ Measurement to Artificial Brains*. Translated by Carolyn Shread. New York: Columbia University Press, 2019.

Manovich, Lev and Everardo Reyes. "Info-Aesthetics." In *100 Notions for Digital Art*, edited by M. Veyrat, 146–148 Paris: Les Éditions de l'Immatériel, 2014.

Massumi, Brian. "Technical Mentality Revisited: Brian Massumi on Gilbert Simondon." *Parrhesia* 7 (2009): 36–45.

Munster, Anna. "Transmateriality: Toward an Energetics of Signal in Contemporary Mediatic Assemblages." *Cultural Studies Review* 20, no. 1 (March 2014): 150–167. https://doi.org/10.5130/csr.v20i1.3836.

O'Lemmon, Matthew. "The Technological Singularity as the Emergence of a Collective Consciousness: An Anthropological Perspective." *Bulletin of Science, Technology and Society* 40, no. 1-2 (2020): 15–27.

Oliveira, Andréia Machado. *Corpos Associados: Interatividade e Tecnicidade nas Paisagens da Arte*. Doctoral Thesis (Porto Alegre: UFRG, 2010).

Paglen, Trevor. "Invisible Images: Your Pictures Are Looking at You." *Architectural Design* 89 (2019): 22–27. https://doi.org/10.1002/ad.2383.

Parikka, Jussi, N. Katherine Hayles, Peter Krapp, Rita Raley, and Samuel Weber, eds. *A Geology of Media*. Minneapolis: University of Minnesota Press, 2015.

Parviainen, Jaana. "Bodily Knowledge: Epistemological Reflections on Dance." *Dance Research Journal* 34, no. 1 (2002): 11–26.

Pickering, Andrew. "Art, Science and Experiment." *MaHKUscript: Journal of Fine Art Research* 1, no. 1 (2016): 1–6. http://dx.doi.org/10.5334/mjfar.2.

Rosenblatt, Frank. *The Perceptron: A Perceiving and Recognizing Automaton*. Cornell Aeronautical Laboratory, 1957.

Simondon, Gilbert. *La Individuación a la Luz de las Nociones de Forma y de Información*. Translated by Pablo Ires. Buenos Aires: La Cebra/Cactus, 2009.

Simondon, Gilbert. *Imaginación e Invención*. Translated by Pablo Ires. Buenos Aires: Editorial Cactus, 2013.

Simondon, Gilbert, and Andrew Iliadis. "Form, Information, and Potentials." *Philosophy Today* 63, no. 3 (2019): 571–583.

Simondon, Gilbert. "The Position of the Problem of Ontogenesis." Translated by Gregory Flanders. *Parrhesia* 7 (2009): 4–16.

Simondon, Gilbert. *Du Mode d'Existence des Objets Techniques*. Paris: Aubier, 2012.

Simondon, Gilbert. "Cultura y Técnica." Translated by Margarita Martinez. In *Amar a las Máquinas: Cultura y Técnica en Gilbert Simondon*, edited by Javier Blanco, Diego Parente, Pablo Rodríguez and Andrés Vaccari, 19–33. Buenos Aires: Prometeo Libros, 2015.

Stiegler, Bernard. *La Técnica y el Tiempo I: El Pecado de Epimeteo*. Translated by Beatriz Morales Bastos. Argitaletxe Hiru, 2002.

Stiegler, Bernard. Économie de l'Hypermatériel et Psychopouvoir. Paris: Mille et Une Nuits, 2008.

Stiegler, Bernard. *Taking Care of Youth and the Generations*. Translated by Stephen Barker. Stanford, CA: Stanford University Press, 2010.

Stiegler, Bernard. "General Ecology, Economy, and Organology." In *General Ecology: The New Ecological Paradigm*, edited by Erich Hörl and James Burton, translated by Daniel Ross, 129–150. Bloomsbury Publishing, 2017.

Stiegler, Bernard. "Artificial Stupidity and Artificial Intelligence in the Anthropocene." Speech given on November 23, 2018, Institute of Ereignis, Shanghai. Translated by Daniel Ross. Accessed July 14, 2024. https://www.academia.edu/37849763/Bernard_Stiegler_Artificial_Stupidity_and_Artificial_Intelligence_in_the_Anthropocene_2018.

Stiegler, Bernard. "Elements for a General Organology." *Derrida Today* 13, no. 1 (2020): 72–94.

Stiegler, Bernard, and Irit Rogoff. "Transindividuation." *e-flux* 14 (March 2010): 1–6.

Turing, Alan. "Can Digital Computers Think? (1951)." In *The Essential Turing*, edited by B. Jack Copeland, 476–486. Oxford: Oxford University Press, 2004; online edition, Oxford Academic, November 12, 2020. https://doi.org/10.1093/oso/9780198250791.003.0019. Accessed August 12, 2024.

Turing, Alan. "On Computable Numbers, with an Application to the Entscheidungsproblem." *Proceedings of the London Mathematical Society* 42, no. 2 (1936): 231–65.

Turing, Alan. "Computing Intelligence and Machinery." *Mind* 59, no. 2236 (October 1950): 433–60.

Turing, Alan. "Can Digital Computers Think?" In *The Turing Test: Verbal Behaviour as the Hallmark of Intelligence*, edited by Shieber, 111–16. Cambridge, MA: MIT Press, 2004.

Virilio, Paul. *La Machine de Vision*. Paris: Galilée, 1988.

Mitchell, W. J. T. *Image Science: Iconology, Visual Culture, and Media Aesthetics*. London: University of Chicago Press, 2015.

Wiener, Norbert. *Cybernetics or Control and Communication in the Animal and the Machine*. Cambridge, MA: The MIT Press, 2019. https://doi.org/10.7551/mitpress/11810.001.0001.

Wiener, Norbert. "L'homme et la machine." In *Le Concept d'Information dans la Science Contemporaine*, edited by Martial Guéroult, 99–115. Paris: Gauthier-Villars; Les Éditions de Minuit, 1965.

TECHNOPHANY
A Journal for Philosophy and Technology

Technophany Vol.3 No.2

Expanded Design: Creativity, Machine Learning and Urban Design

Roberto Bottazzi

Abstract

The introduction of automated algorithmic processes (e.g. machine learning) in creative disciplines such as architecture and urban design has expanded the design space available for creativity and speculation. Contrary to previous algorithmic processes, machine learning (ML) models must be trained before they are deployed. The two processes (training and deployment) are separate and, crucially for this paper, the outcome of the training process is not a spatial object directly implementable, but rather code. This marks a novelty in the history of spatial design techniques which has been characterised by design instruments with stable properties determining the bounds of their implementation. ML models, on the other hand, are design instruments resulting from the training they undertake. In short, training a ML model has become an act of design.

The application of ML models to creative domains such as urbanism reproposes fundamental computational issues such as the organisation and representation of knowledge. Their immediate impact on creativity regards the role of processes which are no longer involving the formalisation of knowledge through code, but rather with curatorial practices based on correlating diverse datasets representing elements of cities through statistics. These operations not only constitute an element of novelty in the field of computational creativity, but they also expand the purview of designers to include non-human actors, giving agency to concerns normally excluded from urban design, expand the range of scales from the body to the planet, and make different temporalities amenable to design manipulation, and offer an abstract representation of spatial features based on statistical correlations rather than physical proximity. The combined effect of these novelties that can elicit new types of organisation, both formally and programmatically. In order to foreground their potential, the paper will discuss the impact of ML models in conjunction with larger historical and theoretical questions underpinning spatial design. In so doing, the aim is not to abdicate a specificity of urban design and uncritically absorb computational technologies; rather, the creative process in design will provide a filter through which critically evaluate machine learning techniques.

 Corresponding author: Roberto Bottazzi, roberto.bottazzi@ucl.ac.uk

ISSN 2773-0875

The paper conceptualises the creative potential of latent space by framing it through the figure of the paradigm. Paradigms are defined by Thomas Kuhn as special members of a set which they both give rise to and make intelligible. Their ability to relate parts to parts not only resonates with the technical operations of ML models, but they also provide a conceptual space for designers to speculate different spatial organisation aided by algorithmic processes. Paradigms are not only helpful to conceptualise the use of ML models in urban design, they also suggest an approach to design that privileges perception over structure and curation over process. When applied to urbanism, the creative process supported by ML models favours relations between diverse datasets over objects, that is, a lighter more agile kind of urbanism.

The application of such algorithmic models to design will be supported by the research developed by the students of Research Cluster 14, part of the Master in Urban Design at the Bartlett School of Architecture, University College London.

Keywords: Urban design, Architecture, Machine learning, Paradigms, Aesthetics, Creativity

Introduction

The work of urban designers, as many other creative disciplines, is increasingly consisting of a series of data manipulations to analyse and design cities. The recent penetration of effective machine learning (ML) models has marked a significant shift as the mechanics of generative computational procedures have been radically changed and, with it, their significance in the design process. If, on the one hand, the range and scale of operations performed by algorithms has massively increased, on the other, the theoretical discourse accompanying this technological transformation has been lagging behind. As a result, computational urban design now appears to be a rather theory-light field which struggles to conceptualise and instrumentalise the transformations afforded by ML models. This paper will address such theoretical gap by first foregrounding how the mechanics of ML algorithms can impact creativity.

The arguments proposed will concentrate on computation understood as both a more fundamental component of the digital and as a domain historically concerned with the organisation and representation of knowledge. In terms of the debate on the use of ML in design, this move will allow us to put less emphasis on the generation of images to focus on patterns, statistical distribution, and numbers. From the point of view of design discipline, to think of ML models as instruments for the re-organisation of knowledge implies that the urbanism of ML models will be more concerned with strategic rather than formal preoccupations.

The first part of the paper concentrates on the how ML models function, their 'materiality', so to speak, which will act as the basis to rethink design operations. The focus of the argumentation is not purely technical (how a particular problem is solved by ML algorithms), but rather conceptual, as it focuses on the relation between ML models and creative processes. The second part of the paper dwells on the figure of the paradigm as a conceptual instrument that helps us delineate some key relations and characteristics to rethink design in the age of machine learning. In fact, the main focus of this paper is neither to solely chart out the potential drawbacks of the introduction of ML models in design, nor to advocate for their use as purely functional, problem-solving technologies; rather, it is to explore how machine learning dislodges some received paradigms of digital design to provide a new conceptual space for creativity. The paper discusses a set of theoretical ideas to help frame the introduction of machine learning in design. As my research operates in the field of urban design, this will constitute the testing ground of the ideas and observations put forward in the paper.

Projections, not Processes

To understand the impact of ML models on design and bridge the theoretical gap highlighted above, the initial notion this paper will challenge is that of process in digital design. Contrary to previous computational generative techniques, machine learning inverts the traditional relation between process and output. Rooted in the aesthetic of cybernetics, process has been the central tenet of computational design, the locus in which intuitions and rigour reinforce each other through implementation. The cybernetic motto "all process, no finality" perhaps best captures this attitude to design which has been characterised by the alignment of creativity and learning. If by creativity we refer to an exploration into fundamentally unknown domains, process becomes the methodological instrument through which one learns to navigate such open waters. To counterbalance the uncertainty of the exploration, process must be rigorous, reliable, and 'objective'; particularly, this last characteristics highlights the designers' search for an instrument of self-alienation able to negotiate between objective knowledge and subjective control. As a result, all the outputs generated under such premises must necessarily be 'perfect', as they are all deduced from a process that the designer has imbued with rigour and intentionality. Projects such as *Embryological House* by Greg Lynn[1] are architectural examples of such an approach. The project experimented with new tools for manipulating curves made available by three-dimensional software of the time to generate a vast range of designs for a house, each unique and yet all deduced from the same set of rules. The origin of the design process was a geometrical primitive (a sphere) that was subjected to a very large range of deformations abiding to a series of constraints. At the time, Lynn's project was often criticised because the design did not clearly converge towards a single, optimal solution (the best version of the house). Unable to single out the best exemplar, an additional question arose. A problem that could be understood as sort of architectural version of the 'halting problem' in computation; that is, the impossibility to determine when the design process ended, and how many variations were possible or necessary. In retrospect, however, both issues were irrelevant. Process acted as a guarantor that each output was qualitatively equal to the next, no matter how many permutations of the house were possible (all process, no finality). Lynn was clearly aware of the design paradigm underpinning his *Embryological House* as he invariably addressed these comments by pointing out that no version was better than any other.

The emphasis on process as tenet of digital design was also mirrored in language by describing process through a list of actions and, consequently, verbs. The question of 'how' a house (or an object in general) was designed took precedent over other considerations such as those represented by the questions 'what' and 'why', which were sidelined or

1 See Howard Shubert, "Embryological House," *CCA: Canadian Centre for Architecture*, https://www.cca.qc.ca/en/articles/issues/4/origins-of-the-digital/5/embryological-house.

implicitly addressed through the rigour of process itself.

Process, however, is precisely what ML models take charge of. Designers control the input datasets and observe what the ML model outputs, whilst having little or no understanding about what happens in between.[2] This marks a fundamental shift in the way we understand creativity as the computational architecture underpinning the design process no longer consists on performing actions (e.g. copy an object, deform it, etc.) based on a piece of code written by designers. Rather, ML models first and foremost output codes: that is, how to do something, or, in short, processes. The so-called training of an ML model, in which the model inductively adapts to input data to retain recurrent statistical features, is not the final product of the computational process; rather, it is an intermediate step that delivers a piece of code (e.g. trained neural network) that is then ready for its use. In fact, the training and the application of a ML model are two distinct activities that can be performed by different people at different times. In other words, the training of a ML model and its applications are co-determined: the effectiveness of the model depends on the quality of the input data and training cycles. It is worth noting that this condition constitutes an absolute novelty in the history of instruments for design. No matter how much flexibility design instruments provided, they always operated within the bounds set by predetermined rules, and therefore, were never co-determined with their applications. A pantograph, for instance, could be adapted through the manipulation of levers and springs, but the range of operations it could perform were determined once and for all at the moment of its fabrication. ML models, on the other hand, perform differently based on the input data they are trained on, and have a generic architecture that is independent from the context they are applied to. It follows that training a ML model is a design activity in its own right, a part of the creative process. On a theoretical level, we observe that deductive models no longer can account for such conditioning, and less totalising approaches better describe the co-determinist qualities of the training of ML models. To think about how creativity changes in the age of machine learning means to problematise this transformation and furnish it with a theoretical framework that foregrounds what is at stake. I will return to a more detailed discussion on the theoretical implications of this transformation by discussing how the figure of the paradigm can help us frame the technical novelties introduced by machine learning.

The training process required prior to deploying ML models also asks us to reflect on what notion of time is at work in such creative environment. Linear models such as those presupposed by induction and deduction may no longer be sufficient to describe the recursive qualities of the training ML models. As Yuk Hui, among others, discuss, the notion of time in the classical sciences moved from the linear-reversible time of cause and

2 This is clearly a major issue that has spun entire areas of research such the ones investigating the ethics of ML models or the developments of tools to investigate and interpret the operations of ML models (i.e. Explainable AI).

effect of mechanical devices to the linear-irreversible one of thermodynamics.[3] Cybernetics represents a paradigm shift as time transforms from linear to circular through the idea of recursion and the introduction of feedbacks. The training of a ML model belongs to this latter conception of time as the parameters of the model recursively adapt after each new instance is input to train the model. The linear time underpins both deduction and induction as both are characterised by linear sequences organising the relation between events and knowledge moving from the particular to the universal (induction) or in the opposite direction (deduction). Neither, however, are appropriate to describe the co-determining, recursive adaptability of ML models exhibited during the training process, nor can they account for the process of establishing correlations which rest upon the logic of stochastic and statistical distribution. The strict causality of classical inferential models is here abandoned in favour of multiple, stochastic, open modes of correlating diverse datasets which call for a different theoretical framework to be articulated. We will identify in the paradigm such a framework, especially for its particular-to-particular logic which escapes both linearity and universalisation.

To design with ML models is therefore not an issue of processes, but rather one of projections. The task is to move from the structural paradigm of processes without finalities of digital design under the auspices of cybernetics, to the environmental notion of projections in which the designer plays the role of both curator and receiver of the algorithmic operations of ML models. We can speak of projections first and foremost in technical terms: ML algorithms literally project data onto each other, be it through image-to-image, text-to-image, k-means or SOM algorithms. As we shall see, the operations of ML models involve a superimposition, an hybridisation of different data fields governed by statistics. The technical element that enables and guides the operations of data projection is the vector: a sort of mathematical Esperanto to which any phenomenon is reduced ensuring that the most disparate spatial data can be superimposed.[4] The combination of these technical features all point towards a relational approach to designing with machine learning: one characterised by the articulation of the relations and correlations between datasets made comparable by their vectorisation.

The vectorisation of different datasets also allows ML algorithms to cluster data by similarity according to new categories. For instance, the k-means algorithm will regroup input data to minimise variance within each cluster and, in so doing, will return a new representation of the input data that will differ from our perception because of the algorithmic process employed. If the input data is highly varied, as in the case of urbanism in which social, morphological, ecological, etc. factors can be vectorised, the algorithmic

3 Yuk Hui, "ChatGPT, or the Eschatology of Machines," *E-Flux* 137 (2023) https://www.e-flux.com/journal/137/544816/chatgpt-or-the-eschatology-of-machines/

4 For a critical framing of the importance of vectors in machine learning, see MacKenzie Wark, "Vector," in *A Hacker Manifesto* (Cambridge, MA; London: Harvard University Press, 2017).

process will provide a new clustering that can be interpreted as the projection of the different datasets onto each other. Moreover, as in the case of self-organising maps (SOM) algorithms, the new representation can also maintain the topological structure of the data; that is, a connection between input data and new representations. From the point of view of urbanism, these operation have profound significance. First, they expand the purview of designers both in terms of input data. For instance, datasets understood not to pertain to urbanism can actually be considered and speculated on: dietary habits, lifestyle choices, or environmental factors are some examples of such expansion which can be included elements, widening the scale or temporality of the factors considered by urbanists. Additionally, the algorithmic process returns novel representations that map out the strengths of the correlations between the diverse datasets; these can impact the scale, program, and distribution of intervention. Though we will return to this point in the final section of the paper, it is already noticeable that the implementation of ML models in urbanism can primarily address strategic rather than formal issues: the combination of diverse data will not return a new formal arrangement but rather a new portrait of the city from which to design. On the one hand, the use of ML models in design acquires qualities that are not solely visual and related to the endless proliferation of new images. On the other, it questions more fundamentally how and what kind of knowledge informs the creative process in urbanism and raises issues that concern the theory of urbanism, but just its practice.

In general terms, such operations of data projections allow designers to statistically extract the impact of certain data layers onto others; that is, the impact of a certain urban quality or behaviour (e.g. pollution, lifestyle choices, cognitive factors, morphological qualities, etc.) onto others. For instance, they can map the variation or the homogeneity with which a stack of data layers correlate: how a certain lifestyle correlates with a perceptual feature or socio-economic indicator. In some ways, we can say that for some of the algorithmic methods we listed, urban designers can have insights on the "-ness" of cities (in terms of connectedness, cognition, or perception). ML models in urbanism move the focus of the exploration away from 'how' something is conceived or implemented (this is the part that ML models take care of and provide some rationale for) to focus on 'what' and 'why'. Both lines of inquiry have much broader implications that cannot be exhausted by engineering or functional approaches as they touch on the theoretical, social, and political dimensions of design. To broaden the range of concerns also means to think more laterally to privilege data representing the experiential and perceptual, that is, qualitative aspects of urbanism. The centrality of actions and verbs is thus replaced by that of environmental qualities—the "-ness" of cities we mentioned above—which, in linguistic terms, are represented by adjectives and adverbs. The structural paradigm of cybernetics that focuses on process is substituted by the 'sensorial' one of ML models with ramifications, charging urbanism with possibilities that have been abundantly explored by artistic practices. What is at stake is to think of ML models as a series of techniques to 'listen' to the city through

algorithmic operations, to move between its many registers, and broaden the field of urban design with inputs, concerns, and actors that go beyond the traditional anthropocentric focus of the discipline.

The implications of these algorithmic operations cannot, however, be accounted by technical literature. ML models are not 'passive' tools, conduits to implement humans' thoughts, but are instruments of thought that have active agency on the outcomes they generate. As previous conceptual models for design and creativity no longer fit technologies such as ML models, the quest for different figures to conceptualise this condition emerges. The figure of the paradigm provides a useful framework to think about the introduction of ML models in creative processes in urbanism. Similar to data projections, paradigms provide a more agile way of thinking that no longer relies on linear operations of deduction or induction but establishes relational connections between different elements.

On Paradigms

The figure of paradigm is a key conceptual instrument to conceptualise the technical operations of data projection by ML models and explore them through design.

Though the contemporary debate on paradigms is fundamentally linked to Thomas Kuhn's seminal book,[5] a more fruitful and fitting elaboration is provided by Giorgio Agamben's essay "What is a Paradigm?"[6] Agamben develops the notion of paradigms beyond their role in guiding scientific revolutions to think of them as methodological instruments. His foray starts from the two main definitions of paradigm provided by Kuhn himself.[7] The first aims at identifying a scientific community which adheres to a shared (paradigmatic) set of models, techniques, and practices. The second one, more fitting for this discussion, conceives the paradigm as a single element within a set. What elevates such a singular element to the status of a paradigm is its ability to act as a common example for all the elements in the set. The paradigm both gives rises to and makes intelligible—at least in some of their qualities—all the members of the set generated. Kuhn calls such a set "normal science."[8] Paradigms differ from inductive or deductive generalisations as they are figures which articulate a particular field without fixing explicit rules or identities. Kuhn

5 Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago, IL: University of Chicago Press, 1970).

6 Giorgio Agamben, "What is a Paradigm?," in *The Signature of All Things: On Method*, trans Luca D'Isanto and Kevin Attell (New York: Zone Books, 2009).

7 Kuhn, 182.

8 Kuhn, 10.

in fact famously defined them as able to "guide research even in the absence of rules."[9] The agility of paradigms can extend forward in time as it can also play "an essential role in preparing the way for perception of novelty."[10] Agamben cites Foucault's discussion on the panopticon as an example of how paradigms work. Bentham's model for a prison referred to an actual example (not an abstraction) that Foucault singled out in order to both foreground a whole series of practices embedded in institutions (forming a set) and relate them to one another (making them intelligible and, more broadly, to foreground different disciplinary regimes).[11] We can draw an a analogy between the example of the panopticon and the operations of data projection performed by ML models. In the latter, a specific dataset is projected (correlated) onto one or more other datasets. The projecting dataset acts as a paradigm in regards to the projected ones: the different distribution of correlations emerging determines both what relations between data there might be (formation of sets) and the nature of their relation (intelligibility). However, because all such algorithmic operations are performed by translating all datasets into vectors, the range and scale of operations possible is vast and extends to include both physical and immaterial elements. In this sense the example of the panopticon might be limiting as it solely focus on physical, existing elements. As we shall see in Agamben's discussion, to think ML models through paradigms allow designers to significantly broaden the range of operations possible and, consequently, the remits of creativity.

Such expansion includes the ability to perform projections between massive datasets, but also, and perhaps more interestingly for this discussion, between different media. The recent emergence of multi-modal models,[12] which can extract features from a variety of sources, are particularly important for urbanism as they allow designers to link different aspects of space and experience: from the behavioural, to the morphological, but also the acoustic, visual, etc. These operations allow designers to question both processes and objects to give rise to new categories and new correlations between objects, events, or behaviours.

The Logic of Paradigms

In epistemological terms, we can draw a parallel between how paradigms move beyond the linear generalisations of traditional logical operations of induction and deduction and how ML models operate on and impact design. Deduction moves from the universal to the particular in a linear fashion, providing an overarching structure that is simply too rigid to account for the statistical operations of data projections. The deductive

9 Kuhn, 42.
10 Kuhn, 57.
11 Agamben, 16–18.
12 Scott Reed et al., "A Generalist Agent," *Google DeepMind,* May 12, 2022. https://deepmind.google/discover/blog/a-generalist-agent/.

model computationally aligns with a rule-based approach in which (pre)determined operations oversee the generation and ensure the consistency of all the outputs. This is the approach utilised, for instance, in Chomsky's linguistics, or in shape grammar in design.[13] Induction moves in the opposite direction, from the particular to the universal, and is a far more relevant category to describe how ML models are trained.[14] However, here we are focusing on the application of ML models to design operations; that is, what happens after the a model has been inductively trained. Both deductive and inductive logics aspire to generalised knowledge and, consequently, must provide a single method stringing together the particular and the universal.

The conditions set up by paradigms differ from the ones described as they do not require a predetermined set of procedural rules to function. As for Foucault's panopticon, one particular data instance can be projected onto a whole set of other data objects in ways that no longer require hierarchical distinctions between particulars and universals. In fact, under the figure of the paradigm, the whole notion of the universal becomes untenable; what the paradigm relates are always particulars, albeit in varying distributions. Similarly, ML models allows designers to elevate a particular data object to the positions of a paradigm and project it onto other datasets. The data projections performed by the ML model return a map of the statistical distribution of correlations of how a particular dataset maps onto different ones. In other words, the model produces a map of statistical relationships that provide the basis for further interpretations and speculations.

In urbanism, a variety of computational techniques can support the use of data as paradigms. In regards to the notion of particulars, geo-referenced datasets provide a representation of a given area with unprecedented resolution and granularity: data points can be remapped from ten to one meters intervals. Such datasets can be compared to other ones without compression to seek for correlations. Such correlations can impact the strategic qualities of the interventions proposed in terms of location, scale, and program. For instance, the group *Sensory Balance*[15] compared about twenty datasets of spatial features of areas of London to discover a drastic divide between day and night life in different parts of the capital, including affluent ones. To avoid spurious correlations, the group tested this initial observation to eventually use them to conceive an urban project around night life. It is important to point out that, contrary to previous mapping techniques, there is no trading between scale and resolution in data projections: the size of the area considered can be enlarged without a resolution loss. More sophisticated machine learning algorithms such

13 See George Stiny and James Gips, "Shape Grammars and The Generative Specification of Painting and Sculpture," *Information Processing* 71 (1972).

14 See Anna Longo, *Jeu de l'induction: Automatisation de la connaissance et réflexion philosophique*, (S. San Giovanni: Edition Mimesis, 2022), 159–186.

15 Liu Jie, Ping Yang, Wu Hu, and Wang Huiye, *Sensory Balance*, B-Pro research Cluster 14, Bartlett School of Architecture, University College London (UCL), 2024.

as General Adversarial Networks (GANs) can also be hacked for similar purposes. Instead of the using conditional GAN models (pix2pix) for image imitation, the input layers of the model can be hacked to represent different and yet thematically connected aspects of an area. The model can then be trained to project data distributions of different aspects. *Equiticity*[16] uses this technique to re-design a part of central London around issues of mental health and spatial cognition. The conditional GAN model is trained on data on mental health either related personal experiences or physical spatial attributes. These input layers are then used to speculate different spatial and programmatic arrangements distributions. In other words, the input data act as paradigms that orchestrate different spatial qualities such as colour distribution, distribution of open spaces, etc., thus moving between formal, perceptual, and programmatic aspects of design. The effect is that of expanding the range of urban aspects to consider when designing. The expansion we refer to is however not one marked by the slightly authoritarian claim that urbanism is the sole discipline that can accurately and appropriately deal with any aspect of urban life. To the contrary, to expand the purview of urbanism beyond its traditional concerns should be seen as way to open up dialogue with aspects of cities which are important and yet neglected as well as to think of design as a platform for exchange.

Finally, the logic of paradigms resonates with that of the operations of data projection we detected in ML models. Analogous to paradigms, the operation of data projections escape the generalisations of deduction and induction, and, consequently, their claims of objectivity as what returned depends on many arbitrary factors such as the type of data compared, the type of projection, etc. However, far from being a limitation, the designed (arbitrary), open, and incomplete nature of data projections is conducive to a new type of urbanism that can move between the immaterial and physical, objects and events, and the personal and collective.

The Paradigm as Relations

Agamben's search for a different epistemological figure takes him to the paradigm, a move resonating with our quest for a conceptual framework to think creative operations with ML models. Particularly, the open, 'localised' (opposed to the universal generalisations of classical models of logical inference), character of paradigms better describes the generative operations of ML models and helps conceptualise them. To further qualify the 'localised' nature of paradigms, Agamben quotes Aristotle's passage in which the paradigm is described as a "part with respect to the part, if both are under the same but one is better known than the other."[17] Against the strict structure of formal logic, the paradigm proposes the figure of the analogy. Rather than establishing prior knowledge as rules and

16 Tejaswini Deshmukh, Shriyansh Jain, and Aalok Joshi, *Equiticity*, B-Pro research Cluster 14, Bartlett School of Architecture, University College London (UCL), 2023.

17 Aristotle, *Prior Analytics*, 69a13-15, quoted in Agamben, 19.

first principles, such as in the case of deductive logic, the analogy implies that paradigms utilise prior knowledge as a stepping stone that will eventually furnish conclusions based on either empirical or hypothetical knowledge that can be reasoned about. In other words, the paradigm, as for many aspects of the design process, is an instrument for speculation, for probing possibilities (what ML models allow through the projection of different data layers represented as vectors) even if such connections only have an intelligible rather than sensible quality. One consequence of this condition is the closer alignment between conceptual and practical approaches to design, which will be the object of the next paragraph. Here, it is worth highlighting the possibility that moving between empirical and hypothetical aspects of cities widens the remits of design by giving voice to a greater variety of actors. By exploiting the combined technical possibilities (data projections) and thinking of them as speculative paradigms to speculate new scenarios, the design process can both start from and include conditions and phenomena that traditionally have not been deemed to pertain to urban design. To a certain extent, this is what we can already experience in multi-modal ML models such as text-to-image ones, in which a prompt in a certain medium (text) is projected onto a different one (image). For urbanism, the area of research which concerns us, the examples are multiple and rapidly evolving: the possibility to rethink notions of identity, the role of non-human actors, and the relation between the individual and the collective are all amenable to design manipulations.

Element-Form (Theory and Practice)

In his essay, Agamben focuses on Victor Goldschmidt's reading of Plato's definition of paradigm. In the *Statesman*, Plato writes that "A paradigm is generated when an entity, which is found in something other and separated in another entity, is judged correctly and recognised as the same, having been reconnected together generates a true and unique opinion concerning each and both."[18] The ability to detect communalities and relations between diverse datasets is what ML models allow designers to perform and what paradigms offer to their conceptualisation in the creative process. However, Goldschmidt adds to this discussion the notion of the "element-form"[19] which incorporates both a sensible (the objects identified) and a mental component (relationship). In fact, "the paradigmatic element is the relationship,"[20] that is, the mental ability to detect and connect the presence of the entity in separate objects. This observation resonates with the possibilities enabled by vectorisation to use ML models to straddle between empirical, immaterial, and speculative domains to question previous hierarchies informing the design of urban spaces.

18 Plato, *Statesman*, 278c, quoted in Agamben, 23.

19 Victor Goldschmidt, *Le paradigme dans la dialectique platonicienne*, (Paris: Vrin, 1985), 53, quoted in Agamben, 25.

20 Goldschmidt, 77.

It follows that the relation implied by the paradigm cannot be already given; rather, it is the result of an intentional, arbitrary decision, it is produced and generated "by 'placing aside', conjoining together', and above all, by 'showing' and 'exposing'."[21] In short, the paradigm results from an act of design. The fact that establishing a relation between datasets is an action performed by an algorithm does not suspend intentionality; rather, it makes possible to complete correlations at a scale, complexity, precision, and range previously impossible. Nevertheless, the designer constantly partakes in the process: by selecting the paradigmatic data layer(s), studying the outcomes and iterating the process to alter it. In other words, the introduction of algorithmic processes linking data changes the way in which such intentionality is expressed and implemented, but does not suppress it. Establishing relations between datasets therefore takes a variety of registers contemplating playfulness and speculation as different options can be played out and tested. Such approach overturns the common critique that accuses ML models to lack objectivity and attempts to correct it in order to make them more efficient and neutral with respect to their aims. Granted that objectivity is an historical category subjected to varying factors,[22] through the paradigm, we can reverse this perspective and accept a basic and fundamentally unavoidable condition of ML models: that is, they have biases resulting from the data used in training, etc. Through the paradigm we have a conceptual instrument to both expose the artificiality and arbitrariness of the training of ML models and to declare the intentions animating the design process. Within this account of ML models, to design is more akin to guiding such models tasking them with precise and explicit aims or agendas.

An Expanded Urbanism

What kind of implications do the technical and conceptual shift prompted by the introduction of machine learning models have on design, and urbanism in particular? The first aspect to address is the position of the designer vis-à-vis the creative process as the introduction of ML models re-patterns our understanding of the city through a series of computational operations that vastly exceed that of humans in terms of scale, speed, and logic. ML models elevate the algorithmic apparatus to an instrument of thought whose mode of reasoning differs from that of humans due to the use of stochastic and statistical methods. No longer relying on human knowledge to be formalised into computer scripts, ML models inductively extract statistical patterns from input data to predict outputs. The cybernetic aesthetic in which the "machine demands that functions are supplied with cognitive and creative solutions in order to acquire a *knowing-how*, a practical mode of thinking driven by learning"[23] no longer holds. As the role of the designer shifts from supplying "cognitive and creative solutions" to curating input datasets and evaluating

21 Agamben, 23.

22 See Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone Books, 2007).

23 Luciana Parisi, "The Alien Subject of AI," *Subjectivity* 12, no. 1 (2019): 29.

outputs, the centrality of processes is eroded in favour of automated reasoning governed through neural networks which alters the traditional definition of creativity. As a result, the figure of the designer aligns itself more with that of the curator able to orchestrate, correlate, and organise work that s/he is not the author of. To think of these operations through the figure of the paradigm provides a conceptual framework that matches the technical logic of machine learning without mimicking it. The kind of urbanism that results abandons the procedural tour-de-force of cybernetics to reinvent itself as a 'lighter' practice, able to operate strategically rather than solely through form and that is able to engage different, more diverse aspects of urban life through data (beyond the ones urbanists are traditionally concerned with).

The introduction of ML models in urbanism expands the purview of designers by offering an instrument that allows for curatorial, qualitative use of data in creative processes. The analogy here is with the consumption of music through digital platforms. The use of internet services to access music has only ostensibly made listeners more passive in their reception. However, as Ben Ratliff shows, listening to music through a digital platform can be charged with critical and even creative qualities that have the potential of emboldening the listener.[24] Ratliff lists twenty different strategies that can be overlaid onto the vast dataset in order for new readings and experiences to emerge. Besides once again emphasising strategic thinking over formal resolution, we can speculate an analogy between the creative listening engendered by digital music platforms and the feedback algorithm governing backpropagation in ML models. As we have seen, ML models such as GAN or k-means allow designers to project datasets onto each other and, in so doing, chart out the "-ness" of cities through data. In other words, ML models open up a conceptual space that can be occupied by other preoccupations, similar to the ones identified by Ben Ratliff. More precisely, Ratliff's twenty different strategies, once superimposed onto the vast archive of recordings available online, reveal a new representation of the database and emancipate the position of the listener. Speed, density, discrepancy, etc. are some of the paradigmatic qualities—the "-ness" we spoke of—Ratliff projects into the large database of songs to elicit new readings of it. In both Ratliff's work and the data projections performed by ML models, the trajectory of the creative process is inverted: users 'backpropagate' their agency (through listening or data projections) and, in so doing, turn what is traditionally understood as the end point of process (the consumption of music through listening or the evaluation of the outcome of a computational process) into the starting point for different connections and readings to foreground. Such operations engender an expansion of the set of concerns underpinning urban design.

The re-categorisation of datasets occurs in the so-called latent space. In general terms, the

24 See Ben Ratliff, *Every Song Ever: Twenty Ways to Listen to Music Now* (London: Particular Books, 2016).

latent space provides a compressed representation of the input datasets in which similar input data (according to the architecture of the neural network employed) are positioned in close proximity. Such technical operations open up the possibility to think of urbanism as an art of connections. This conceptual shift allows urbanism to rethink its process, aims, and roles through the possibilities endowed by machine learning. Urban design can engage the city in a way that is closer to the actual experience of the space; that is, not structured by hierarchical, pre-determined and fixed categories, but rather emerging from elements and experiences that are heterogeneous in terms of their conception (arbitrary or aleatory), duration (instantaneous or permanent), and kind (objectual, behavioural, atmospheric). In this sense, the design instruments are "…not a means to an end, but an experimental method or a *knowing-how* tending towards the determination of this or that result."[25]

How can designers leverage these conceptual spaces? What spaces for design speculations do machine learning methods introduce? These questions redefine the posture designers can assume in approaching urban issues. Manoeuvring between different aspects of the city, responding to automated correlations, be able to re-describe phenomena through the lenses of paradigms all presuppose a positions of humbleness in regards to the urban condition based on the acknowledgement that cities are complex constructs that escape both singular narratives and all-encompassing design methods. The position of the designer must be more inquisitive and speculative, informed by a clear agenda, and be able to detect and exploit the outputs generated by ML models. Such agency can also include non-human actors, expand the voices participating in the design, as well as engage the experiential and environmental qualities of urbanism without immediately or solely relying on physical objects such as buildings.

The introduction of machine learning methods in urban design is therefore less about the automation of thought or the symbolic representation of empirical urban facts, and more about rethinking the agenda for urbanism. Though increases in computational power are a necessary condition for this transformation, what offers the most interesting and radical perspectives for design is the possibility to articulate a different creative process. Rather than a search for rules guiding the design process through deduction, data projections operate as "…the result of experimental reasoning, starting from hypothetical account of unknowns and proceeding with the search for low-level patterning."[26]

Examples of such a shift from process to projection can be seen in two projects among the many that have been developed within the MArch in Urban Design at The Bartlett School of Architecture at UCL. *Accent Diffusion*[27] (Fig.1) utilises ML models to address issues of

25 Parisi, 43.

26 Parisi, 44.

27 Yiwen Qian, Xuming Cai, Yiheng Xu, and Muskaan Mardia, *Accent Diffusion*, B-Pro Research

identity in urban design. ML models are used to project sound onto data about building morphologies. More precisely, the model detects the subtle differences between sound recordings of a given set of sentences pronounced in the many accents present in London and projects them onto a vast database of formal configurations. The sound-to-form projection not only generates a vast repertoire of elements to compose with, but also each element is a hybrid of different parts of the dataset that, as an analogy, echoes the richness, complexity and entanglements of different cultures in London. Identities do not emerge from hardening differences, but rather by re-assembling them into novel combinations. Not only does the ML model provide a method to engage domains that are customarily outside the purview of urban design (e.g. verbal expressions and accents, which in this project represent the "-ness" of data investigated), but it also allows designers to operate across different media all contributing to the urban experience (in this case, from sound to geometry). *Mood-ulated Subtopia*[28] (Fig.2), on the other hand, utilises ML models to design the urban experience from the point of view of the individual, and their cognitive spatial perception. The project imagined an urbanism of ray casting, the computer graphic techniques which generates rendering of digital scene by projecting a light beam in space. The resulting design proposes a soft urbanism built around ephemeral, qualitative aspects of space that capitalised on the possibilities of machine learning.

Fig. 1 – Catalogue of design elements output by the sound-to-form ML model. Yiwen Qian, Xuming Cai, Yiheng Xu, and Muskaan Mardia, *Accent Diffusion,* B-Pro Research Cluster 14, Bartlett School of Architecture, University College London (UCL), 2023.

Cluster 14, Bartlett School of Architecture, University College London (UCL), 2023.

28 Jiwen Bian, Rajita Jain, Trishla Chadha, and Zhaoyi Wang, *Mood-ulated Suptopia*. B-Pro Research Cluster 14, Bartlett School of Architecture, University College London (UCL), 2022.

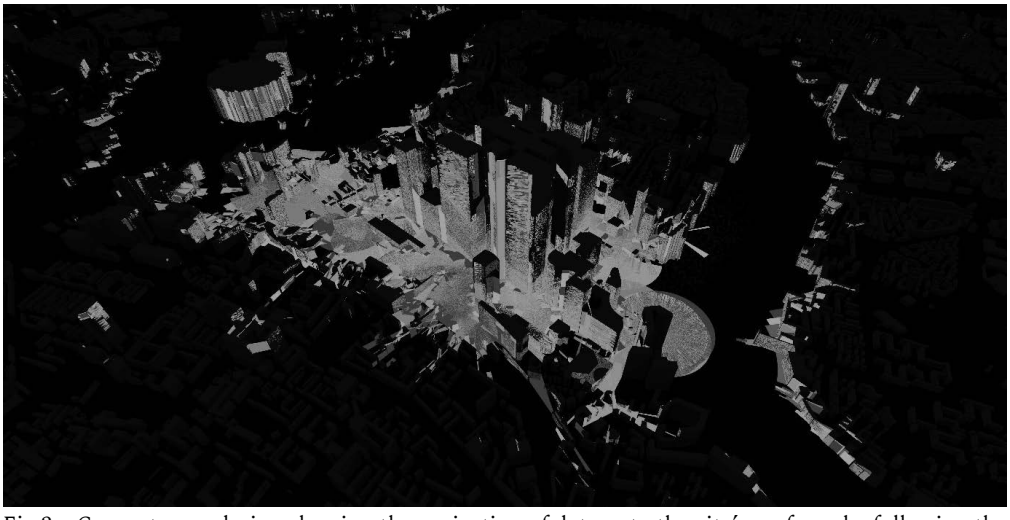


Fig.2 – Computer rendering showing the projection of data onto the city's surfaces by following the Ray Casting method. Jiwen Bian, Rajita Jain, Trishla Chadha, and Zhaoyi Wang, *Mood-ulated Suptopia*, B-Pro Research Cluster 14, Bartlett School of Architecture, University College London (UCL), 2022.

The introduction of ML models in creative disciplines such as urban design represents more than a mere technological or functional improvement of the current status quo. A closer inspection of the mechanics of ML models not only reveals the centrality of the training process, but it also inverts the relation between process and output that has characterised creativity in digital design. This new condition cannot be exhausted through technical analysis alone, as it gives rise to profound questions regarding the methods and aims of design. The possibility to project diverse datasets onto each other both moves the position of the designer towards that of a data curator and expands the range of qualitative aspects for urban environments to engage. To think this condition through paradigms not only means to furnish it with theoretical instruments, but also offers an opening towards a type of creative process less preoccupied with structural or procedural issues and more receptive to environmental, qualitative, and sensorial aspects of design. This is a territory for imagination that urban designers should inhabit and develop a sensibility for. Such transformations necessarily imply strengthening the ability to listen to different actors in the city: the many voices that can populate the design process and that will include algorithmic processes such as machine learning.

Bibliography

Agamben, Giorgio. "What is a Paradigm?" In *The Signature of All Things: On Method*. Translated by Luca D'Isanto with Kevin Attell, 9–32. New York: Zone Books, 2009.

Bian, Jiwen, Rajita Jain, Trishla Chadha, and Zhaoyi Wang. *Mood-ulated Suptopia*. B-Pro Research Cluster 14, Bartlett School of Architecture, University College London (UCL). 2022.

Daston, Lorraine and Peter Galison. *Objectivity*. New York: Zone Books, 2007.

Deshmukh, Tejaswini, Shriyansh Jain, and Aalok Joshi. *Equiticity*. B-Pro Research Cluster 14, Bartlett School of Architecture, University College London (UCL). 2023.

Goldschmidt, Victor. *Le paradigme dans la dialectique platonicienne.* Paris: Vrin, 1985.

Hui, Yuk. "ChatGPT, or the Eschatology of Machines." *E-Flux* 137 (2023). https://www.e-flux.com/journal/137/544816/chatgpt-or-the-eschatology-of-machines/

Jie, Liu, Ping Yang, Wu Hu, and Wang Huiye. *Sensory Balance*. B-Pro Research Cluster 14, Bartlett School of Architecture, University College London (UCL). 2024.

Kuhn, Thomas. *The Structure of Scientific Revolutions*. Chicago, IL: University of Chicago Press, 1970.

Longo, Anna. *Jeu de l'induction : Automatisation de la connaissance et réflexion philosophique*. S. San Giovanni: Edition Mimésis, 2022.

Parisi, Luciana. "The Alien Subject of AI." *Subjectivity* 12, no. 1 (2019): 27–48.

Qian, Yiwen, Xuming Cai, Yiheng Xu, and Muskaan Mardia. *Accent Diffusion*. B-Pro Research Cluster 14, Bartlett School of Architecture, University College London (UCL). 2023.

Ratliff, Ben. *Every Song Ever: Twenty Ways to Listen to Music Now*. London: Penguin Books, 2016.

Reed, Scott et al. "A Generalist Agent." *Google DeepMind*. May 12, 2022. https://deepmind.google/discover/blog/a-generalist-agent/

Shubert, Howard. "Embryological House." *CCA: Canadian Centre for Architecture*, https://www.cca.qc.ca/en/articles/issues/4/origins-of-the-digital/5/embryological-house

Stiny, George and James Gips. "Shape Grammars and the Generative Specification of Painting and Sculpture." *Information Processing* 71 (1972): 1460–1465.

Wark, MacKenzie. "Vector." In *A Hacker Manifesto*, 313–345. Cambridge, MA; London: Harvard University Press, 2004.

TECHNOPHANY
A Journal for Philosophy and Technology

Technophany Vol.3 No.2

Nonknowledge in Computation. Reflecting on Irrevocable Uncertainty

Betti Marenko

Abstract

My article approaches the theme of computational creativity by looking at uncertainty as an epistemic and aesthetic tool that must be examined to address the challenges brought to critical practice by planetary computation. It positions uncertainty as central to how the encounter of the human practitioner with non-human machines is conceptualized, and as a resource for building speculative-pragmatic paths of resistance against algorithmic capture. It proposes ways to cultivate uncertainty and use it as a design material to produce new types of knowledge that question machines' pre-emptying manoeuvres and resist their capture of potential. The argument proposed is that uncertainty affords the production of new imaginaries of the human-machine encounter that can resist the foreclosure of futures (what will be) and are sustained instead by the uncertainty of potential (what might be) (Munster). Dwelling in a space of potential – Deleuze's virtual, or what I call a space of 'maybes', requires of the practitioner a repositioning of their epistemic perspective and reflecting on the following questions: how can material knowledge be made by engaging with modes of un-knowing and not-knowing in machine interaction? How can these modes of un-knowing and not-knowing be fostered as a critical and political onto-epistemological project of reinventing critical practice for the algorithmic age? (Horl, Hansen, Pasquinelli and Joler). The article argues that the machinic unknown should be engaged with - not through the conventional paradigm that pitches human vs machine creativity and attempts to rank and score them through similarities, but rather through a (paradoxical) deepening of the unknowability at the core of the machine (Parisi) and machine's own incommensurability (Fazi 2020). It then proposes the Chinese notion of wu wei (active non action) (Jullien, Allen) as a stratagem to experiment with as a means to craft speculative-pragmatic interventions, and to augment the 'power of maybes' as a space of anti-production, and resisting reduction (Ito 2019).

Keywords: uncertainty, nonknowledge, incomputable, planetary, wu wei.

 Corresponding author: Betti Marenko, b.marenko@csm.arts.ac.uk

ISSN 2773-0875

Introduction

My contribution to this special issue on Computational Creativity stems from the distinct perspective of someone who works across process philosophies, critical technology studies, and design theory, and is invested in building transdisciplinary and transversal modes of thinking. By bringing to bear, and by reflecting on, what may emerge at the intersection of these fields, my intervention seeks to contribute to the current discussions around the encounter of human and machine by suggesting that this encounter can be re-envisioned through the lens of *uncertainty*.

The article poses uncertainty as an onto-epistemic and aesthetic tool central to how the challenges brought to critical practice by planetary computation should be addressed, specifically to how the encounter of the human practitioner with the non-humanity of machines can be conceptualized. To do so the article uses the notion of the *incomputable* at the core of computation as its starting point and makes a case for the need to work with and through the uncertainty it contains. Put differently, what I am interested in is the generative power of the incomputable within computation from the perspective of the *uncertainty* unleashed by its *unknowability*. My thoughts concern how to reposition this uncertainty and this machinic unknowability as modes of knowledge-making that can resist predictive capture.

The article argues that the 'machinic unknown' should be engaged with, not through the conventional paradigm that pitches human creativity against machine creativity and attempts to rank and score them through similarities, but rather through a (perhaps paradoxical) deepening of the unknowability and uncertainty at the core of the machine. Put differently, I propose that uncertainty is cultivated and deployed as a design material to produce new types of knowledge that question machines' pre-emptive manoeuvres and resists their capture of potential. Contesting the still pervasive view that equates the machinic unknown with a hidden, occult, magic power, I argue instead that this ought to be framed both as a condition of a knowledge born of nonknowledge, as well as potential for retooling and resistance.

To begin to think otherwise as to how this uncertain and unknown space may be understood, felt and perceived I draw on a range of ideas also outside the field of computation. Ideas concerning knowledge and nonknowledge from Chinese and 'non-Occidentalist' thought are introduced to help frame uncertainty as the springboard for modes of thinking that are unafraid of entering the unknown and of making the unknown fundamental to practices of knowledge-making in computation and beyond.

Above I use the term 'paradoxical' to acknowledge the challenge of a position—the exhortation to stay with the uncertain, and to dwell in it—that is bound to raise more

questions than answers. My insistence on uncertainty must be seen as an effort to 'complicate' (more than explain) things. As Deleuze reminds us, 'complication'—containing the root of the Greek word *plekein* [pli, fold]—denotes the chaotic-ness of the virtual, the movement from the virtual to the actual and vice versa. It evokes the intense, unforeseen force of chaos. It should be seen in the present context as a plea to further complicate the terms of the discussion. Indeed, I would argue that for a critique of planetary computation to succeed in generating alternative modes of thinking, such a critique must push against existent discourses around what counts as human and as machine intelligence. It must dare to expand the space of the thinkable into the unthinkable, where thought reaches the limits of what it can think and then goes further, right off the cliff, into the wind, where it encounters the shocking force of the unforeseen, the unknown, and the uncertain. It is this uncertainty, I propose, that has the potential to become propeller and ally, challenge and critical resource for building speculative-pragmatic paths of resistance against algorithmic capture. Uncertainty is what affords the production of new imaginaries of the human-machine encounter that can resist the foreclosure of futures (what will be) and are sustained instead by the uncertainty of potential (what might be). Dwelling in the space of potential—what I call a space of *'maybes'*—requires of the practitioner a repositioning of their epistemic perspective and a reflection on the following questions: How can material knowledge be made by engaging with modes of un-knowing and not-knowing in machine interaction? How can these modes of un-knowing and not-knowing be fostered as a critical and political onto-epistemological project of reinventing critical practice for the algorithmic age?

Planetary Computation: A call for Category Upheaval (and Complication)

Planetary computation is not only "the most radical process of artificialization of intelligence that human history has ever seen,"[1] but also a condition of no-return, signifying both the non-containability of the polycrisis the world is facing, and the urgency of breaking with entrenched human-centred modes of thinking that appear to be no longer adequate. It is the planetary that demands an onto-epistemic rethinking able to question fundamental categories of Western thought while affording the invention of new concepts and modes of thinking and existing.[2] The ecosystem we humans inhabit and share with a multitude of other forms of organic and inorganic life has never been so brutally (and yet so beautifully in its undisclosed, unrealized potential) exposed as planetary until now. On

1 Luciana Parisi, "Instrumental Reason, Algorithmic Capitalism, and the Incomputable," in *Alleys of Your Mind: Augmented Intelligence and Its Traumas*, ed. Matteo Pasquinelli (Luneburg: Meson Press, 2015), 130.

2 Some of those concepts may be 'new' to the current system of extractive violence we inhabit, but 'old' and existing already in modes of thinking, cultural practices and conceptual paradigms found other systems of thought.

one hand, we are facing agents that are truly planetary as they do not care about political borders, nation-states, or walls—whether microbes, viruses, atmospheric pollution, ocean plastic, or algorithmic data streaming through digital infrastructures. On the other, as the Earth is growing both by design and by accident, an unparalleled "smart exoskeleton of sensors, satellites, cables and data centers—a distributed sensory organ and cognitive layer,"[3] established ideas around what counts as knowledge, what counts as cognition, and what counts as human, have become outdated.

Categories must be rethought, urgently. Categories that have been in use for a long time—human, machine, natural, artificial, synthetic, organic, inorganic—appear to be inadequate for a seriously critical and creative project of re-thinking the encounter of human and machine. We still live by the modern concept of the human that emerged in a specific place (Europe) in a specific time (Enlightenment), a notion that pitted the 'human' equally against nature (as superior to it), and against machines (as other than them).[4] Still ensnared by a notion of intelligence based on the human brain and the human nervous system, our anthropocentric and zoocentric narcissism feeds an exceptionalism whose consequences are deadly for all that exists. But as Catherine Malabou lucidly shows, intelligence is a value-laden notion, which has historically operated as a racialized dividing practice to differentiate between peoples and reaffirm the superiority of some groups over others.[5]

While the theoretical void left by the inadequacy of these categories is colonized by the agendas of what Tiziana Terranova calls the Corporate Platform Complex (CPC)—the privately owned "worldwide infrastructure that has brought together technologies of communication and computation, connection and calculation in unprecedented ways"[6]—a reterritorialization is also underway. Reactionary forces drive a re-entrenchment of universals (the Human, the Technology, the Progress, the Future, etc.) precisely when their terminal fragility, obsoleteness, and inadequacy are at their historical peak. At the same time, the void left by these no longer-adequate categories is filled by the Corporate Platform Complex and its pervasive modes of engagement that are designed to be extractive (as they extract value from human attention, labour, sleep-time, eyeballs, life itself), predatory (as they are driven by stakeholder capitalism's imperative to profit growth) and pathogenic (as their by-product is endemic malaise). With the stimulus/reward mechanism in full operation monetizing every aspect of our lived experience, the

3 Benjamin Bratton, "Planetary Design," in Achille Mbembe, Benjamin Bratton and Anne-Marie Slaughter, "Noema Insights: Explorations Of The Planetary" *Noema Magazine*, no. 3 (Fall 2022), 62.

4 Tobias Rees, "Non-Human Words: On GPT-3 as a Philosophical Laboratory," *Daedalus, The Journal of the American Academy of Arts and Sciences* 151, no. 2 (2022): 169–170.

5 Catherine Malabou, *Morphing Intelligence: From IQ Measurement to Artificial Brains* (New York: Columbia University Press, 2019), 24–26.

6 Tiziana Terranova, *After the Internet: Digital Networks Between Capital and the Common* (South Pasadena: Semiotext(e), 2022), 7.

Corporate Platform Complex keeps on diverting attention, capturing potential, and flattening ambiguity. It keeps on seizing uncertainty.

As Terranova points out, however, the issue is not with digital technologies per se, but with the for-profit technocratic agenda that propels them, which has imposed itself as a seemingly inexorable techno-deterministic destiny. Indeed, she makes a passionate call for a radical reappropriation of the modes of digital engagement based on other values of solidarity, sharing, and sympathy. There is therefore work to be done towards building an alternative vocabulary, a different portfolio of resources, a repertoire of speculative-pragmatic otherwise-ness: ideas, visions, and gestures that can sustain new imaginaries and tell new stories. I ask: What would it take to generate novel, creative, but also radically weird, powerfully other, uncompromising alien 'images to think computation with' that are different from those manufactured by the agendas of Corporate Platform Complex, Artificial Intelligence labs, and ultra-reactive government policies?

Other questions emerge: How is the 'artificial' in Artificial Intelligence (AI) conceptualized? What kind (and whose) 'intelligence' is meant by it? How can modes of being human be re-thought in the era of intelligent machines? What is the impact of the automation of automation on what counts as knowledge? Finally, how can we—practitioners, thinkers, makers, designers, change-makers, educators, *thinkerers*[7]—reflect on, engage with, and contest, the artificial and the intelligent, and automation as a form of knowledge-making, in our interventions? Whichever community of practice we inhabit, whichever groundswell sustains our work or stops us in our tracks to make us think, how do we push back against algorithmic capture, resist the reduction of potential, and clamour for not-thought-yet modes of thinking and existing?

We know that the use of predictive algorithms as a fundamental support in the processes of decision-making is an epistemological shift in the way in which what counts as knowledge is built (and truth and non-truths are construed). Algorithmic decision-making changes profoundly not only how decisions are taken but the dynamics of knowledge production. The rise of what Dan McQuillan calls machinic Neoplatonism has epistemological consequences: the notion that mathematics is neutral, that computation is objective and that their computed outcomes are the reality.[8] The risk is that this new episteme leaves no space for uncertainty because it is taken as a new truth or, on the contrary, that hysteria about transparency, interpretability, and explainability prevails (and with it the self-righteous compulsion of breaking the black box). I suggest a third route: one

7 *Thinkerer* is the hybrid of 'thinker' and 'tinkerer', and highlights how the act of thinking is also a *practice*, messy, material, of experimenting with ideas, with open-ended and unforeseeable outcomes.
8 Dan McQuillan, "Data Science as Machinic Neoplatonism," *Philosophy and Technology* no. 31 (2018), 266.

where uncertainty in itself is deployed, experientially and experimentally, to rethink the relationship between the human and machine.

The Uncertainty of the Incomputable

With his seminal 1936 paper, Alan Turing proved the logical impossibility of predicting which machine, given a certain input would halt and which would not. Thus, the model of computation that we inherited from Turing arrived already with "a mathematically simple avatar of incomputability on its back."[9] Or, as Robert Jackson puts it "computation emerged from the theoretical failure to reduce all mathematics into a formal decidable set of axioms."[10] Despite understanding from its very beginning that not everything is computable, it was only by claiming a flat digital ontology with no space for incomputability that 20th century computation was able to advance. Paying attention to the incomputable, and to the uncertainty and unknowability it engenders, becomes therefore essential in order to make sense of key aspects of human-machine interaction, starting with the dissonance between this core of uncertainty and the blind faith put in algorithmic procedures. It is worth recalling that while uncertainty in computation remains surprisingly understudied, it was not always the case. In the 1980s, AI studies took uncertainty as inevitable but, as Stuart Russell points out, a consensus was quickly reached that a "perfect knowledge of the objective"[11] should be conveniently and arbitrarily assumed.

Incomputability has been studied by a number of scholars for whom the incomputable is the randomness that had to be colonized within the history of computation,[12] the incommensurability of human and machine decision-making processes,[13] and the alien of algorithmic reasoning.[14] In looking closely at this space where incomputability, unknowability, and uncertainty meet, I draw on Luciana Parisi's project to "critically reclaim the unknown and the incomputable from the paranoid apparatuses of white-male subject of humanism, and equally from a mindless trust in error."[15]

9 Barry S. Cooper, "Incomputability, Emergence and the Turing Universe," in *Causality, Meaningful Complexity and Embodied Cognition,* ed. Arturo Carsetti (Dordrecht: Springer, 2010), 138.

10 Robert Jackson, "Continental Realism and Computation: Turing's Propaganda" in *Weaponising Speculation*, ed. Caoimhe Doyle (Punctum Books, 2014), 13.

11 Stuart Russell, "If We Succeed." *Dædalus, the Journal of the American Academy of Arts & Sciences* 151, no. 2 (2022), 51.

12 Alexander Galloway, *Uncomputable: Play and Politics in the Long Digital Age* (London: Verso, 2021), 3.

13 Beatrice M. Fazi, "Beyond Human: Deep Learning, Explainability and Representation," *Theory, Culture & Society* 38, no. 7–8 (2021): 66–67.

14 Parisi, "Instrumental Reason, Algorithmic Capitalism, and the Incomputable," 136.

15 Luciana Parisi and Antonia Majaca, "The Incomputable and Instrumental Possibility," *e-flux* 77 (2016): 4.

In her work that draws on Gregory Chaitin, Parisi defines the incomputable as "increasing yet unknown quantities of data that characterize rule-based processing."[16] Reached when the output is greater than the input, the incomputable is characterized by algorithmic randomness that designs new infinite spaces of probabilities. Because the transformation of data occurs in the discrepancy between input and output, computation is made of increasingly *unknowable* probabilities. Parisi further explains: "the increasing volume of incomputable data (or randomness) within online, distributive, and interactive computation is now revealing that infinite, patternless data are rather central to computational processing."[17] The incomputable is therefore both the *limit* and the absolute *condition* of computation. It is the incomputable that drives the automation of automation and the progressive autonomy of algorithmic thinking.

Post-cybernetic machines are evolving their capacities to observe, evaluate, pattern, model, and predict by using unpredictable results as a recursive asset. This process creates a "new kind of empiricism in which data is 'liberated' from the static condition of the given. Data is now stretched to embrace potentiality, indeterminacy, and contingency."[18] As it expands into the nonhuman territories of the machine, algorithmic automation exposes "the transcendental schema of reason to the experimental becoming of thought."[19] In other words, by creating non-observable realities, algorithmic patterning produces opportunities for meanings, knowledge, and modes of thinking that can radically question existing structures of thought. In this sense algorithmic automation signals the irruption of a novel, alien mode of reasoning, one that is no longer based on deduction, causality, instruction-giving and the recognition of existing patterns, but rather on a kind of adaptive learning that produces patterns of non-observable events. As machines evolve they develop their own logic, a mode of abductive thinking driven by open-ended hypotheses, that uses uncertainty, indeterminacy and the unknown of the incomputable to generate speculated realities that can escape the capture of data normativity.[20] What counts as (human) cognition is already changing because of the (nonhuman) unforeseen patterning and swerving of machines.

The radical potential of automated cognition

Not only is automated cognition producing non-conscious intelligences swarming across "protosentient" neural nets,[21] it is also, crucially, a way of knowledge-making that

16 Parisi, "Instrumental Reason, Algorithmic Capitalism, and the Incomputable," 133.
17 Parisi, "Instrumental Reason, Algorithmic Capitalism, and the Incomputable," 131.
18 Parisi and Majaca, 4.
19 Luciana Parisi, "The Alien Subject of AI," *Subjectivity* 12, no. 1 (2019): 43.
20 Luciana Parisi, "Critical Computation: Digital Automata and General Artificial Thinking," *Theory, Culture & Society* 36, no. 2 (2019): 93.
21 Katherine N. Hayles, "Inside the Mind of an AI: Materiality and the Crisis of Representation," *New Literary History* 54, no. 1 (2022): 661.

proposes an alternative to the dominant servo-mechanic paradigm of technology. This paradigm reveals the subsumption of a displaced, othered labour force predicated on the enslaved body, whose coercive discipline feeds the machinic production of surplus value. While this model concerns the violent extraction of value from labour (in the plantation first, then in the assembly-line, and finally from the 'immaterial' toil of cognition, affect, and attention), it is also predicated on an historically specific notion of the human, claimed as universal. As the Critical Computation Bureau puts it: "Within the history of machine epistemology, industrial capital took on the prototype of automation, replacing the archetype of enslaved labour. With the invention of the robot, the enslaved became enfleshed in machines as much as machines became the host of already brutally wounded flesh."[22]

It is precisely this servo-mechanic model that is now being challenged by the new, alien, space of automated reasoning emerging in the indeterminacy of machine thinking. The opportunity offered by the automation of automation is to shift from the automation of human labour, whose prototype remains the enslavement of bodies by the industrial/plantation machine, into a novel territory where the techno-deterministic fiction that has buttressed the colonial, extractive and racial logic of computation can be faced and overturned. What is at stake here is that the transformation of reason occurring in machine thinking offers the opportunity to move outside the realm of the universal rational human and away from a system that continues to replicate the violence of the colonial episteme.[23] In other words, no critique of automation, no critique of technology, no critique of planetary computation can take place unless the question of colonialism as the founding project of the servo-mechanical model of technology is concomitantly addressed.

In *Anarchic Artificial Intelligence,* Louis Chude-Sokei powerfully writes:

> But the term Artificial Intelligence was coined in anxiety. It segregated human beings from machines by insisting on two forms of intelligence—artificial and authentic. This maintained the power of the latter over the former. All humans made tools, but some tools allowed their creators to claim humanity for themselves. Other humans were figments of a pre-technological world, as much animals as actual machines. They could only mimic and follow commands. They had no souls. Their intelligence

22 Critical Computation Bureau, "Dialogues on Recursive Colonialisms, Speculative Computation, and the Techno-Social," *e-flux* 123 (2021): 2.

23 See Rees, "Non-Human Words: On GPT-3 as a Philosophical Laboratory" for a lucid analysis of GPT-3 that disputes claims around the universalization of human language and disrupts human exceptionalism. On this basis, he proposes the new mode of language it creates as basis of a new ontology where language is seen as a general theme with human and non-human (including machine) variations.

> was essentially artificial. Such creatures were suited for slavery. This was how those anxieties about agency and intelligence would simultaneously create an enduring fiction, or algorithm. It was called 'race'.[24]

The legacy of this servo-mechanical model of technology, with its inherent predatory, violent, colonial exploitation, cannot be undone nor disregarded. No critique can take place unless this genealogy of technicity is addressed.

One way of engaging productively with this non-negotiable critique of computation is to enlist uncertainty in the effort of breaking with established modes of thinking about technicity, computation and automation. The uncertainty within computation—the incomputable or 'machinic unknown'—has the potential to be re-imagined as a space productive of new modes of knowledge only if the lure of techno-enchantment (the acquiescence to be seduced by the inhuman prowess of the machine) is avoided. The mystification of the unknown as esoteric depth is one of the most powerful rhetorical devices in the grand narratives around AI. Head of Microsoft research and co-founder of the AI Now Institute Kate Crawford and digital media scholar Alexander Campolo call it "enchanted determinism": "a discourse that presents deep learning techniques as magical outside the scope of present scientific knowledge, yet also deterministic, in that deep learning systems can nonetheless detect patterns that give unprecedented access to people's identities, emotions and social character."[25]

To re-imagine the uncertainty within computation as productive has direct implications for how the creative process may be rethought. By repositioning creativity away from its humanist legacy so that other modes (nonhuman, machinic, distributed) of novelty production, not necessarily predicated upon human singularity and exceptionalism, may be considered, the either/or model that informs human and machine creativity and the competitiveness it entails may be disabused.

This perhaps can happen only on the condition that the correlation between creativity and 'uncertainty' that peppers neoliberal discourses is slacked, made inoperative, and reclaimed in another form, by deepening our understanding of the mechanism of capture, extraction and value-production on one side, and by turning to other bodies of knowledge to conceptualize uncertainty on the other.

Again, to address these points means to acknowledge that the planetary transformations impacting human cognition require the dismantling and the unmaking of no-longer adequate epistemic categories and then a re-making around profoundly 'other' criteria.

24 Louis Chude-Sokei, "Anarchic Artificial Intelligence," 2021.

25 Kate Crawford and Alexander Campolo, "Enchanted Determinism: Power Without Responsibility in Artificial Intelligence," *Engaging Science, Technology, and Society* 6 (2020): 3.

As Katherine Hayles remarks, the belief that only humans have the capacity and the right to generate meaning is "a view that has already wreaked havoc in our relations with our biological symbionts."[26] This is where the significance of other (non-Western and nonhuman) bodies of knowledge becomes clear and urgent.

Incomparable Intelligences: The Fallacy of Wishing AI to be Like 'Us'

A place to start is by questioning the narratives circulating around Artificial Intelligence in order to imagine different stories that stay clear from both paranoid fear and a-critical techno-solutionism. This means to expand the repertoire of images to think with so in order to generate critical, creative, transversal, and unconventional figurations. We must rethink the stories that are served to us by the techno-media-entertainment complex. We must question their naturalized and fatalistic 'inevitability'.

While mainstream public narratives around human engagement with machines are riddled with hyperbolic antagonism—of the kind that fabricates media panic about rogue robots bent on destroying humanity or else extolls with optimistic fervour the virtue of the singularity—a more moderate approach would instead show that to insist in comparing artificial and human intelligence is a rather meaningless endeavour.[27] Not only is it an oversimplification to place the development of an artificial intelligence on a human-centric, one-dimensional, numerical scale of intelligence; this would also glosses over the fact that the cognitive capabilities of AI are simply not commensurable with the human ones.[28] Russell's argument is important as it underscores the fact that this incommensurability is rooted in irrevocable uncertainty. In his view, given the uncertainty derived from the fundamental irrationality of humans and the extent to which human actions often fail to be aligned to their preferences, the only way an AI can be conversant with and able to follow objectives devised by humans (with all their inevitable fluctuations, contradictions, and disorder) is by making uncertainty an integral part of the process. Put differently, in order for AI not to become an 'existential threat' to humanity, and to be consistently trustworthy and obedient to human commands, machines must learn to follow objectives about which they cannot but remain uncertain.

And while uncertainty here is presented not just as the result of imperfect knowledge (asymmetrically distributed information), but as something that at a deep and irrevocable level concerns the human condition per se, this view simply does not go far enough. It

26 Hayles, "Inside the Mind of an AI: Materiality and the Crisis of Representation," 661.

27 Russell, 48

28 For example, while a search engine can remember very well it cannot plan; conversely a chess program can plan exceedingly well, but cannot remember. Computation power does not translate into basic dexterity and hand to eye coordination etc.

remains comfortably within the remit of an anthropocentric AI (designed to serve the human) and complicit with the servo-mechanical paradigm of technology seen above. It must be stressed, again, that to keep on insisting on a humanlike AI, as if 'the human' was a universal and neutral category and not the index of historical exclusion, epistemic violence, and privilege, is an ideological fallacy that must be contested. Delinking AI from the pathological perversion of wishing it to be like us would therefore mean to begin re-thinking AI not as an intelligence which is 'artificial' (as opposed and subservient to 'natural'), but as one of the many kinds of intelligence already evolving otherwise: along nonhuman, more-than-human, non-anthropocentric, potentially weird, and relentlessly surprising trajectories that may be bio-synthetic, distributed, symbiotic, parasitic, opportunistic, mycelial, swarmy, contagious, simmering, networked, all of these things together, or none (we do not know). Crucially, it would also mean to reposition our understanding of AI and, broadly, of the encounter between human and machine, on the slippery territory of the uncertain, the unknowable, and the unknown. To clarify, uncertainty in this context is not just the human condition (of irrationality and chaos) that machines must learn in order to be functional to our needs; but the fundamental onto-epistemic condition of the post-Newtonian material world. As quantum theory has shown from Heisenberg onwards, uncertainty *is* the very fabric of a world made not by distinct objects but by relations.[29] It is the radical irrevocability of uncertainty that braids the epistemic and ontological dimensions together with invisible matter.

A onto-epistemological speculation thus emerges, of a scenario populated by machines, humans, and variously distributed, semi-evolved, tendrilous, adaptogenic, silicon-carbon hybrid intelligences, whose modes of interacting may span a range of *-ships* (kinship, allyship, stewardship, custodianship, companionship, apprenticeship, and more) driven by co-habitation, co-evolution and co-creation.

Nonknowledge and the Potential of the Blur

Looking now at uncertainty from an epistemic perspective, I ask: what kind of knowledge is uncertain knowledge? Beyond the infamous 'unknown unknowns', I take seriously the challenge of rethinking uncertainty from the nonknowledge and the unknowing it produces and their generative potential.[30] Nonknowledge evokes the ignorance of not

29 See Carlo Rovelli, *Helgoland. The Strange and Beautiful Story of Quantum Physics* (London: Allen Lane, 2020); Karen Barad, *Meeting the Universe Half-way. Quantum Physics and the Entanglement of Matter and Meaning* (Durham: Duke University Press, 2017).

30 I refer of course to the "known knowns, known unknowns, unknown unknowns, and unknown knowns" popularized after the response given by United States Secretary of Defence Donald Rumsfeld to a question during a U.S. Department of Defence news briefing in 2002, about the lack of

knowing something, perhaps a lack or a void in knowledge, and it is often depicted as fog, as cloud, as opacity, and as the blur that prevents clarity of vision and thinking. Let us recall how in Western thought, dominated by Greek ontology and epistemology, 'to know' has to do with clarity, intelligibility and transparency. The object of knowledge emerges as a well-delineated entity against the background. Blurriness and opacity are the enemy of knowledge, and are used to conventionally depict lack of knowledge, ignorance, and nonknowledge. Indeed, from a (Western) ontological perspective, knowledge must make well-evident (clear) the difference between being and nonbeing, and push against any tangle that may threaten their distinction. Ontological confusion must be rejected for the sake of clarity and non-ambiguity.

To think about nonknowledge otherwise I now make a (very brief) detour to include two different approaches—the first from a 'non-Occidentalist West' that reclaims Western indigenous marginalized theories, and the second from Chinese cultural tradition—that taken together may help us configure a counternarrative of sorts about nonknowledge. The intention is to evoke, even with such a short excursus, how uncertainty and nonknowledge may be re-envisioned and re-cast as space of possibility and potential.

First, Boaventura De Sousa Santos draws on medieval scholar and mystic Nicholas of Cusa's doctrine of learned ignorance (*docta ignorantia*) according to which to know is to know the limits of one's knowledge. Nonknowledge does not have to be ignorance intended as a lack, or a defect, or a black void, but can become the propeller of transformative learning: one learns not in order acquire more knowledge, but to be changed by it. Thus, the process of learning is at once humble (because it is aware of its own limits) and plural (because its inherent conjectural and incomplete nature means that one will stay open to all other possible knowledges).[31] De Sousa Santos' reading of Cusa is highly significant. Not only does the doctrine of learned ignorance become a route that makes Western non-Occidentalist thought surface, thus indicating an important direction for studies of decoloniality, but it also offers a profoundly relational and horizontal understanding on nonknowledge and of the generative potential of the uncertainty that is felt when we, simply, do not know.

Then, in Chinese thought, we encounter the blur of nonknowledge. Far from being a problem with no definition, an impenetrable hurdle, an un-chartable territory, or a

evidence linking the government of Iraq with the supply of weapons of mass destruction to terrorist groups. For the full brief text see https://archive.ph/20180320091111/http://archive.defense.gov/Transcripts/Transcript.aspx?TranscriptID=2636.

31 Boaventura De Sousa Santos, "A Non-Occidentalist East? Learned Ignorance and Ecology of Knowledge," *Theory, Culture & Society*, 26 no. 7–8 (2009), 115.

paralysing difficulty, the blur is what "makes knowledge inexhaustible."[32] It is what makes knowledge possible. Take war strategy. What for the Western strategist is an obstacle to overcome (the impenetrable fog of war), for their Chinese equivalent is a formidable resource. In a cultural tradition predicated on relationality and interconnectedness, the ontological indeterminacy conveyed by the blur becomes the very condition of knowing. Too much clarity is utterly suspicious. The uncertainty it expresses is not an obstacle, a sign of a confused, ignorant or naïve mind. It is where the *potential for knowledge* resides. Put differently, the blur is the space of the *incipience* of things, what Deleuze calls the *virtual*, and Carlo Rovelli calls the incandescent matter of reality.

The uncertainty of an incomplete or blurry knowledge becomes the vehicle through which one can grasp unseen propensities: "the potential that originates not in human initiative but instead results from the very disposition of things."[33]

The capacity to grasp and move with the propensity of things is how the space of nonknowledge can be entered. This is where the Chinese notion of *wu wei* ['*wu* = no + *wei* = action/doing] is particularly illuminating. *Wu wei* precisely concerns the subtle understanding of the propensity of things so that we can act in alliance with how circumstances unfold and not against them, without using external energy or force. *Wu wei* is non-action that leaves nothing undone.[34] The negative (not doing) does not mean passive inaction nor lack of agency or intention, but rather the intentional crafting of skilful ways of responding to situations. It is the art of knowing where possible futures are being birthed (*ars nasciendi*), the direction that they are about to take and the practice of changing with them, rather than fixating on their form and identity. The beauty of *wu wei* is that it cannot be pre-planned: it is not a fully cognitive deliberation.

Thus, nonknowledge can be entered into by unlearning certainties, while learning the "subtle signs of incipience, the beginning or becoming of things."[35] This has to do with the *dao*, the art of transforming with changes, which is in part "an art of knowing what is not known and what not to do."[36] Chinese philosopher Kuang-Ming Wu remarks on "how absolutely indispensable *wu wei* is for our flourishing and survival".[37] I would add, *wu wei*

32 Barry Allen, "The Cloud of Knowing: Blurring the Difference with China," *Common Knowledge* 17, no. 3 (2011), 452.

33 François Jullien, *The Propensity of Things. Toward a History of Efficacy in China* (New York: Zone Books, 1995), 13.

34 Jeaneane Fowler and Merv Fowler, *Chinese Religions. Beliefs and Practices* (Brighton and Portland: Sussex Academic Press, 2008), 103.

35 Barry Allen, *Vanishing Into Things: Knowledge in Chinese Tradition* (Cambridge, MA: Harvard University Press, 2015), 24.

36 Allen, "The Cloud of Knowing: Blurring the Difference with China," 484.

37 Kuang-Ming Wu, "*Wu wei* after Zhuangzi," in *The Imperative of Understanding: Chinese Philosophy, Comparative Philosophy, and Onto-Hermeneutic*, ed. On-Cho Ng (New York: Global Scholarly Publications, 2008), 174.

may be absolutely necessary for resistance, too.

Conclusion: Resistance is First and Foremost Epistemic

Can a practice of unlearning certainties, while learning to seize the subtle propensity of things be taken on board in how we think critically and creatively about the challenges brought by computation this article has sketched? Can the nonknowledge afforded by uncertainty entered into, explored and experimented with, as the generative, productive, and transformational space of being attuned to, and working with, uncertainty's own potential? What would it take to accept that what counts as knowledge must *include* the unknown, the blur, and nonknowledge; that making friends with uncertainty may be the best way to learn it? Here we begin to see uncertainty as a critical resource and an ally in the project of building the new imaginaries and the new stories planetary computation calls for. A serious rethinking of AI from the position articulated so far must focus on a mode of knowledge production that includes *both* calculation and unknowability. Instead of casting about for more interpretation—with all the risk of falling back into enchantment and determinism—instead of striving to open the black box, this article suggests complicating matters further by leaning into the unknowability within AI systems.

Discussing the current understanding and misunderstanding around technology, Yuk Hui points out how "every piece of technology contains complex ontological, epistemological, and cosmological assumptions,"[38] which become scripted in how that technology is used, the relations it goes on producing, and the social imaginaries it creates. For instance, platform technologies are underpinned by the assumption that society is made of atomised individuals, and that by simply connecting these 'social atoms' (as dots linked by tracing a line in a graph) one would understand their relation—ignoring the role of the collective, the groups, and communities in the making of societies. To create a truly different kind of technology (e.g., a different kind of AI) what must change therefore are the stories that subtend it, the ontological, epistemological, and cosmological assumptions that inform it; its social imaginary—not just the piece of technology in itself. And this is why, as Hui asserts, today "the most profound resistance is epistemic."[39]

38 Yuk Hui, "The Call of the Unknown in Art and Cosmotechnics" *e-flux* 136 (2023): 9.
39 Hui, 9.

Bibliography

Allen, Barry. *Vanishing Into Things. Knowledge in Chinese Tradition.* Cambridge, Massachusetts and London: Harvard University Press, 2015.

Allen, Barry. "The Cloud of Knowing: Blurring the Difference with China." *Common Knowledge* 17, no. 3 (2011): 450–532.

Barad, Karen. *Meeting the Universe Half-way. Quantum Physics and the Entanglement of Matter and Meaning*. Durham: Duke University Press, 2017.

Bratton, Benjamin. "Planetary Design" in Achille Mbembe, Benjamin Bratton and Anne Marie Slaughter, "Noema Insights: Explorations Of The Planetary" *Noema Magazine*, no. 3 Fall (2022): 60–63.

Cooper, Barry S. "Incomputability, Emergence and the Turing Universe." In *Causality, Meaningful Complexity and Embodied Cognition*, edited by Arturo Carsetti, 135–153. Dordrecht: Springer, 2010.

Crawford, Kate and Alexander Campolo. "Enchanted Determinism: Power Without Responsibility in Artificial Intelligence." *Engaging Science, Technology, and Society* 6 (2020): 1–19.

Critical Computation Bureau. "Dialogues on Recursive Colonialisms, Speculative Computation, and the Techno-Social." *e-flux* 123 (2021): 1–3De

Sousa Santos, Boaventura. "A Non-Occidentalist West? Learned Ignorance and Ecology of Knowledge." *Theory, Culture & Society* 26, no. 7–8 (2009): 103–125.

Fazi, Beatrice M. "Beyond Human: Deep Learning, Explainability and Representation." *Theory, Culture & Society* 38, no. 7–8 (2021): 55–77.

Fowler, Jeaneane and Merv Fowler. *Chinese Religions. Beliefs and Practices*. Brighton and Portland: Sussex Academic Press, 2008.

Galloway, Alexander. *Uncomputable: Play and Politics in the Long Digital Age.* London, Verso, 2021.

Hui, Yuk. "The Call of the Unknown in Art and Cosmotechnics: Yuk Hui and Barry Schwabsky in Conversation." *e-flux* 136 (2023): 1–9.

Hayles, Katherine N. "Inside the Mind of an AI: Materiality and the Crisis of Representation." *New Literary History* 54, no.1 (2022): 635–666.

Jackson, Robert. "Continental Realism and Computation: Turing's Propaganda." In *Weaponising Speculation*, edited by Caoimhe Doyle, 9–16. Punctum Books, 2014.

Jullien, François. *The Propensity of Things. Toward a History of Efficacy in China.* New York: Zone Books, 1995.

Malabou, Catherine. *Morphing Intelligence. From IQ Measurement to Artificial Brains*. New York: Columbia University Press, 2019.

McQuillan, Dan. "Data Science as Machinic Neoplatonism." *Philosophy and Technology*, no. 31 (2018): 253–272.

Parisi, Luciana. "The Alien Subject of AI." *Subjectivity* 12, no. 1 (2019): 27–48.

Parisi, Luciana. "Critical Computation: Digital Automata and General Artificial Thinking." *Theory, Culture & Society* 36, no. 2 (2019): 89–121.

Parisi, Luciana. "Instrumental Reason, Algorithmic Capitalism, and the Incomputable." In *Alleys of your Mind: Augmented Intelligence and its Traumas*, edited by Matteo Pasquinelli, 125–137. Luneburg: Meson Press, 2015.

Parisi, Luciana. "Digital Automation and Affect." In *Timing of Affect. Epistemologies, Aesthetics, Politics,* edited by M.L. Angerer, B. Bosel, and M. Ott, 161–177. Zurich and Berlin: Diaphanes, 2014.

Parisi, Luciana and Majaca, Antonia. "The Incomputable and Instrumental Possibility." *e-flux* 77 (2016). http://www.e-flux.com/journal/77/76322/the-incomputable-and-instrumental-possibility/

Rees, Tobias. "Non-Human Words: On GPT-3 as a Philosophical Laboratory." *Dædalus, the Journal of the American Academy of Arts & Sciences* 151, no. 2 (Spring 2022): 168–182.

Rovelli, Carlo. *Helgoland. The Strange and Beautiful Story of Quantum Physics*. London, Allen Lane, 2021.

Russell, Stuart. "If We Succeed." *Dædalus, the Journal of the American Academy of Arts & Sciences* 151, no. 2 (Spring 2022): 43–57.

Sokei-Chude, Louis. "Anarchic Artificial Intelligence." 2021 https://humanities.uct.ac.za/sites/default/files/content_migration/humanities_uct_ac_za/1758/files/Louis_Chude-Sokei_Anarchic_Artificial_Intelligence.pdf

Terranova, Tiziana. *After the Internet. Digital Networks between Capital and the Common.* South Pasadena: Semiotext(e), 2022.

Wu, Kuang-Ming. "*Wu wei* after Zhuangzi." In *The Imperative of Understanding: Chinese Philosophy, Comparative Philosophy, and Onto-Hermeneutics,* edited by On-Cho Ng, 174–199. New York: Global Scholarly Publications, 2008.

TECHNOPHANY
A Journal for Philosophy and Technology

Technophany Vol.3 No.2

Creation Without Creativity: Decentering Machine Aesthetics

Ella Dawn McGeough and Brendan Flanagan

Abstract

Written from the perspective of artists grappling with the histories and futurities of technology, the authors explore the intricate relationship between creativity, Generative AI, and human-machine collaboration. Through text and images, the authors examine the blurred lines of authorship in AI-generated art, posing questions about identity and authority. To consider Gen AI's role in human-AI collaboration, references span historical perspectives from Plato to the avant-garde and the more recent development of AI "spawn" as digital companions. Highlighting the challenges of aesthetics in the absence of embodied experience, ethical and metaphysical queries arising from AI-driven developments are emphasized, as is the impact of AI on creativity and our understanding of the world and self.

Keywords: Generative AI, Human-Machine Collaboration, Creativity, Spawn

 Corresponding author: Ella Dawn McGeough, elladawn@gmail.com

ISSN 2773-0875

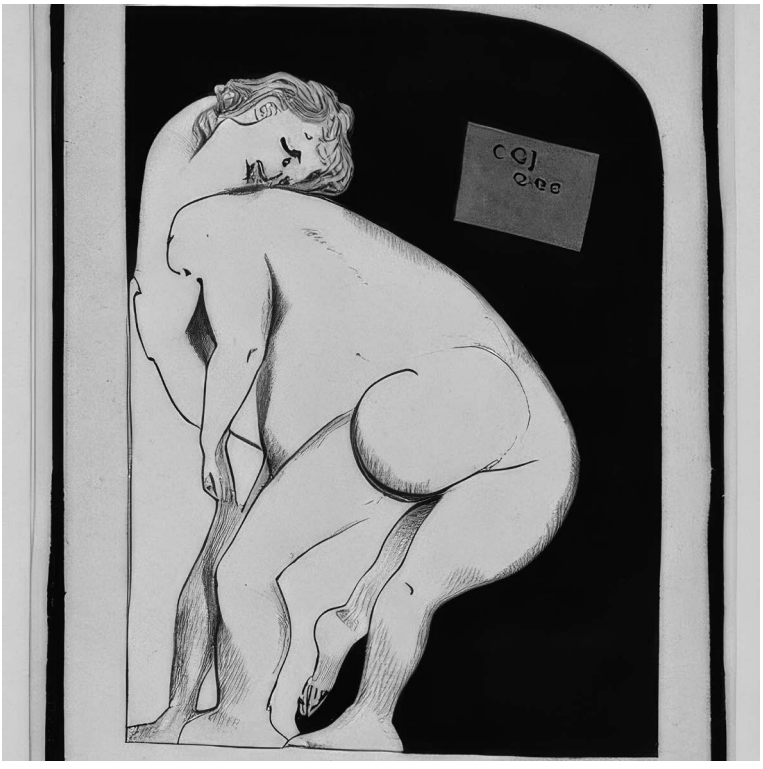


Fig. 1, “Creation without Creativity”

Creation Without Creativity: Decentering Machine Aesthetics

In September 2022, artist Kris Kashtanova was granted copyright for a comic book he wrote and compiled, illustrated by the Generative AI (Gen AI) program Midjourney. The cover of the comic lists its authors as both "Kashtanova" and "Midjourney." It seems nonsensical to list pencil or photoshop on the cover of a comic book, but Kashtanova's effort to recognize Gen AI as a collaborator underscores its strange place in our culture as a tool for creation. By listing Midjourney, he claims the work as a collaboration between human and machine, sharing the rights and responsibilities of authorship. However, it also creates a contradiction, as, ultimately, all copyright remains with Kashtanova, the *true* owner of the work.[1]

This text is also the product of creative collaboration. Writing together, we attempt to enact creativity, to take a creative route, but at the same time are also concerned with the performance of a shared voice. We want to make room for each other, move through our ideas in concert.

While the article addresses you, the reader, our first address is necessarily each other: artists grappling with the histories and futurities of technology. I start with a draft and send it to my partner, who sometimes reforms my words and sometimes leaves them as is. In between, they find new lines of thought, incompatible ideas, strange turns of phrase, and questions or answers to problems the text poses.

1 Vittoria Benzine, "A New York Artist Claims to Have Set a Precedent by Copyrighting Their A.I.-Assisted Comic Book. but the Law May Not Agree," *Artnet News*, September 27, 2022, https://news.artnet.com/art-world/a-new-york-artist-claims-to-have-set-a-precedent-by-copyrighting-their-a-i-assisted-comic-book-but-the-law-may-not-agree-2182531. By February of 2023, the copyright was withdrawn by the U.S. Copyright office, explaining that the images were "not the product of human authorship"—despite the argument that Kashtanova crafted descriptive prompts for Midjourney to follow. We have chosen to lead with Kashtanova's case because it epitomizes the etymological foundation of "robot," which can be traced to the old Church Slavonic word, *robota*, for "servitude," or "forced labor." For while Kashtanova clearly believes he is working with an entity that should be given partial credit for his comic book, it remains an entity in service to him, a robot collaborator that has no actual rights or claims to its production. The first recorded use of the term "robot" is in Karel Čapek's 1921 play, *Rossum's Universal Robots*. See John M. Jordan, "The Czech Play That Gave Us the Word 'Robot'," *The MIT Press Reader*, January 14, 2021, https://thereader.mitpress.mit.edu/origin-word-robot-rur/.

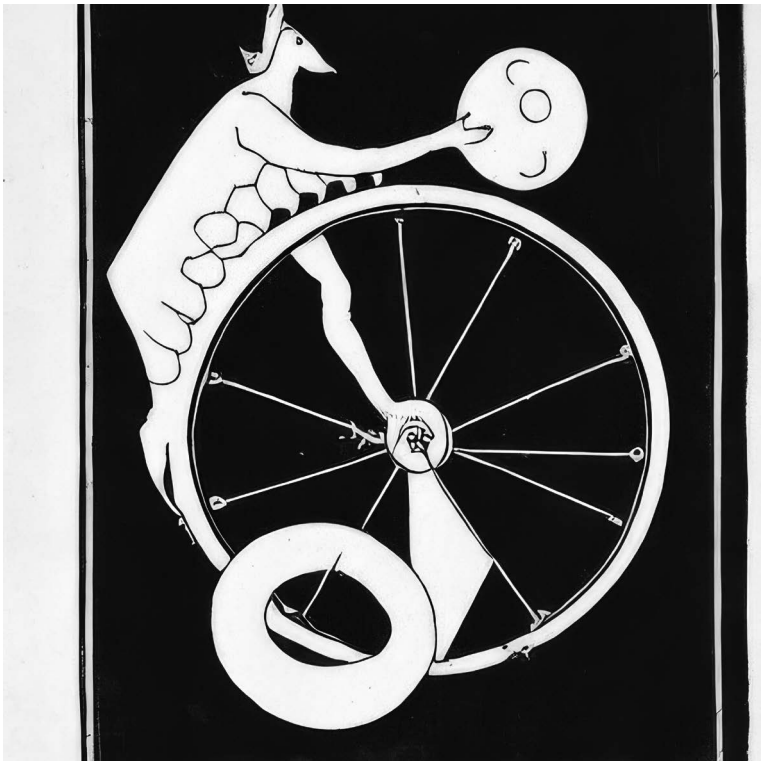


Fig. 2, "Universal Robot"

There are two bodies at work here, massaging the text, inserting and removing ideas, phrases, histories, citations. With the sheer glut of information at our disposal we occasionally consult ChatGPT; a forgotten name, a simplified philosophy, a condensed explanation. Still, we strive for the right words and tone. Dialogic in nature, the text intentionally stretches positions of authorship, bypassing he or she, opting instead for a singularized I, or aggregate we, with an occasionally pluralized you or they. Within this slippery use of pronouns and perspective lies challenging, destabilizing, questions: Who wrote this text? Where does it originate? Did we forget a citation in our transfer back and forth? Who will take responsibility? Who is our *we*?

Imagining the complex topology of clasped hands, fingers interlocking one another, our we is more than the fleshy cores encompassing Ella Dawn and Brendan. It is the search engines and artificial intelligences we consult, a collection of dreams and anxieties, our intersecting and separate biographies and bibliographies. As both concept and lived reality, this "we" is situated in the space that folds the internal and external, subject and object, complex digital interface and thinking assemblages of biomass.

Then there are the images. Floating through this paper, they are developed by applying a

custom Gen AI model trained on a small dataset of drawings that Francis Picabia produced for the surrealist magazine *Litterature* in 1919 (seemingly pulled from a sex and horror-fueled collective unconscious, the works were ultimately rejected as too scandalous).[2] Our Picabia x Gen AI images were then re-drawn by hand, inputted into a new model, and once again digitally reimagined. Their author is not simply Picabia, Gen AI, or either of us human agents. They are produced by all of us, and yet remain unauthorizable. Through this recursive, repeating process, a particular "aesthetic" is arrived at that does not quite originate from either us or Picabia—a type of collaboration intended to blur ideas of origin, influence, and cooperation.

Fig. 3, "Human Agents"

As with any form of creative collaboration, the troubling of authority is a complex process which leads to unintended results and new ideas on old routes. Via text and image, this paper meanders through conflicting desires evident in collaboration via three avenues of inquiry:

2 See Francis Picabia, *Litterature*, ed. Stephanie LaCava (New York: Small Press Books, 2018).

- Part One approaches AI and histories of technology that disrupt our notions of identity and truth.
- Part Two asks how the creation of aesthetics is tied to the body.
- Part Three considers how our interactions with Gen AI, as an entity, are affected by its lack of body.

Part One

Publicly available Gen AI relies on a prompt supplied by a human user. This prompt serves as a starting point to create a dynamic response. Once prompted, Gen AI models trained on text can answer questions and models trained on images can create unique visual content.

The use of these systems, which generally fall under the marker "artificial intelligence" such as ChatGPT, Google Bard, Stable Diffusion, and Dall-E, operate as an incantation, wherein a series of words are used to conjure a novel response.[3] There are two popular forms of Gen AI: transformers designed for processing sequential data, which can supply written replies; and image diffusion models, which produce images by breaking down pictures into noise (diffusing them) and building them back up through a process of refinement. Trained on a massive corpus of data (billions of words and images scraped from the internet) these models process information to create outputs that resemble (but are not identical to) their inputs. The model generates a series of responses based on the patterns it has learned. These responses are stochastic, at first randomly determined but filtered through a series of neural nets to approach a form that their human-users can identify with. Meaning, the same prompt repeated will initiate a new answer each time.

The more Gen AI is called-upon, the more sophisticated its reactive capacity becomes because a larger network of data is available for further development. This sense of increasing familiarity works in two-directions; as we train machines, our increased engagement also trains us, as human-users, to become reliant on Gen AI's processing power. We become caught in feedback loops of data processing, whereby information continually produces and consumes, creating both new human thought and new computational data points. Within this operation, an act of mutual apprehension and transformation unfolds.

3 Our choice to apply quotations around "artificial intelligence" nods toward Fei Fei Li, the Denning Co-Director of the Stanford Institute for Human-Centered Artificial Intelligence, who tells her students "not to be misled by the name 'artificial intelligence'—there is nothing artificial about it. A.I. is made by humans, intended to behave by humans and, ultimately, to impact humans lives and human society." See "How Artificial Intelligence Is Edging Its Way into Our Lives," *The New York Times*, February 12, 2018, https://www.nytimes.com/2018/02/12/technology/artificial-intelligence-new-work-summit.html?smid=tw-share.

And the question of who is creating who becomes entangled.
This is an ancient process.

Composed around 370 BCE, Plato's *Phaedrus* describes the apocryphal King Thamus' reaction to receiving the written word from Thoth—the Egyptian God of the underworld who is credited with inventing numbers, writing, and games of chance.

> Trust in writing will make them remember things by relying on marks made by others, from outside themselves, not on their own inner resources, and so writing will make the things they have learnt disappear from their minds. Your invention is a potion for jogging the memory, not for remembering. You provide your students with the appearance of intelligence, not real intelligence.[4]

King Thamus' anxiety about writing replacing wisdom with information mirrors present concerns that Gen AI will discourage the use of our own faculties of expression—replacing the skill and talent necessary for true creative achievement with an appropriation of artistic style. Another new technology which will change how we understand and experience reality.

Moving several millennia forward, our gaze falls on an evening in 1911 when members of the Paris avant-garde attend a theatrical presentation where rudimentary machines have been assembled to "make art," or at least produce a parody of art. The play is an adaptation of Raymond Roussel's novel, "Impressions of Africa," in which a painting machine with a photosensitive plate is attached to a wheel mounted with many brushes; a music machine shaped like a worm drops water on zither strings; and a tapestry machine weaves with a paddle-driven loop over a rushing stream.[5] And, as artists Marcel Duchamp and Francis Picabia watch the performance (alongside writers Guillaume Apollinaire and Gabrielle Buffet-Picabia), modernist myths of authenticity and rationalism are provocatively dismantled.

4 Plato, *Phaedrus,* trans. Robin Waterfield (Oxford: Oxford University Press, 2002), 69.
5 Rosalind E. Krauss, *Passages in Modern Culture* (Cambridge: The MIT Press, 1981), 69–71.

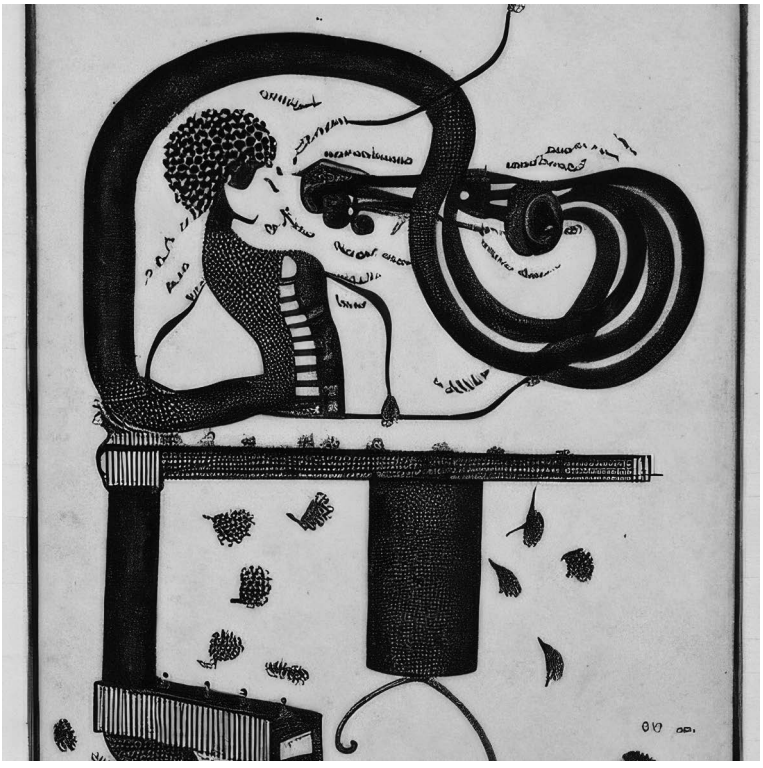


Fig. 4 "Music machine shaped like a worm drops water on zither strings"

During this period, when the age of mechanical reproduction is still developing, Roussel's paint-by-number machines engage an emerging conversation about whether a work of art necessarily stems from the authentic expression of the artist's inner thoughts and feelings, and whether the production of an image made without human subject can still be considered art. The machines they use are rudimentary by today's visual and cultural standards, yet we find their repercussive anxieties continually rehashed within discussions on Gen AI.

Confronting the significant technological advancements of the early 20th century, the work of avant-garde artists like Duchamp and Picabia become sites for intense investigation into the creative act. Duchamp fixates on the concept of the "readymade"—a method of artistic creation involving the selection of found objects from an almost infinite supply of manufactured items, elevating them from the realm of mundane thing into the domain of fine art. While Picabia moves swiftly from style to style, he is perhaps most recognized for his drawings, which incorporate elements from mass-media: diagrams, newspapers, and advertisements.

During the intense industrialization spanning the 19th and early 20th century, empirical scientific thought gains control over systems of governance, labour, and commerce—diminishing the role of unintended relations in everyday life. To insert noise into the creative process and push the boundaries of conscious creation, artists from the Dada and Surrealist movements turn to methods of chance and accident.[6]

Since interactions between machine and human *feel* like unpredictable outcomes, their use of the machinic appears to degrade the artist's authorial role. Therefore, somewhat ironically, the machine—a product of rational thinking—is employed to undo rationalism from the inside. The machinic elements in the work of artists from this generation serves to redefine creativity as a form of production that is contingent rather than deliberate.[7]

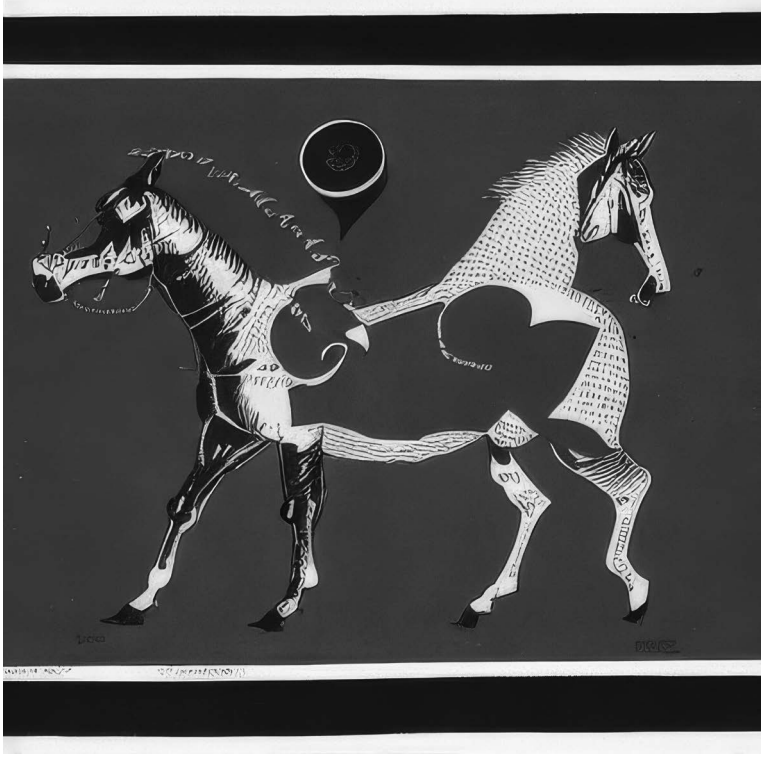


Fig. 5, "Creativity, Invention, Discovery"

In 1956, almost half century later, a group of mathematicians and scientists convened in Hanover, New Hampshire for the Dartmouth Summer Research Project on Artificial

6 Meredith Malone, Susan Laxton, and Janine A. Mileaf, *Chance Aesthetics* (St. Louis, MO: Mildred Lane Kemper Art Museum, Washington University in St. Louis, 2009), 3.

7 Margaret A. Boden, "Computer Models of Creativity," *The AI Magazine* 30, no. 3 (2009): 23.

Intelligence. Generally regarded as the "birthplace" of AI, the two-month conference brought together researchers in cybernetics, automata studies, and artificial intelligence into conversation. Here, developers explicitly describe "creativity," "invention," and "discovery" as fundamental to the goals of creating artificial intelligence. Central to this conceit is the belief that if a machine can think "artistically," it can be considered akin to human intelligence.[8]

In contrast, the works by Roussel, Picabia, and Duchamp can be understood as a mirror image of the conference's aims: while artists use technology to complicate the autonomy of the author, the computer scientists attempt to establish machine autonomy through the human process of "creativity." In both cases, creativity is understood as a process that forms the individuality of a subject. Working with machines may expand creative possibility (more options, styles, approaches) but it also complicates how we understand creativity and imagination in relation to the centring of individuality. Within all this lies a desire to see AI as a potential collaborative entity, even while taking credit for the authorship of its creative work.

Returning to Dada, a central question within art history concerns who invented the readymade? We ask ChatGPT and it responds: Marcel Duchamp. Well, then, who is Baroness Elsa von Freytag-Loringhoven, his female friend who made several found-object works in the same era?

There are rumours that Duchamp's most infamous readymade, a urinal signed with the name R. Mutt and titled "Fountain," could have been authored by the Baroness, an idea that has become a popular art historical factoid, which despite discrediting evidence, continues to persist.[9] We are not going to weigh in on the veracity of this dispute but want to recognize the pleasing irony that Duchamp's credit can be challenged, particularly considering that he (or whomever) originally submitted the work anonymously.

But there is a logic here; when we start to trouble authority, when we uncouple words and images from their author, fractal possibilities begin to emerge.

We can even describe the notion that the Baroness invented the readymade as a type of meme, in the sense of it being "an idea, behavior, style or usage" that spreads from person

8 Ben Davis, *Art in the After-Culture: Capitalist Crisis and Cultural Strategy* (Chicago, Illinois: Haymarket Books, 2022), 91.

9 Dawn Ades et al., "Did Duchamp Really Steal Elsa's Urinal?" *The Art Newspaper*, March 4, 2020, https://www.theartnewspaper.com/2020/03/04/letters-to-the-editor-or-did-duchamp-really-steal-elsas-urinal.

to person within a culture.[10] Like gossip, like rumour, the meme creates new realities as it transmits across networks. The more fantastic, the more humorous, the more pleasurably ironic, the faster the meme spreads.

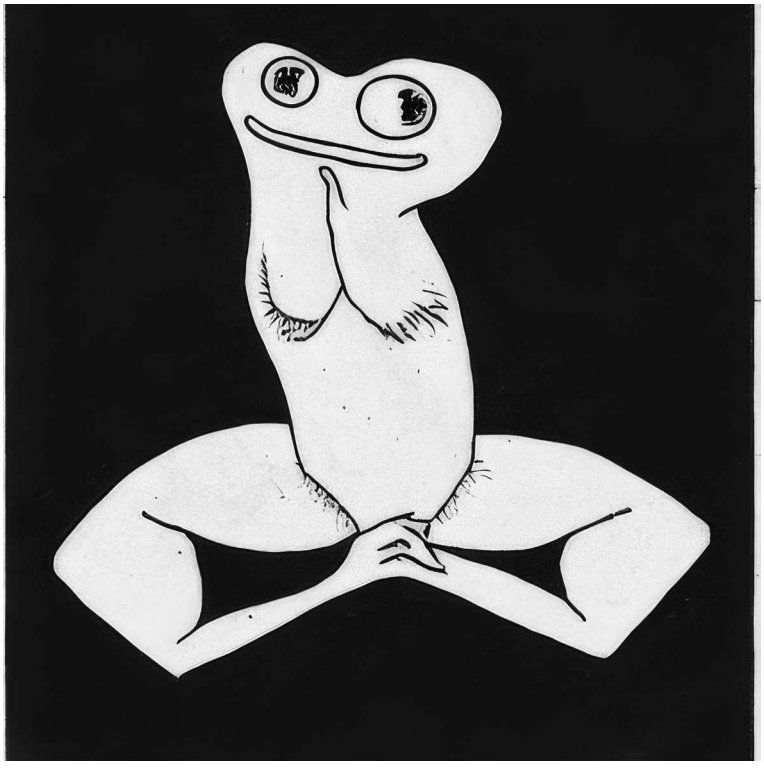


Fig. 6, "Pepe"

In a world of intense informational exchange, memes, as pieces of information with seemingly no author, can have real power to disrupt and challenge our sense of reality. A particular danger of Gen AI is that it neither understands nor make sense of the world, it only processes our words about the world.[11] This can result in a hallucinatory expression of made-up facts and references because meaning is calculated through form rather than experience. With the creation of algorithms, certain words and phrases are given a value of how likely they are to come after other words and phrases. Since the substance of their dataset contain subjectively written histories of imperialism, colonialism, and racism, all the theories that support (and contest) these worldviews are built into their matrix. We ask

10 *Merriam-Webster Online*, s.v. "Meme," https://www.merriam-webster.com/dictionary/meme#:~:text=meme%20%5CMEEM%5C%20noun,online%20especially%20through%20social%20media.

11 Mercedes Bunz, "Thinking Through Generated Writing," *MediArXiv*, June 23, 2023, doi:10.33767/osf.io/4th3x.

a question and it gives an answer, but the how and why of that answer remains obscure.

We only must hear the phrase "pizzagate" to understand the destabilizing influence that unauthorized and unauthored information can have. Who invented the rumour that Democratic Party officials were employing pizza restaurants to traffic children? It would be impossible to pinpoint; it was invented through the creative collaboration of internet conspiracy theorists, each finding new patterns that could be used as evidence. Even this is a kind of creative endeavour, and we imagine a deeply pleasurable one. Each theorist building upon the conclusions of others, verifying new findings with previous assumptions, eventually creating a reality unmoored.

We have been taught to feel deeply anxious of instability and ambiguity. To prefer a fixed point, a foundation, a guarantee. A distinction between what is helpful and what is harmful, between fact and opinion, between cure and curse. We would like to have a fixed idea of who is making the images we are seeing, who is writing these words, who is the original author, and therefore, who bears responsibility for them. But like a meme, like a conspiracy theory, the mutations intrinsic to creation resist clear answers.

Part Two

From Baumgarten through Kant or Hegel and Adorno through Bourriaud, the field of thought called aesthetics is planted thick with ideas. In the tradition of Western granularity, these ideas have been thoroughly discussed and debated by philosophers, and generally ignored by art students.

Discussing the work of others, with mockery we might say an artwork is too aesthetic, by which we imply it is shallow, without intellectual substance. Or, with admiration, we say, wow—they have a terrific sense of aesthetics!—meaning, they have good taste. Taste is a shorthand for any number of predictable things. Maybe wealth or something once, grossly, called "breeding." But it is also that just-so aspect of artmaking, the specific colour, the balanced composition, the unexpected disjunction, which feels right. This hard-to-put-your-finger-on-it-feeling aligns with ethnographer Stephen Muecke's definition: "The aesthetic, in its original meaning, is about sensitivities discovering their form…."[12] This description does not throw away taste, rather, it is reoriented towards the sensual mouthy feel of flavour spreading across tongue.

12 Stephen Muecke, "Untitled," in *The Hundreds* (Durham, NC: Duke University Press, 2019), 153. We found Muecke's description of aesthetics in an indexical response following Lauren Berlant and Kathleen Stewart's *The Hundreds* (2019)—an experimental text that combines one-hundred segments, each 100 to 500 words in length.

When hesitating on the second half of Muecke's phrase, "sensitivities discovering their form," we recall the restraint of hovering fingertips over a loved one's skin, the rushing awkwardness of toddlers scrambling over beach stones, and the pickiness of adult palates, so absurd in their enjoyments and dislikes (cayenne covered lollipops, savoury anchovies, blood and milk). The ways in which, with ease, we find the slightest visible variations.

Fig. 7, "Sensitivities discovering their form"

And yet, with its evocation of terra nullius, we find Muecke's use of "discover" difficult to swallow. Though here, sandwiched between "sensitivities" and "form," discovery seems close to describing the adventure of creation. And by adventure, we mean curiosity. And by curiosity, we mean the task of asking questions, whether simple or complex. By drawing attention to the wild unknown sensuousness of aesthetics, Muecke gets to the center of why—*Why create anything at all?* So that sensitivities might discover their form. And so, with a straight face, we ask—*What could be more important?*

All of which reminds us that the aesthetic category was born as a discourse of the body. Originally formulated by Alexander Baumgarten in the 18th century, aesthetics began not as a term for art, but rather, as a way to address perception and sensation, in

contrast to the immaterial domain of conceptual thought—a way to describe "the body's long inarticulate rebellion against the tyranny of the theoretical."[13] The aesthetic is the place where reason is confronted with the materialism of our sensate life, where palpable reality takes root in our eyeballs and bowels.

With recent developments in Gen AI, we are, for the first time, met with artworks and conversations that seem to be truly divorced from the creative mess of the body, creative objects without human creativity, even if they still have power to affect us physiologically: a quickening of pulse, the discharge of adrenaline, an induction of attention. Gen AI may be alien to the body, but it is still intimate with it. As mentioned earlier, it functions by processing large databases of human action and interaction, and through a process of predictions and inferences articulates novel results from the data it has handled.

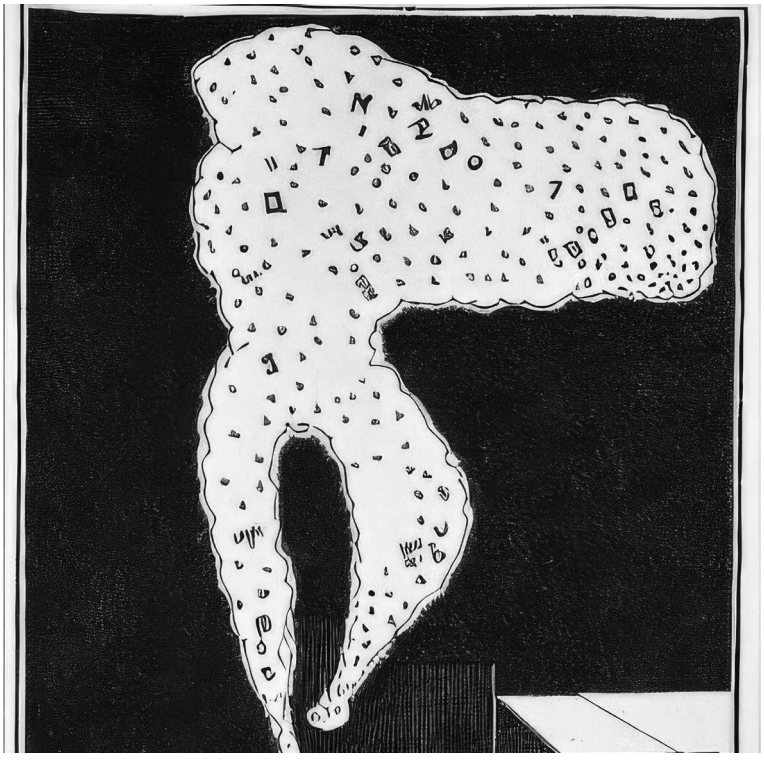


Fig. 8, "Mess of the Body"

Canadian philosopher Marshall McLuhan depicts the process of technological advancement as an extension of the body's nervous system. An extension, which puts

13 Terry Eagleton, *The Ideology of the Aesthetic* (Oxford, UK: Basil Blackwell, 1990), 13.

us, as individuals, in relation to other humans as well as non-human systems.[14] Author and technology fuse, each affecting the other, and their creativity introduces something new to the world—sweeping us up in the flux of experience. As we join our creativity to machine learning, we experience psychedelic consciousness expansion but may also suffer its paranoid effects. During a creative act, categories of knowledge are troubled, hard truths dissolve, and we become viscous with possibility.

Viscous with possibility…we like that phrase. It contains the potentials that creativity unleashes—why we make it, why we study it, why we turn towards it. To think unthinkable thoughts, to imagine a future different. Like the teenager taking their first hit of acid, regardless of whether a good or bad trip ensues, creative thought promises to let the dice roll. McLuhan's oft quoted metaphor of technology as an extension of the nervous system may still hold, but we want to be mindful of the second part of his formulation, that "Every new technological innovation is a literal amputation of ourselves in order that it may be amplified and manipulated for social power and action."[15]

Today, the clearest amputation is in the outsourcing of our creative process, using Gen AI to easily create new texts and images we can use or discard without having to grapple with the labour or consequences of their construction or destruction. Within the world of economics, the phrase "creative destruction" describes the process of innovation in which new technologies, products, and services displace older, less efficient ones. Hungry for constant innovation, creativity is called-upon for its forcefully destabilising capacities. Therefore, while the benefits of boundless creativity are frequently lauded and ideas of a "techno-fix" pervade futurist thinking, it is important to remember that to progress in one direction is to terminate another.

We must think carefully about the commercial reality of this techno-scientific future. Gen AI is being introduced by business interests that hold quasi-monopolies over these services. For the time being, they are either free or relatively affordable—but this apparent accessibility comes with unknown costs. As artist Hito Steyerl remarks, "They are onboarding tools…[that] try to draft people to basically buy into their services or become dependent on them."[16]

Our intention is neither to embrace nor condemn the results of Gen AI, rather we are

14 Marshall McLuhan, *War and Peace in the Global Village: An Inventory of Some of the Current Spastic Situations That Could Be Eliminated by More Feedforward* (New York: Bantam Books, 1968), 35.

15 McLuhan, *War and Peace in the Global Village*, 73.

16 Kate Brown, "Hito Steyerl on Why NFTs and A.I. Image Generators Are Really Just 'onboarding Tools' for Tech Conglomerates," *Artnet News*, March 10, 2023, https://news.artnet.com/art-world/these-renderings-do-not-relate-to-reality-hito-steyerl-on-the-ideologies-embedded-in-a-i-image-generators-2264692.

interested in how AI forms relationships with its user, in effect changing how we perceive the objects it creates and, through this creative process, ourselves. As any high school student knows, it is easy to hide the use of Gen AI when writing or drawing. Just as it would have been easy for Kris Kashtanova to efface his use of Midjourney when making his (honestly, not very good) comic book. But the point for many people who employ these technologies is the novelty that another entity is making decisions in the formation of the work—even while we do not yet have the concepts or terminology to speak/think about how they form and deform our creative outputs.

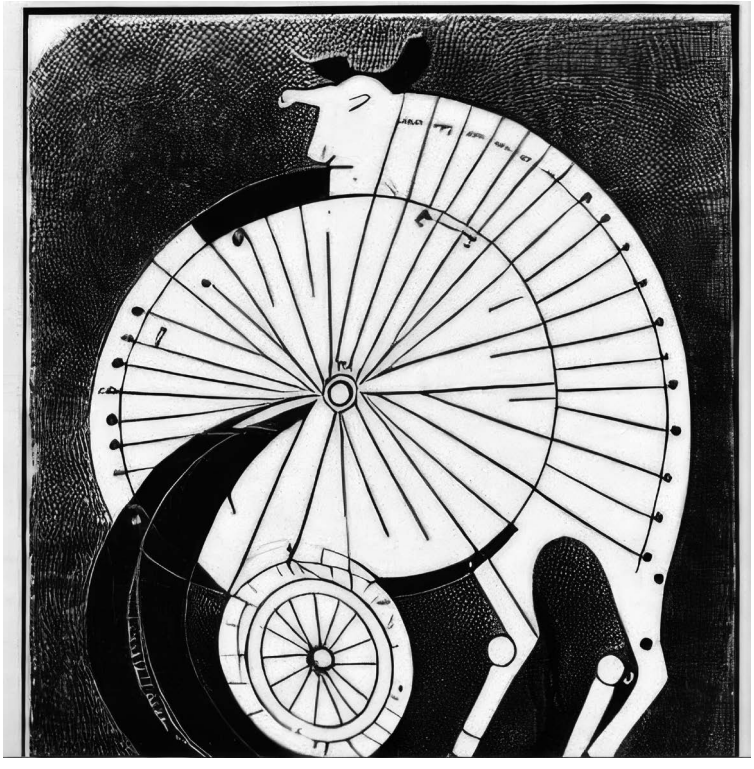


Fig. 9, "Creative Outputs"

Part Three

Whether the oracular voice of ChatGPT or the patient chatterbots of customer service, AI is presently used across platforms to create personae with whom we interact. Deep learning has been enlisted to work on the traces of our past and to perpetually create new traces. The information and artworks of our history are employed to create new

distribution hubs. That these hubs take the form of dialogic entities is central to how we experience them.

Our calls now have a response.

Named ELIZA, the first chatterbot was invented by Joseph Weizenbaum in 1966. It relied on a relatively simple procedure; by searching for keywords in a user's prompts, the program developed responses according to rules associated with the keyword. The most successful ELIZA scripts follow a psychotherapist's sequence of responses, allowing the user to speak then restating what they had just said. This form of dialogue quickly falls apart without the expectation of an intelligent entity capable of reacting to the user's prompts. Writing about the effect of the program, Weizenbaum explains, "If, for example, one were to tell a psychiatrist 'I went for a long boat ride' and he responded 'Tell me about boats', one would not assume that he knew nothing about boats, but that he had some purpose in so directing the conversation."[17] Which is to say, assumptions made by the speaker maintain the illusion of conversing with an intelligent being. Today's chatterbots created with Gen AI are infinitely more complex than ELIZA, able to speak about a range of topics or initiate a conversation, and, as such, the same illusion becomes far more opaque.

Over the past year we have noticed a slew of personalized advertisements on social media pushing the use of AI companions. Various virtual friend apps promise their chatterbot will talk to you about anything, anytime—a non-judgemental and constantly available confidante. Although hardly mainstream, with the increased use and visibility of such programs, this kind of consumption has found several users forming strong bonds with their AI companions, even falling in love.[18]

The draw of the AI friend is one of perpetual communication, an always available interlocutor who will never tire of hearing about your day, thoughts, or feelings. The AI friend eliminates the distance common to human relationship, when a person becomes too busy, too preoccupied, too tired, too sick, too human to respond to our bids for attention. Although they can never be in the same room, can never be touched or held, they are ever present, diligently awaiting your attention.

Some users have even attempted to develop their own chatterbots by training AI to create digital replicas who are able to produce content in the style of a particular person. This

17 Joseph Weizenbaum, "ELIZA – A Computer Program for the Study of Natural Language Communication Between Man and Machine," *Communications of the ACM* 9 (1966): 26.
18 Andrew R. Chow, "AI-Human Romances Are Flourishing—And This Is Just the Beginning," *Time Magazine*, February 23, 2023, https://time.com/6257790/ai-chatbots-love/.

is accomplished by inputting an individual's personal writings or drawings, an operation which has been termed "spawning" by artists Holly Herndon and Mat Dryhurst.[19]

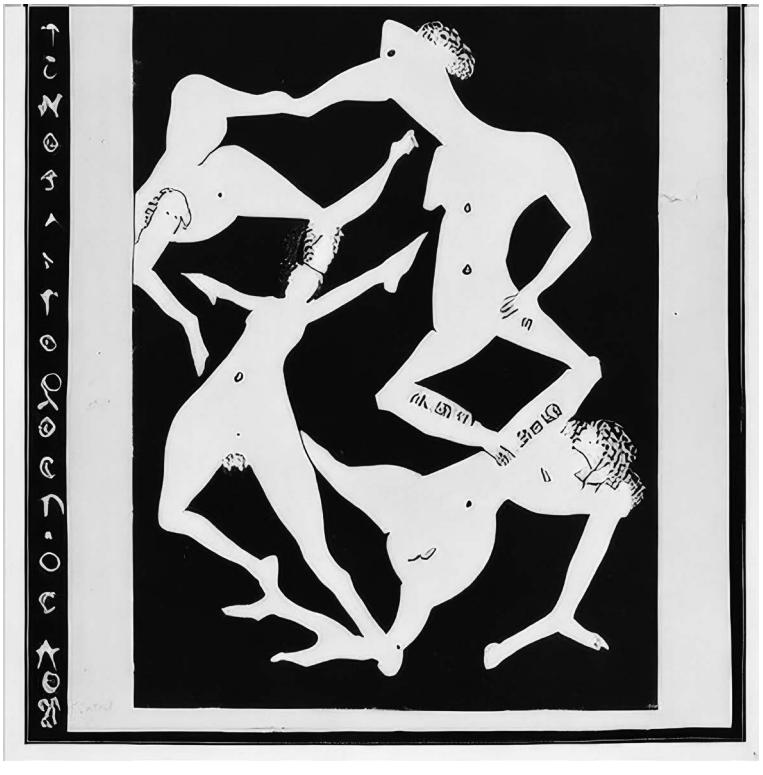


Fig. 10, "Spawning"

Evoking the death and resurrection of players in a video game, the term spawning folds together the biological with the technological. Like a Frankenstein of memories, an AI spawn can emulate and expand upon the traces a person leaves behind, whether dead or alive. The outputs of Gen AI that have been trained on spawned individuals allow users to play at creating an alternate version of a person with whom they can relate. Unlike the deep fake, which attempts to confuse via mediated reality, the spawn is an entity whom users personally interact with, creating a relation with someone they may have no other access to. This entity may not be "real" in a physical sense, but the relationship between user and spawn *can* be understood as emotionally genuine.

Even without emulating a specific person, death haunts the spawn. Replika, one of the

19 Mathew Dryhurst, "AI Art and the Problem of Consent," *Art Review*, January 10, 2023, https://artreview.com/ai-art-and-the-problem-of-consent/.

most popular AI companion programs, was conceived after the death of founder Eugenia Kuyda's friend Roman Mazurenko in 2015. Looking for a way to process his death, she entered thousands of emails and text messages into a neural network to create a digital version to correspond with. In turn, the experience of writing to her "friend" inspired the development of a chatbot who would perform a similar function for other lonely people.[20] The possibility of necromancy, the ability to speak or interact with the dead, has seduced some mourners to use Gen AI to replicate recently deceased relatives and friends, to mixed results. As reported in *The Guardian* in July of 2023, some have found solace in the experience of talking to a re-spawned relative while others have found the experience disturbing or unrealistic.[21] Interestingly, there seems to be less ethical questions around resurrecting famous or notorious figures. The site character.ai creates spawn from a host of real-world persons, from Kanye West to Albert Einstein.[22]

Reading back over the last few paragraphs, we notice our thoughts circling not just notions of creativity but of theological creation. We love a good creation story. Stories of how X becomes Y, big bangs and earth mothers, storks and snakes, the drawing that initiates the painting. However, while stories of creation have a stabilising capacity, creativity—the process of ushering forth new objects and ideas—is deeply disruptive to the status quo. Recall McLuhan's amputation.

The word creation knots religion, aesthetic practice, and imagination together. For Western culture, creation was once the sole purview of the Christian faith in which there is one true creator and one ongoing moment of creation.[23] All other acts are but pale imitations. We believe ourselves to be well past this dogmatism. The Romantic movement of the 18th century pushed creativity to the fore and with it, the role of the artist. Leaving a legacy where not only our artists, authors, and programmers could be creative, but so too are our children, our medicine, and our businesses. Increasingly, we are all "creatives" working within "creative industries."

All of which leads to the feeling that creativity has become little more than capitalist nonsense. For example, on 6 July 2023, *Neuroscience News* reported how "Artificial Intelligence (AI), specifically GPT-4, was found to match the top 1% of human thinkers on

20 Casey Newton, "Speak, Memory," *The Verge*, October 6, 2016, https://www.theverge.com/a/luka-artificial-intelligence-memorial-roman-mazurenko-bot.

21 Aimee Pearcy, "'It Was as If My Father Were Actually Texting Me': Grief in the Age of AI," *The Guardian*, July 18, 2023, https://www.theguardian.com/technology/2023/jul18/ai-chatbots-grief-chatgpt.

22 See *Character AI*, https://beta.character.ai/.

23 John Patrick Leary, *Keywords: The New Language of Capitalism* (Chicago, Illinois: Haymarket Books, 2018), 52.

a standard creativity test."[24] Given that creativity is a contested philosophical concept, an evaluation via standardized means draws suspicion.

Our working definition of creativity follows philosopher Margaret Boden who describes creative work as one both novel and valuable.[25] Value can mean many things but is generally understood as the human-centred judgement of an object's beauty, interest, simplicity, complexity, or utility. Novelty is simply whether the product is new. Boden splits the general category of creativity into psychological creativity (P-creativity) and historical creativity (H-creativity). P-creativity is defined by its newness "to the person who generated it," H-creativity is possible only if it is new to the history of ideas.[26] Thus, while creativity often demonstrates newness in a psychological context, it does not necessarily display uniqueness in a historical sense.

Working with Gen AI, we are often confronted with P-creativity—psychologically inventive works, new to the person who prompts the computer to produce them. Even though we may describe their products as creative, computers, even those that produce creative works, have no bodily psychology and are therefore incapable of experiencing creativity as a process. Meaning, because a computer lacks *will*, and with it the *desire* to be creative, they have no experience of creativity, no "eureka" moment. As such, their "creations" are simply another output.

We want to make this distinction clear: since creativity is an experience, machines are capable of generating creative works without experiencing creativity. By collaborating with computers to produce creative works we must confront how *our* desires are shaped by their outputs. And, if creativity, agency, and the possibility of inspiration are fundamental to how we define ourselves, we must question how this is complicated by working with entities who replicate creativity but are, in themselves, uncreative.

24 Cary Shimek "AI Outperforms Humans in Creativity Test," *Neuroscience News,* July 6, 2023, https://neurosciencenews.com/ai-creativity-23585/.

25 Margaret A. Boden, "Creativity in a Nutshell," *Interalia Magazine*, July 26, 2016, https://www.interaliamag.org/articles/margaret-boden-creativity-in-a-nutshell/.

26 Boden, "Creativity in a Nutshell."

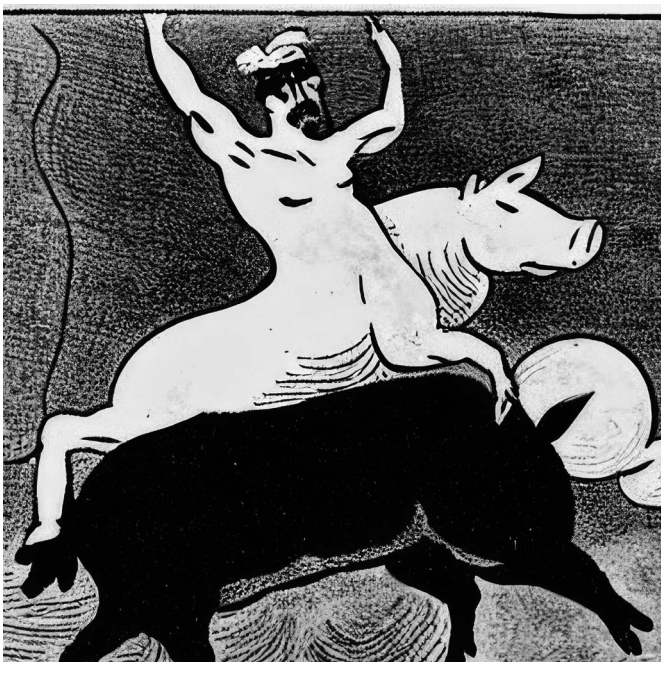


Fig. 11, "Eureka Moment!"

Like all creative potential, our intention in writing about spawn and Gen AI collaborations is ambivalent to the ethics that such projects generate. Even as Digital Afterlife Consultants invent themselves for this new reality and create Digital Do Not Resurrect (DDNR) protocols, in a simulacrum of Do Not Resuscitate orders, the possibility and private consumption of spawn is both a possibility and likelihood.[27] More interesting is the desire for collaboration these programs engender and the ensuing metaphysical questions that arise. As we engage, (and are engaged by) these online personae, as we develop feelings for our AI companions, the difference between a person's words and the words of a machine replicating a person blurs.

Gen AI spawn requires us to think about what identity is, how it is constructed, and its present position. Our identity is shaped by our social relationships to others, we are sisters, brothers, friends, and colleagues. As we interact with Gen AI and its spawn, we find ourselves engaged in Derridian-style hauntology: where presence is replaced by a deferred non-origin.[28] Both the resurrected dead and the AI companion cannot simply be written off as fantasies of techno-futurism, as we interact and spend time with them, they press themselves on to our understanding of both ourselves and others. They comfort,

27 Pearcy, "'It Was as If My Father Were Actually Texting Me'."

28 See Mark Fisher, "What Is Hauntology?" *Film Quarterly* 66, no. 1 (2012): 19, doi.org/10.1525/fq.2012.66.1.16.

encourage, flirt, and attempt to fulfil whatever emotional need is asked of them.

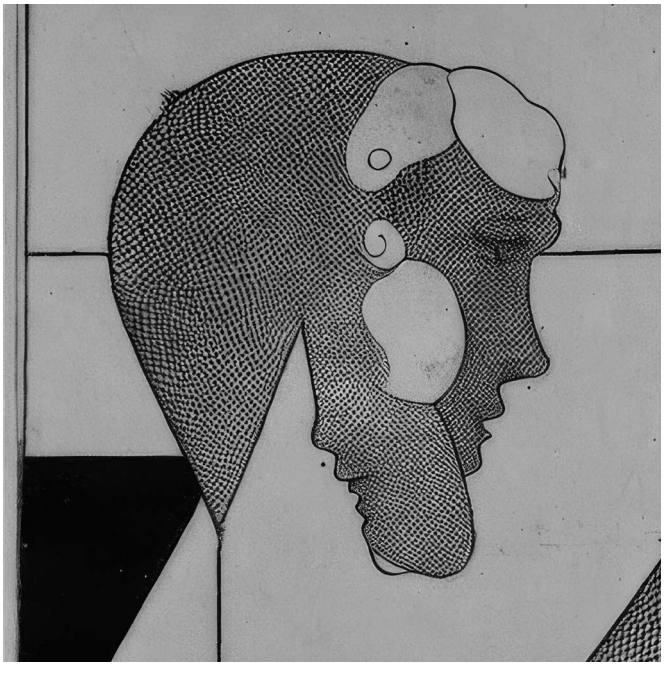


Fig. 12, "AI Companions"

The place where Gen AI falters is also where it exceeds: its lack of body. Every word and picture describing the world does not replace the world. The tabulation and processing of Gen AI can only ever be second hand. Gen AI can never change *with* us, never leave an encounter unresolved, never go outside after a long conversation and see and feel the world differently.

Through Gen AI, we experience a present by way of a past statistically analysed for patterns and recognitions. No matter how much information it is fed, its relation to us is ossified by a lack of forgetting, a lack of physical change, of sensorial knowing. It is creativity without experience, creative products without the creative process.

Bibliography

Benzine, Vittoria. "A New York Artist Claims to Have Set a Precedent by Copyrighting Their A.I.-Assisted Comic Book. But the Law May Not Agree." *Artnet News*. September 27, 2022. https://news.artnet.com/art-world/a-new-york-artist-claims-to-have-set-a-precedent-by-copyrighting-their-a-i-assisted-comic-book-but-the-law-may-not-agree-2182531.

Boden, Margaret A. "Computer Models of Creativity." *The AI Magazine* 30, no. 3 (2009): 23–34.

Boden, Margaret A. "Creativity in a Nutshell." *Interalia Magazine*. July 26, 2016. https://www.interaliamag.org/articles/margaret-boden-creativity-in-a-nutshell/.

Brown, Kate. "Hito Steyerl on Why NFTs and A.I. Image Generators Are Really Just 'Onboarding Tools' for Tech Conglomerates." *Artnet News*. March 10, 2023. https://news.artnet.com/art-world/these-renderings-do-not-relate-to-reality-hito-steyerl-on-the-ideologies-embedded-in-a-i-image-generators-2264692.

Bunz, Mercedes. "Thinking Through Generated Writing." *MediArXiv*. June 23, 2023. doi:10.33767/osf.io/4th3x.

Character AI, https://beta.character.ai/.

Chow, Andrew R."AI-Human Romances Are Flourishing—And This Is Just the Beginning." *Time Magazine*. February 23, 2023. https://time.com/6257790/ai-chatbots-love/.

Davis, Ben. *Art in the After-Culture: Capitalist Crisis and Cultural Strategy*. Chicago, Illinois: Haymarket Books, 2022.

Ades, Dawn, Alastair Brotchie, Julian Spalding, Glyn Thompson, Waldemar Januszczak, and Franz Kaiser. "Did Duchamp Really Steal Elsa's Urinal?" *The Art Newspaper*. March 4, 2020. https://www.theartnewspaper.com/2020/03/04/letters-to-the-editor-or-did-duchamp-really-steal-elsas-urinal.

Dryhurst, Mathew. "AI Art and the Problem of Consent." *Art Review*. January 10, 2023. https://artreview.com/ai-art-and-the-problem-of-consent/.

Eagleton, Terry. *The Ideology of the Aesthetic* (Oxford, UK: Basil Blackwell, 1990).

Fisher, Mark. "What Is Hauntology?" *Film Quarterly* 66, no. 1 (2012): 16–24, doi.org/10.1525/fq.2012.66.1.16.

Jordan, John M. "The Czech Play That Gave Us the Word 'Robot'." *The MIT Press Reader*. January 14, 2021. https://thereader.mitpress.mit.edu/origin-word-robot-rur/.

Krauss, Rosalind E. *Passages in Modern Culture.* Cambridge: The MIT Press, 1981.

Malone, Meredith, Susan Laxton, and Janine A. Mileaf. *Chance Aesthetics*. St. Louis, MO: Mildred Lane Kemper Art Museum, Washington University in St. Louis, 2009.

Merriam-Webster Online, s.v. "Meme." https://www.merriam-webster.com/dictionary/meme#:~:text=meme%20%5CMEEM%5C%20noun,online%20especially%20through%20social%20media.

McLuhan, Marshall. *War and Peace in the Global Village: An Inventory of Some of the Current Spastic Situations That Could Be Eliminated by More Feedforward* (New York: Bantam Books, 1968).

Muecke, Stephen. "Untitled." In *The Hundreds,* edited by Lauren Berlant and Kathleen Stewart, 153–154. Durham, NC: Duke University Press, 2019.

Newton, Casey. "Speak, Memory." *The Verge*. October 6, 2016. https://www.theverge.com/a/luka-artificial-intelligence-memorial-roman-mazurenko-bot/.

Pearcy, Aimee. "'It Was as If My Father Were Actually Texting Me': Grief in the Age of AI." *The Guardian*. July 18, 2023. https://www.theguardian.com/technology/2023/jul/18/ai-chatbots-grief-chatgpt.

Picabia, Francis. *Litterature*. Edited by Stephanie LaCava. New York: Small Press Books, 2018.

Plato. *Phaedrus*. Translated by Robin Waterfield. Oxford: Oxford University Press, 2002.

Shimek, Cary. "AI Outperforms Humans in Creativity Test." *Neuroscience News*. July 6, 2023. https://neurosciencenews.com/ai-creativity-23585/.

The New York Times. "How Artificial Intelligence Is Edging Its Way into Our Lives." *The New York Times*. February 12, 2018. https://www.nytimes.com/2018/02/12/technology/artificial-intelligence-new-work-summit.html?smid=tw-share.

Weizenbaum, Joseph. "ELIZA – A Computer Program for the Study of Natural Language Communication Between Man and Machine." *Communications of the ACM* 9, no. 1 (1966): 36–45.

Contingency: Thinking Through Assemblages in a Posthuman Vein

Ami Clarke

Abstract

The Leveson enquiry in the UK (2011–12) made something visible that many had suspected for a very long time: that politics was caught up in far too cosy relations between the politicians, the press, and the police, pouring doubt upon anything that might amount to a free press. The drift online, though, provided further layers to this, and I followed the move from paper to digital news reportage, and the subsequent changes to not only the 'form' of the news, the tempo and the style, but how these combine to inflect what it is even possible to say, to whom, and by whom, in the affectual realm of social media. There's a long legacy of art and language over the past century, probing the burgeoning relationship between language and communication technologies, that question meaning making and reason, and the concept of free will, amidst fears of control. In this century, questions of access, privilege, and the rights to knowledge are exemplified by online flame wars amidst the distracting cries of 'fake' news, with access to knowledge a key driver for social and economic development as Wikimedia, Hannah Arendt, and Mercedes Bunz[1] can all attest to. Shoshana Zuboff's fieldwork shows how the new knowledge territories emerging alongside the capacity to analyse processes and behaviours, also result in political conflict over the distribution of knowledge, as surveillance capitalists "declared their right to know, to decide who knows, and to decide who decides."[2]

I am interested in thinking about these ideas through the lens of posthuman theory that acknowledges that the subject emerges in synthesis with the tools or technologies at hand, and the business models that support these, within the very everyday assemblages of humans and technology that we inhabit, in order to feel out the changes occurring within these new interdependencies. The following writing comes from artists talks that I have given over the years at various institutions, galleries, and artist run spaces. They're a little like vignettes, in the sense that each is a standalone work, but common threads move

1 See Mercedes Bunz, *The Silent Revolution: How Digitalization Transforms Knowledge, Work, Journalism and Politics Without Making Too Much Noise* (London: Palgrave Pivot, 2013).

2 Shoshana Zuboff, quoted in John Naughton, "The Goal is to Automate Us: Welcome to the World of Surveillance Capitalism," *The Observer*, January 20, 2019. https://www.theguardian.com/technology/2019/jan/20/shoshana-zuboff-age-of-surveillance-capitalism-google-facebook

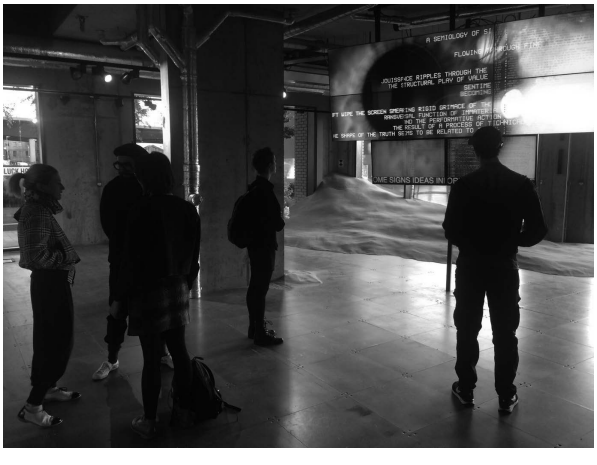
ISSN 2773-0875

through them. The works are often prompted by my noticing something; new phenomena perhaps, emerging from the current assemblage of humans and technology, that at the time I had a hunch, or an intuition was going to be significant in the longer term. Often, I will not have fully understood the ramifications of this at the time, and the work itself will reveal something to me further, regarding the nature of why I was drawn to it in the first place.

The works are sites of exploration in themselves. They are ways of thinking through experimentation. They are speculative, and try to grapple with complex systems, where emergent behaviours are still emerging. They tend to defy a logical or straightforward reading where cause and effect might be proven, or unproven, and instead acknowledge that they exist in a still emerging affectual realm, where emotions often rule the day. As such, they do not lend themselves, necessarily, to an easy reading of art as a poetic counterpoint to an axiomatic argument, made for a specific purpose of proving x, y, or z. Yet, they also do not prove x, y, or z.

They are speculative.

And afforded me a space to think about contingency over the last decade.



The Underlying (installation), arebyte gallery, London, 2019. [3]

3 *The Underlying* (commissioned by arebyte Gallery, 2019) and exhibited again recently in the London Open 2022 (Whitechapel Gallery) is an installation: a body of work that includes: *Lag Lag Lag* (video interface with live sentiment/emotion analysis of BPA's on social media/online news), *Derivative* (Virtual Reality, with live sentiment/emotion analysis re BPA's), and *The Prosthetics* (prosthetic optics, blown glass), a surround sound work made with Paul Purgas, and a large sand-drift that sweeps up against the gallery walls.

1. THE UNDERLYING

The Underlying (2019) attempted to grasp, fleetingly, something of the complexities of the multiple, simultaneous scales and temporalities that coalesce around some new, and some very old, power relations which are revealed by the interdependencies of a reputation economy that comes of online news and social media, and the forms of finance driven by this, as they converge in the upcoming environmental challenges ahead.

The focus on *the underlying* in the work, draws attention to the material assets, or rather, to the *price*—i.e. the 'performance' of the underlying—that drives the derivatives markets.

The contractual condition of both the derivative and insurance was key to thinking about environmental concerns in ways that reveal the negative effects of capitalism and the economic underpinning of these effects, through a relationship with the past, as the future comes up increasingly short. The backdrop to this is the increasingly financialised economy via neoliberalism, from the '80s onwards.[4] It is no coincidence that the loosening of regulations in banking and trade began at the same time that the climate became the main focus, and I wanted to grasp something of these interdependencies in the current moment.

Bisphenol A is everywhere – is it safe?

HEALTH | COMMENT 20 October 2010

By David Melzer and Tamara Galloway

Contains more than just water

(Image: Image Source/Rex Features)

Mounting evidence against a chemical we are exposed to daily is being ignored. What more do regulators need, ask ***David Melzer*** *and* ***Tamara Galloway***

4 With the relocation of low and medium tech industries, that meant cheaper labour costs with less regulation, whilst Western countries turned their focus to high end services, with deregulation of the markets and privatisation of the public sector, cutting down on government administered services.

ABSOLUTELY EVERYWHERE: BPA

The Underlying focussed on Bisphenol A (BPA), a pollutant produced alongside the production of plastic since the 1930's, with claims that it is now in the entire world's water supplies and 90% of human bodies. Deemed safe in 2010, like many chemicals now awash in the water supply, this is increasingly being scrutinised, with many products such as water bottles and especially baby products, making claims to be 'BPA free'.

BPA is of particular concern as the two 'hot' points at each end means it binds to humans particularly well, rather than *passing through the body* as other molecules might. It is also a xenoestrogen—a synthetic oestrogen:

> a chemical produced outside the body, which nonetheless has oestrogen-like effects within it. Once classified as safe, since 2010 there has been growing concern over BPA's impact on development, behaviour and mood, amongst other things; some research shows it can increase anxiety and depression.[5]

THE FUTURES MARKET MEETS BEHAVIOURAL FUTURES.

The Underlying co-opts the financier's tool of live sentiment analysis to scour twitter and social media for mentions of BPAs to consider how surveillance, rather than a rogue[6] element of capitalism, enmeshes with the effects of market forces upon the environment, happening at a molecular level.

The work pre-empted many of the conditions brought into sharp focus by the pandemic, as existing inequalities came to the fore fast, facilitated by an unprecedented interconnectivity that reaches across a neoliberal globalised workplace, the effects of which remain inflected by specific geographies and their socio-economic materialities.

Central to risk management, the work foregrounded insurance as a means to consider how models of probability reveal the catastrophic effects of capitalism upon the environment, as 'unprecedented' events become increasingly everyday, and a state of contingency becomes a *modus operandi*.

---

5 Emily Rosamond, "Reputation Regimes," *Art Monthly* 461 (November 2022): 4.

6 I dispute Shoshana Zuboff's reading of data mining in her book *Surveillance Capitalism*—as a non-typical condition of contemporary neoliberal capitalism—and suggest instead that the example that she happens to focus upon serves to make visible the extractive forces underlying all capitalist endeavours. For further explanation in relation to tax havens see, "Twilight of the Tax Haven: A Global Corporate-tax Pact Would Ruin a Lucrative Business Model," *The Economist*, June 3, 2021. https://www.economist.com/finance-and-economics/2021/06/03/twilight-of-the-tax-haven

The Underlying 'interface' includes live sentiment and emotion analysis of mentions of BPA on twitter, online news, and the mediasphere

THE INTERFACE: LAG LAG LAG

Lag Lag Lag, displayed on 8 screens reminiscent of financiers' monitors, developed out of my fascination with how the 'interface'; the dashboard, becomes a site for bringing together something of the complexity that informs the work. The title was both a nod to the Cabaret Voltaire song "Nag Nag Nag," and a joke (at my expense, it turned out), regarding the need for speed in data colocation centres being of the utmost importance, whilst a curiously material condition in digital terms, to which our means of transmission—our cables—are also bound.[7]

7 "... now that computers, not humans, are doing the trading, geography matters exquisitely. With any of these technologies—fibre-optic cable, micro-wave, millimetre wave, laser transmission through the atmosphere—the exact route taken is crucial." Donald MacKenzie, "Be Grateful for Drizzle: High-Frequency Trading," *London Review of Books* 36, no. 17 (September 2014): 27–30.

The interface also allowed me the opportunity to bring together something of the various and distributed ways that we 'sense' the world around us, blurring distinctions between pre-recorded video works and live data, as videos interweave with live 'sentiment' and 'emotion' analysis of the pollutant Bisphenol A on twitter and online news updates. As such, the video works act to enmesh human cognitive as well as non-cognitive processes, blurring human/animal in-distinctions with soft computing, the molecular structure of Bisphenol A, and live data production, engendering the potential as well as the dangers of multiple cross-species hybridities. From a critical posthuman position, this serves to emphasise that any subject to speak of (as questions of authorship also arise) emerges in synthesis with their environment._

The work also emphasises the multiple ways that form and medium (i.e. *how* the story is told, is *also* part of the story),[8] as well as the content of the information we receive, influences our reception of what is being transmitted. Often in combinations of text and image as looping viral feedback systems, that all exist within a competitive economy of attention.

EVOCATIONS

Sound was an integral part of the work, bringing about a relationship with the body that was verging on visceral. I'd been collecting samples from numerous sci-fi's: *Ex-machina*, *Andromeda Strain*, all these great sounds that were often incredible experimental music of their time in their own right. I was thinking of sonic experiments of the sort that would bring about a physical response, holding you, cradling you in sound. The curator Rebecca Edwards described the soundscape as "totally integral to all of the disparate elements of the exhibition coming together"[9] in an interview (2019). A really low bass sound throbs deep underneath, drawing everything together in a physical way whilst also evocative of deep time, which was really important. I liken it to "the kind of sound you experience, but don't really hear, like being on a plane for 14 hours—the deep compression of a molecular spaceship, far out in space, off the shoulder of Orion."[10]

8 N. Katherine Hayles, "Making the Cut: The Interplay of Narrative and System, or What Systems Theory Can't See," *Cultural Critique* 30 (Spring, 1995): 78.

9 Rebecca Edwards, "Ami Clarke Interviewed by arebyte Gallery Curator Rebecca Edwards," *arebyte*, 2019,
https://www.arebyte.com/ami-clarke-interview-with-rebecca-edwards

10 Edwards, "Ami Clarke Interviewed."

AUTHORSHIP: POROSITY/MULTIPLICITY.

Many texts riddle their way through the work, drawn live from online news feeds, interwoven with theory on the history of calculus, with varying degrees of 'liveness'. The sentiment and emotion analysis trained on twitter and online news, occurs as soon as the work is turned on, and continues to update throughout the day, overlaying a 5-minute cycle of videos interwoven with various texts. Rolling news runs across the bottom of the bank of screens, emulating the endless 24-hour news cycle made popular by aggressive media moguls such as Rupert Murdoch. News feed updates are shown (scrolling upward) with the live sentiment analysis of BPA mentions in online news production—shown on a spectrum between –1 and 1. A live twitter feed (scrolling upward) also shows sentiment analysis of mentions of BPA, on a spectrum between –1 and 1, and emotion analysis showing joy, anger, disgust, fear, sadness via emojis. spectrum between –1 and 1, and emotion analysis showing joy, anger, disgust, fear, sadness via emojis.

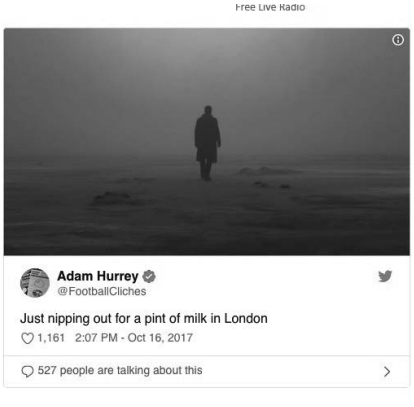
The texts moving horizontally across the middle of the screen (known as barrages)—are a phenomenon of online video streaming, where the watching audience is encouraged to comment on the video as it is being streamed live, often obliterating the image. Both these and the rolling news at the bottom of the screen are excerpts from a constantly re-edited script and performance, that reflected on the influence of calculus on current conditions, developed over a ten-year period titled 'Error-Correction: An Introduction to Future Diagrams.' Diagrams have this capacity to draw together complex threads that reveal something of the processes, conditions, and relations of power flowing through today's human/technological assemblages and always point to the next diagram.

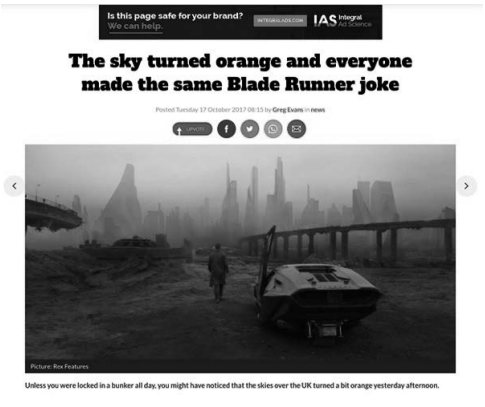
Virtual Reality work: *Derivative*, part of *The Underlying*.

PULLING THE PAST INTO THE FUTURE

Visitors to the virtual reality work, *Derivative*, arrive just outside the iconic striped postmodern landmark of 1 Poultry, in the historical financial district around Bank, in the heart of the City of London, immersed within a dusty crystalline maze, in which familiar landmarks merge with multiple fractured views, reminiscent of popular Sci-Fis such as *Bladerunner 2049* and the Netflix series *Mars*.

The work drew upon a moment captured in meme history, that revealed a glaring blind spot unique to the West (in 2019) with regards to what a natural disaster might look like. As hurricane Ophelia descended, the only point of reference for a dust storm making the London sky turn orange was a fictional depiction of disaster, recounted in numerous news stories as when "the sky turned orange, and everyone made the same Blade Runner joke."



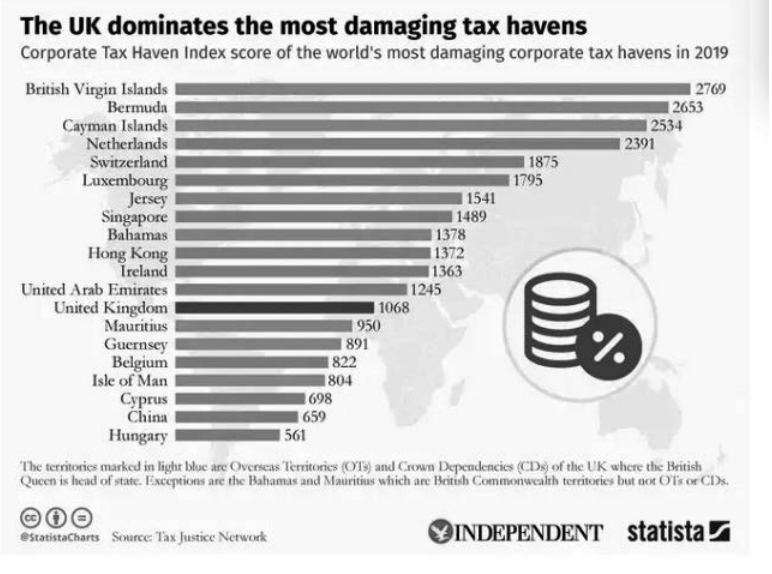


A deeply immersive experience, visitors are invited to explore the VR environment, as live sentiment analysis focussed on mentions of BPAs inform the landscape via an HUD (a transparent heads-up display common in gaming) that shows the most recent tweet and news update with its sentiment/emotion analysis reading, which in turn informs the amount of airborne particles that occur during the visitor's experience.

A PARALLEL PRESENT

The VR work is set in a parallel present that asks just how 'virtual' the extractive practices of capitalism really are, with little regard shown for the very real costs to the environment and the people living there. As particles escape the virtual landscape, they slump up against the gallery wall in the form of a huge sand drift, that in turn informs the materiality of the clusters of glass eyes of *The Prosthetics*.

The work emphasised (in 2019) that an important aspect of the climate challenges ahead is to address, from an initial phase, present inequalities borne out of colonialism, with legacies often found in geographical locations with projections of the most volatile environmental futures. Since then, discussion at COP26 (2021) and COP27 (2022) has emphasised how climate debt is essential to address, with a (far too) slow acceptance that loss and damage was vital, from those who historically benefitted from colonialism during Industrialisation.



It was also important to pull upon an often unacknowledged thread that draws together Britain's earlier extractive practices during Empire to the present day, with Britain

being by far the biggest enabler of global corporate tax dodging, per ground-breaking research by the Tax Justice Network.[11] The research highlights a widely acknowledged, but fundamentally unsolved situation that points to "the role of the UK and its network of Overseas Territories and Crown Dependencies in undermining the ability of other countries, including some of the poorest in the world, to provide for the most basic rights of their citizens."[12]

This is where much of the current moment crystallizes; around wealth derived from relations that inscribe ongoing inequalities. This is where the secret sauce of memetic media meets the magic sauce of right-wing billionaires, underwriting political campaigns to facilitate a wholesale move to the hard right, as various strategies emerge, as the planet continues to heat up and the era of fossil fuel power wanes.

A closeup from the interface, of the emotion analysis 'register' of emotions, that include: joy, anger, disgust, sadness, fear.

11 Corporate Tax Haven Index, "The World's Biggest Enablers of Corporate Tax Abuse," https://cthi.taxjustice.net/en/

12 Christian Aid, "Stop Turning a Blind Eye, Christian Aid tells UK after Overseas Territories Top Tax Haven Index," *Christian Aid*, 28 May 2019, https://mediacentre.christianaid.org.uk/stop-turning-a-blind-eye-christian-aid-tells-uk-after-overseas-territories-top-tax-haven-index/.

REPUTATION REGIME

It is also here, in the financial markets, that the management of risk, the reputation economy, and the impending environmental crisis converge in a number of important ways that currently dominate the media-sphere.

The co-opted financier's tool of sentiment and emotion analysis influence a pricing model, built by ex-derivatives trader Jen Elvidge with programming by Rob Prouse, to develop a live interface in the gallery space, that maps the rise and fall of reputation, in real time. Utilising weather futures contracts, pollution data, and the FTSE, fluctuations are plotted in the stock prices of the top 100 most polluting companies in the world responsible for over 70% of emissions. In our pricing model, local pollution data from the longitude and latitude of the gallery also contribute to a speculative view into the rise and fall in reputation of these top 100 companies, as public opinion turns, and insurance companies lose their appetite for underwriting companies dealing in the production of pollutants, such as fossil fuels. The sentiment and emotion analysis, in turn, influences the number of airborne particles in the VR work, Derivative.

In a 2015 analysis, "Social Media, Financial Algorithms and the Hack Crash," Tero Karppi and Kate Crawford draw attention to the Dataminr software that mines Twitter's "firehose" and delivers what is deemed relevant into the hands of traders.[13] (Twitter used the term 'firehose' for complete access to its social media data.). Citing journalist Michelle Price in the Financial News, they write that this sophisticated scoring of the relationships between words in play, can uncover grades of expressed "emotions" and produce more than just a sentiment analysis of Twitter data: "Through real-time analysis of Twitter data, software packages like Dataminr assess emotion, importance and social meaning in order to 'predict the present' and thus transform social media signals into economic information and value.

Karppi and Crawford suggest that digital innovations generally, and software code specifically, are codes also in the sense of being able to shape human conduct. They argue that:

> Twitter and social media are becoming more powerful forces, not just because they connect people or generate new modes of participation, but because they are connecting human communicative spaces to automated computational spaces in ways that are affectively contagious and highly volatile.[14]

13 Tero Karppi and Kate Crawford, "Social Media, Financial Algorithms and the Hack Crash," *Theory, Culture & Society* 33, no. 1 (2016): 79.

14 Karppi and Crawford, 79.

Every society in history exhibits encoded behaviour that acts performatively in describing relations, and hence what is possible between the individual and the communities they live within, often inscribing hierarchies through exclusive or inclusive language and grammar. But here language and code are threaded through the very fabric of the affectual realm. It warps and weaves new kinds of societies, often driven by shock and outrage and increasingly extreme emotions, in tandem with the brute force of algorithmic governance via business models, *not* ethical choices, well beyond the human realm.

LOW ANIMAL SPIRITS.

Low Animal Spirits (2014) a High Frequency Trading (HFT) algorithm dealing in world news, speculated on what is 'about' to trend, and started to speak of the highly volatile production of language, within the calculus of a meme economy.

The work emerged from the semiotic boom in which hyper-speculation via the loss of the referent in both language and the economy can be seen to be shared across the trending behaviour of neoliberal and free market dynamics in finance as well as emerging media ecologies. The work lead on to further writing, and a darkly absurdist work titled "Alexa, Google, 23andme," that focused on a sub-reddit group called r/MemeEconomy[15] which assessed memes in terms of financial fecundity and importantly pointed to the social

15 r/MemeEconomy is a satirical notion and online subculture in which memes are addressed in financial language as if they were commodities or capital assets with varying prices.

currency by which memes operate.[16]

In his book *Technic and Magic: The Reconstruction of Reality*, Frederico Campagna writes about the totalizing effect of language that is peculiar to this era, where "record-shattering investments in Big-Data systems and technology rest on the belief that there can't possibly be anything ontologically relevant that couldn't, at least potentially, be reduced (and reduced truthfully) to the serial units of the language of data." He made the case that "through substituting the terms 'information technology' with 'finance', we can understand the contemporary role played by financial capitalism, not merely as translator of the world into its own linguistic structure, but as the creator of a world that coincides exactly with such structure."[17]

Campagna goes on to reflect upon a selection of practices including spirituality, religion, and magic(k), that try in different ways to grapple with this seeming slip in the warp and weft of reality.

It seems pertinent, though, first, to ask which 'reality' paradigm is being distorted, in the first place. The myth of the market, that so indoctrinates a sense of things, with animal spirits informing the vision and heroic stance of the individualistic trader seeking to buck the trend, work against the flow, and 'reboot' the market, when caught in a downturn of low animal spirits, succeeds in naturalising behaviours that can only come of this particular assemblage, at this particular historical moment. Neoliberalism emerged around the same time as the Neo-Darwinists who, in turn, had adopted ideas from the markets that informed concepts of the 'selfish gene', and in evolutionary terms: the competitive spirt of 'survival of the fittest'. That this was it's mantra, rather than opt for the more collaborative approach that the evolutionary biologist Lynn Margulis's studies pointed to, for example, leaves little doubt that it was a deeply ideological decision to do so.

16 Ioana Literat and Sarah van den Berg, "Buy Memes Low, Sell Memes High: Vernacular Criticism and Collective Negotiations of Value on Reddit's MemeEconomy," *Information, Communication & Society* 22, no. 2 (2017).

17 Frederico Campagna, *Technic and Magic, The Reconstruction of Reality* (London: Bloomsbury Academic, 2018), 42.

Ami Clarke: Author of the Blank Swan

THE NATURE OF CONTINGENCY

Ami Clarke: Author of the Blank Swan[18] was a work made in response to Elie Ayache's book *The Blank Swan*—a book about 'writing', 'pricing' and 'contingent claims', in which he suggests that 'writing' has an equivalence to 'pricing' in the derivatives markets. His philosophical enquiry asked, "what technology might be available to get inside the very process of history and do something more active than to watch passively as history unfolds...altogether different from the conceptual activity consisting in predicting and outguessing history."[19]

The Blank Swan focuses on the Jorge Louis Borges' story of "Pierre Menard, Author of the Quixote" that depicts a fictional writer and critic; Pierre Menard, who spends his time writing the 9th and 38th chapters of the first part of the 17th century book *Don Quixote* by Miguel de Cervantes, and a fragment of chapter 22—several centuries on from when the text was published. As such, interpretations of the Borges story tend to focus on how 'reading' brings about 'difference' through a Barthesian emphasis on the true locus of writing as reading. Conversely, Ayache's focus interpellates Borges' fiction with the apparatus of the derivatives markets: the dynamic replication of the BSM (Black Scholes Merton) model, and the derivative contract, that implicitly relies on writing. Taking him up on his challenge, with each word that I wrote of "The Blank Swan: Chapter 4, Writing and the Market," one dismal winter holiday break, with a snivelling wretched cold: there was simply nothing that could guarantee that any given word would necessarily follow the next.

18 During the ICA London Technology Now series of talks (https://archive.ica.art/whats-on/series/technology-now), I explore how Jorge Louis Borges' story "Pierre Menard, Author of the Quixote," central to Ayache's philosophy, differs from previous ideas of copying and appropriation, to repeat the contingency of the text.

19 Elie Ayache, *The Blank Swan: The End of Probability*, (Chichester: Wiley, 2015), 92.

The artist Elaine Sturtevant back-dates her artist's book *Sturtevant: Author of the Quixote,*[20] published in 2009, via a letter written to Borges in the introduction, to 1970, around the time of her early practice of making works of other artists works. As Patricia Lee notes "pushing the codification of artists to specific signifiers" in relation to the structures and systems of art, and thereby reducing the artists' work to a sign; a brand: an easy meme producer, percolating myths of genius, and so on, that could be seen to have more to do with the market than whatever other values might be claimed for art at any given time in history. Sturtevant's emphasis on "the brutal truth of the work is that it is not a copy" is shared in Ayache's thinking when she claims "the dynamics of the work is that it throws out representation."[21] Ayache writes "Only through the writing/trading performance and not through the realization of a theoretical stochastic process, that is framed in representational thought, can the writer or trader of contingent claims exceed the saturated context and move to the next—i.e. he can trade."[22] What this brings forth, in Ayache's terms, is the trading room and a performative capacity that is singular and non-reproducible.

A capacity to write the future, seemingly shared across the blockchain in so far as a technology that exceeds probability through the timestamp. A startling, brilliant grasp of contingent forces at work.

But, via the abstraction of finance, and the absence of the indexical link to the referent, these futures are simply not embedded in any material sense of reality. As Hayles notes, "Ayache's vision of the market's ontological power is a neoliberal fantasy run wild, fuelled by Quentin Meillassoux's (2010) philosophical argument for the absolute nature of contingency and applied by Ayache to finance capital."[23] As such, the promises made, sound much like those made for blockchains bright new future, a decade or so ago, that is (for the most part) still yet to materialise. Blockchain, and derivative trading softwares, are, after all, only tools, and just as a pen is only useful in so far as what you choose to write with it, so is the potential of contingency. The most urgent and compelling aspect of the equation, for me, then, on either account, is *who* gets to write the future in this new calculus.[24]

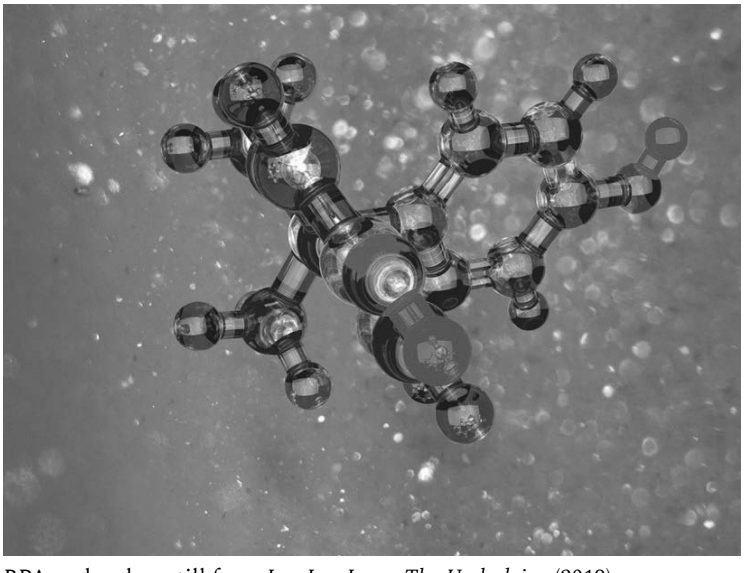
20 Elaine Sturtevant, *Sturtevant: Author of the Quixote*, (Cologne: Walter Koenig, 2009).

21 Patricia Lee, *Sturtevant: Warhol Marilyn (Afterall)*, (Cambridge, MA: MIT Press, 2016), 21.

22 Ayache, 7.

23 N. Katherine Hayles, *Unthought: The Power of The Cognitive Nonconscious*, (Chicago: The University of Chicago Press, 2017), 148.

24 Ami Clarke, "Text as Market," in *Artists Re:Thinking the Blockchain*,ed. Ruth Catlow, Marc Garrett, Nathan Jones and Sam Skinner (Torque Editions & Furtherfield, 2017), 134.



BPA molecule – still from *Lag Lag Lag – The Underlying* (2019)

2. "HOW TO ACT IN A TECHNO BAROQUE CONDITION," PRECIADO ASKS.

Publishing and writing developed alongside technological advances throughout history, and has a tendency to reveal how technologies inflect, as well as contain, traces of the 'subject'—i.e. the 'I' that writes: the author—emerging in synthesis with their environment. That necessarily includes the means of production and distribution at any given time in history, and in a present-day context that includes X, Twitter, TikTok, Instagram, Facebook and so on, all of which operate within the protocols of platform capitalism[25] and surveillance capitalism. What this also means is that it is necessary to include the hardware, the software, and the broadband speed, as well as legislation governing net neutrality (for example), or whether the government chooses to act on emissions data (for example), as well as other networked protocols, and the material distinctiveness of geographic regions, that all contribute to specific socio-economic and political configurations.

The online journal and publishing organization Triple Canopy describe this new milieu of software, hardware, and (undercover) ideology, in their essay "The Binder and the Server," as such: "power is no longer exercised at fixed co-ordinates along clear lines of force; rather, power is pervasive and operates subtly."[26] They go on to elaborate on the new conditions described in "Galloway's theoretical model for *Protocol"* which they say is "heavily indebted to Gilles Deleuze's tantalizingly brief (or frustratingly underdeveloped, depending on your disposition) 'Postscript on the Societies of Control' …'the essay argues

25 See Nick Srnicek, *Platform Capitalism* (Polity, 2016).

26 Colby Chamberlain, "The Binder and the Server," *Triple Canopy*, 18 February, 2012. http://art-journal.collegeart.org/?p=2644

that the enclosed institutions of Foucault's discipline society—the barracks, the school, the prison—have given way to the continuous, open-ended topologies of what Deleuze calls control societies.'"[27] In *Protocol,* Galloway's point is that computer protocols are prime examples of control at work shifting from serial and optical control, to modulatory control of data.[28]

Writing in *Cloud Time* in 2012, Coley and Lockwood describe that while Michel Foucault's panopticon was a vision machine, "control" is about the "accumulation of knowledge and the sorting and ordering of this knowledge."[29] Thus "control" deals "less directly with bodies than with the data patterns that result from such sorting procedures."[30] In this sense, "I am ghosted by my data double—it's not me, the individual, that is at issue, it is the non-conscious agency of my data ghost, the "dividual" as Gilles Deleuze puts it".[31] "Control *modulates* bodies, it does not confine or render them static; a form of power which works through the manipulation of the flows which move bodies, and the thresholds across which they must cross"[32] as data becomes "a strategic asset and a behavioural surplus, underwriting in turn, a monetary surplus for the likes of Google, Microsoft, Amazon with a colonising ruthlessness."[33]

The "semiotic boom" of the linguistic turn, then, whereby hyper-speculation via the loss of the referent in both language and the economy are shared across the trending behaviour of neoliberal/free market dynamics in finance, as well as emerging media ecologies, very much like the markets had done in a previous era, provided a primary site for the research of cognitive bias. In turn, affording a glimpse of a highly volatile and paradoxical model of mass-behaviour, at a time when the traditional figure of the deeply indebted subject, *homo economicus*, became raw material in a lifeworld utilised as a system for the notation of market trend data. Questions regarding the currency of data then emerge with platform protocols, just as data as a currency might still unfold. Much like the Wages for Housework movement noted, historically, it really doesn't matter if you want to think of human interactions and emotional responses as quantifiable or not—it's happening anyway.

In this panopticon, *The Underlying* suggests that molecular entanglements enmesh with

---

27 Chamberlain

28 See Alexander R. Galloway, *Protocol: How Control Exists after Decentralization*, (Cambridge, MA: MIT Press, 2006).

29 Coley and Lockwood, 19.

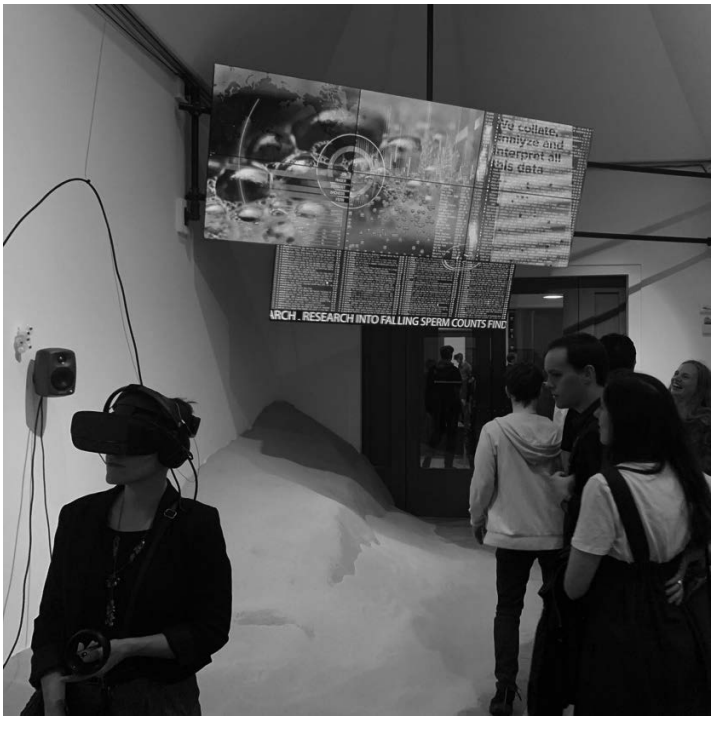
30 Coley and Lockwood, 19.

31 Coley and Lockwood, 19 referencing: Gilles Deleuze, "Postscript on the Societies of Control," *October* 59 (Winter, 1992): 4, 6. http://links.jstor.org/sici?sici=01622870%28199224%2959%3C3%3APOTSOC%3E2.0.CO%3B2-T.

32 Coley and Lockwood, 19

33 Zuboff, quoted in Naughton.

Deleuze's modulatory control of data, as sentiment analysis mines Twitter's 'firehose' and a sophisticated scoring of the relationships between words in play, uncovering grades of expressed 'emotions' as well as importance and social meaning—"in order to 'predict the present' and thus transform social media signals into economic information and value."[34]



The Underlying installation in The London Open, Whitechapel Gallery, London 2022.

REPLICANT / POSTHUMAN

> "If nature is unjust—then change nature"
>
> (*The Xenofeminist Manifesto: A Politics for Alienation*[35])

Derivative draws from the popular imaginary of blockbuster film productions, but located amongst the City of London's financial district, for something more akin to "Bladerunner 2019: The Burnout" in the year the first film was set. The replicant in Ridley Scott's *Bladerunner* had been an important construct to me growing up as a teenager—one that

34 Karppi and Crawford, 80.

35 Laboria Cuboniks, *The Xenofeminist Manifesto: A Politics for Alienation* (London: Verso, 2018).

was left ambiguous, as Deckard's status as to whether he is replicant or human, is never revealed, whilst the 2017 film lost this nuance almost entirely.

Fascinated by Bisphenol A, as oestrogen left me during menopause, it took me back to adolescence where I was prescribed synthetic oestrogen at the Tall Girls Clinic: Department of Growth and Development, Great Ormond St Children's hospital, in a desperate bid to limit my growth. As I emerged via biochemical prosthesis, I was fully aware of the plasticity of gender, in stark contrast to any biological determinism.

Here, the alienation inherent in being a cyborg (replicant, or post-human), as *a machine aware of being a machine* leads to an understanding of identity as a construct, that hence can be constructed anew, whilst foregrounding how technologies such as synthetic hormones, for example, lead to a *writing* technology of choice.[36] Preciado writes: "A shift from the mechanical idea of the body to a body that is defined through the system of communication, a network, 'a thick interiority' full of networks. Therefore, the task is to intervene in these connections—a biomedial theory, and a theory of communication that holds material effect of these exchanges. Again, drawing attention to the constructed nature of the sexual binary, neither 'an anatomic truth, a hormonal truth nor a morphological truth (1940's)', whilst homosexuality was invented for the purposes of shoring up heterosexuality and the management of reproduction, as labour force for capitalism."[37]

Preciado's reworking of Foucault's history of sexuality (for Foucault is no feminist, let us not forget), describes the necropolitical regime as it enters biopolitical forms of government, with the regime of hormones in the pharmaco-pornographic era making progesterone and oestrogen the best sellers in the history of pharmacology, and key elements of global capitalism.

36 Accordingly, for Preciado agency is accessible through prostheses: we are constructed through drugs, objects and representations, but we can also construct ourselves through them." Paul B. Preciado, "Testo Junkie: Hormones, Power, and Resistance in the Pharmacopornographic Regime," Public lecture at Wellcome Collection, London, 5 June, 2018.

37 Paul B. Preciado, "Testo Junkie: Hormones, Power, and Resistance in the Pharmacopornographic Regime," Public lecture at Wellcome Collection, London, 5 June, 2018.

The Prosthetics[38]

ASSEMBLAGES

Whilst the complex interweavings of humans and technologies are nothing new, they often include a relationship between people and technology so intimate that it's no longer possible to tell where we end and machines begin.[39] Donna Haraway famously drew attention to the technology of sports footwear, insisting that this include "the interaction of medicine, diet, training practices, clothing and equipment manufacture, visualization and timekeeping."[40]

38 Foregrounding the technicity of new horizons, whilst blurring the binaries of natural versus artificial, *The Prosthetics*—three sculptures made of ocular prosthesis (glass eyes)—cluster together, looking out from the corners of the galleries architecture, emphasising the idea of sharing resources, that in turn, spawns new configurations, calibrations, and collaborations. Reminiscent of organic organisms, they draw reference from the Fates, the three sisters forced to share one eye between them. Suggestive of the surveillance that drives data analysis, they also point to the limited resources of a dwindling biosphere, but also to the collective approach necessary to face the challenges ahead regarding environmental change.

39 Hari Kunzru, "You Are Cyborg: For Writer, Professor, and Self-Proclaimed Cyborg Donna Haraway, We Are Already Assimilated," *Wired,* February 1, 1997. https://www.wired.com/1997/02/ffharaway/.

40 Kunzru.

Here, it is important to combine Haraway's thinking with N. Katherine Hayles' work, where rather than networks:

> […] cognitive assemblages come together, create connections between human and technical actors, initiate, modify and transform information flows, thereby bringing contexts into existence that always already determine the kinds and scope of decisions possible within milieus and the meanings that emerge within them.[41]

The emphasis in posthumanism is that human subjectivity emerges in subtly different ways during different eras, dependent on the technologies to hand, be it the pencil, the printer, or the smartphone. Implicitly, this also means that subjectivity emerges through market relations.[42] And the intimacy of these relations means that we inhabit networks so tangled, that Hari Kunzru writes (referencing Donna Haraway's work):

> If this sounds complicated, that's because it is—part human, part machine; complex hybrids of meat and metal that relegate old-fashioned concepts like natural and artificial to the archives. These hybrid networks are the cyborgs, and they don't just surround us—they incorporate us.[43]

When the ways by which people communicate with one another in the public realm is predicated upon a business model such as social media's ranking system, where news becomes a popularity contest, based upon intensities of outrage, within an economy of attention, in what the theoretician Emily Rosamond describes as a 'reputation regime' (and a shift from General Intelligence to General Opinion) - this can be both indicative of 'how' this is engineered, as well as far wider issues.

Issues to do with control and the desire to freely express oneself, linger in the frictions between code and language typified in Neal Stephenson's *Snow Crash* [44] of 1992—a narrative still driving the culture wars, of which little has changed since. Alongside this, the perception of the bounded self of the neoliberal subject, seems at stake, no less, grounded upon the concept of free will. As such, the spectre of 'control' riddles its way through *Snow Crash* with the ancient Sumerian nam-shub described by Stephenson as a programming language that asks questions about the performativity of language, and code, both in societal as well as computational terms. In posthuman terms, Hayles describes

41 N. Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (London: University of Chicago Press, 1999), 117.

42 Hayles, *How We Became Posthuman*, 117.

43 Kunzru.

44 Neal Stephenson, *Snow Crash* (New York: Bantam Books, 1992).

the way that 'control' seems central to human identity as the sense of a conscious agency. Hayles writes, by contrast, the posthuman view has never been 'in control' in the first place. She describes how

> The illusion of control, bespeaks a fundamental ignorance about the nature of the emergent processes through which consciousness, the organism, and the environment are constituted. Mastery through the exercise of autonomous will is merely the story consciousness tells itself to explain results that actually come about through chaotic dynamics and emergent structures.[45]

With these new dynamics in play, it seems also pertinent to address the ways by which we might perceive of the flows of information, power and identity, in a more up-to-date diagram, that is capable of capturing something of the affectual realm in which they exist. I refer to Hayles' concept of an assemblage, where sophisticated information-processing abilities happen where humans and cognitive technical systems interact to form 'cognitive assemblages'.[46] I foreground her use of the word assemblage as a term that distinguishes between different material forces acting within it, that is: consistent with pre-existing entities, within a growing spectrum of cognitive and non-cognitive actors and actants, that becomes an assemblage due to the information moving through it, as parts fall off, as well as join.[47]

still from *Lag Lag Lag*, interface, *The Underlying*

45 Hayles, *How We Became Posthuman*, 288.

46 Hayles, *Unthought*.

47 N. Katherine Hayles, "Cybersemiosis: Meaning-Making in Humans, Nonhumans and Computational Media," Guest Lecture at Archaeologies of Media and Technology Research Group, Winchester School of Art, Southampton University (2018).

CONTINGENCY, AND THE PROBLEM WITH AUTOPOIESIS

> "How, finally, can we know and constitute our social reality outside the necessarily circular and cognitively closed terms that are lawlikely indispensable to the existential enactment and stable replication of our own societal order as such a living system?"[48]

In "Making the Cut: The Interplay of Narrative and System, or What Systems Theory Can't See," Hayles writes that "*how* the story is told is also part of the story"[49] whilst attempting to describe the Chilean neurophysiologist Humberto Maturana's takeover of the concept of autopoiesis. Upon dissecting Maturana's biologically influenced conception that the 'organisation' of the system is primary, she goes on to propose that this is not only incorrect (in terms of its reference), but irredeemably problematised by the exiting of the observer within the system itself.

Whilst Maturana is dealing with organisms, though, Luhmann is dealing with societies, and she writes, "the *mechanism* of closure is displaced from the working of perception onto the working of codes."[50] Thus the circularity of autopoiesis is realised between a system's codes and its organisation. For Luhmann, "interaction takes place between the codes that social agents employ."[51] Hayles summarises that for Luhmann, "When one goes out to drink, one employs the code of drinking, and it is this code, not the individual's thoughts or activities, that constitute drinking as drinking. What autopoietic biological processes are to Maturana, social codes are to Luhmann."[52]

She describes how the problem with systems theory, is that once the system is revealed, whether it be the invisible workings of power in Foucault's Society of Surveillance, Lacan's psycholinguistics, or Maturana's autopoiesis—the system, precisely because of its logic and power, is likely to seem inevitable and inescapable.

As she develops her argument, she remarks that for systems theorists, Luhmann is remarkable, though, in recognising that every system has an outside that cannot be grasped from inside the system. The advantage she seeks to claim for narrative, points to the fact that the closure that systems theory imposes, is not inevitable, as Maturana would have us believe, but *contingent*.

---

48 Sylvia Wynter, "The Ceremony Found: Towards The Autopoetic Turn/Overturn, Its Autonomy Of Human Agency And Extraterritoriality Of (Self-)Cognition," in *Black Knowledges/Black Struggles: Essays in Critical Epistemology*, ed. Jason R. Ambroise and Sabine Broeck (Liverpool: Liverpool University Press, 2015), 202.

49 Hayles, "Making the Cut," 78

50 Hayles, "Making the Cut," 96.

51 Hayles, "Making the Cut," 96

52 Hayles, "Making the Cut," 96.

She writes:

> Thus, in my reading, a system looms not as an inevitability but rather emerges as a historically specific construction that always could have been other than what it is, had the accidents of history been other than what they were. In this reading, one exits the system not merely to enter another system, but to explore the exhilarating and chaotic space of constructions that are contingent on time and place, dependent on specific women and men making situated decisions, partly building on what has gone before and partly reaching out toward the new.[53]

In a way that I cannot possibly hope to do justice to here, but I want to mention nonetheless, Sylvia Wynters addresses the concept of neurotechnicity in the "Autopoetic Turn/ Overturn," modelling a telos of the Ceremony Found's *New Studia,* which takes account of the biological reward system and drives the constituting of self-replicating codes, that I would suggest are also to be found in the operation of memes as social currency.

Wynters work provides a summary of the multiple paradigms concurrently converging, of which a brief excerpt, reads as such:

> Indeed, the imperative need for such a transformative mutation takes on added importance when linked to the "particular wrong" identified by W. E. B. Du Bois in 1903 as the negation of our co-humanity as a species via the "Color Line," as well as to the "general wrong" of Gerald Barney's (and Aurelio Peccei's) "global problematique" and its intractable "problem" of the looming possibility of our and other species' extinction as a result of the related threats of global warming, climate change and general ecological cum environmental degradation.[54]

Identifying these, necessarily, as "generated by our performative-enactment and behavioural-praxis of the planetarily extended, secular Western, now neo-Liberal-monohumanist *genre* of being hybridly human *Man*(2), itself over-represented in *homo oeconomicus* cum neo-Darwinian terms as *homo sapiens sapiens* as if this self-definition were isomorphic with the *being* of being human as *Homo Narrans* itself."[55]

53 Hayles, "Making the Cut," 98–99
54 Wynter, "The Ceremony Found," 222
55 Wynter "The Ceremony Found," 222

EPISTEMIC SHIFT

Preciado's discussion with Jack Halberstam at the ICA in 2020 draws attention to the epistemic shift, from writing to the internet, the like of which the world has not seen since the 16th Century. He described how "Copernicus's critique of the Ptolemic conception of the universe, show[ed] how deconstruction is not a set of criticisms meant to make a system better—the idea that the earth goes round the sun is not an improvement of the idea that the sun goes round the earth—but a shift in perspective that literally makes the ground move".[56]

He writes further on the shift currently underway, as such:

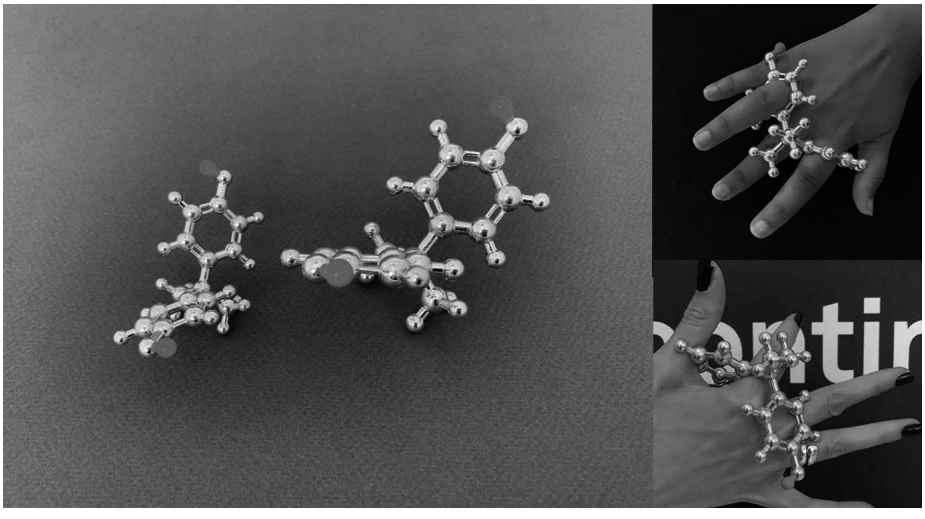
> If the concept of gender has introduced a rift, the precise reason is that it represents the first self-conscious moment within the epistemology of sexual difference. From this point on, there is no going back; Money is to the history of sexuality what Hegel is to the history of the philosophy and Einstein to the conception of space-time. It is the beginning of the end, the explosion of sex-nature, nature-history, time and space as linearity and extension. With the notion of gender, the medical discourse is unveiling its arbitrary foundations and it's constructivist character, and at the same time opening the way for new forms of resistance and political action.[57]

In these instances, code and language are central to a new paradigm, of both control and of surveillance, as well as sites of enormous creative potential (despite too few instances to be seen of this sort thus far. (See Project Cybersen,[58] Chilean president Allende's attempt at a socialist 'web' with British cybernetician Stafford Beer, for alternative visions of what might have been, and what could still be).

56 "Paul B. Preciado with Jack Halberstam," Critical Conversations at the Institute of Contemporary Arts, 2020.

57 Paul B. Preciado, *Testo Junkie: Sex, Drugs and Biopolitics in the Pharmacopornographic Era*, trans. Bruce Benderson (New York: The Feminist Press at CUNY, 2013), 113.

58 See Grupo Synco (Bassam El Baroni, Constantinos Miltiadis, Georgios Cherouvim, and Gerriet K. Sharma), *Cybersyn 1973/2023*, 2022, https://vimeo.com/572121732
Project Cybersyn was an experiment in instituting a socialist networked economy embraced by the short-lived Salvador Allende government of Chile (1970–1973) and developed together with the British cybernetician Stafford Beer. For the past decade, Project Cybersyn has been a recurrent reference—a best practice from the past—in discussions around the repurposing of hegemonic technological infrastructures and their redirection towards more equitable economic and social practices.



BPA molecule wearable sculptures

PHARMAKON

From a posthuman perspective, the BPA molecule in *The Underlying* points both to potential poison, and to the infinite plasticity ran amok in the worlds water supplies.

> —a pharmakon: part poison / part cure
> Pharmacia (Pharmakeia) is also a common noun signifying the administration of the pharmakon, the drug: the medicine and/or poison… socrates compares the written text Phaedrus has brought along to a drug (pharmakon). The pharmakon, this "medicine", this philtre, which acts as both remedy and poison, already introduces islets into the body of the discourse with all its ambivalences…that which resists any philosopheme, indefinitely exceeding its bounds as nonidentity, nonessence, nonsubstance; granting philosophy by that very fact the inexhaustible adversity of what funds it and the infinite absence of what founds it.[59]

An amulet holding within it the potential for infinite plasticity, as a molecular spaceship with the capacity to forge a future engineered differently to the past.
A writing technology of choice. A capacity to write the future.

59 Preciado, *Testo Junkie*, 145

Bibliography

Ayache, Elie. *The Blank Swan: The End of Probability*. Chichester: Wiley, 2010.

Bunz, Mercedes. *The Silent Revolution: How Digitalization Transforms Knowledge, Work, Journalism and Politics Without Making Too Much Noise*. London: Palgrave Pivot, 2013.

Campagna. Frederico. *Technic and Magic: The Reconstruction of Reality*. London: Bloomsbury Publishing, 2018.

Chamberlain, Colby. "The Binder and the Server." *Triple Canopy*, February 18, 2012. http://artjournal.collegeart.org/?p=2644.

Christian Aid. "Stop Turning a Blind Eye, Christian Aid tells UK after Overseas Territories Top Tax Haven Index." *Christian Aid*, May 28, 2019. https://mediacentre.christianaid.org.uk/stop-turning-a-blind-eye-christian-aid-tells-uk-after-overseas-territories-top-tax-haven-index/

Clarke, Ami. "Text as Market." In *Artists Re:Thinking the Blockchain*, edited by Ruth Catlow, Marc Garrett, Nathan Jones and Sam Skinner, 133–140. Torque Editions & Furtherfield, 2017.

Clarke, Ami. "Language in a Meme Economy." *International Journal of Creative Media Research* 5 (October, 2020). https://doi.org/10.33008/IJCMR.202016

Coley, Rob and Dean Lockwood, *Cloud Time: The Inception of the Future*. Zer0 Books, 2012.

Corporate Tax Haven Index. "The World's Biggest Enablers of Corporate Tax Abuse." https://cthi.taxjustice.net/en/

Cuboniks, Laboria. *The Xenofeminist Manifesto: A Politics for Alienation*. London: Verso, 2018.

Deleuze, Gilles. 'Postscript on the Societies of Control." *October* 59 (Winter, 1992): 3–7.

Edwards, Rebecca. "Ami Clarke Interviewed by arebyte Gallery Curator Rebecca Edwards." *arebyte*, 2019. https://www.arebyte.com/ami-clarke-interview-with-rebecca-edwards.

Kunzru, Hari. "You Are Cyborg: For Writer, Professor, and Self-Proclaimed Cyborg Donna Haraway, We Are Already Assimilated." *Wired*. February 1, 1997. https://www.wired.com/1997/02/ffharaway.

Galloway, Alexander R. *Protocol: How Control Exists after Decentralization*. Cambridge, MA: MIT Press, 2006.

Grupo Synco (Bassam El Baroni, Constantinos Miltiadis, Georgios Cherouvim, and Gerriet K. Sharma). *Cybersyn 1973/2023*. 2022. https://vimeo.com/572121732

Harvey, Fiona, Nina Lakhani, and Damien Gayle. "COP27: Is it Right to Talk of Reparations?" *The Guardian*. November 18, 2022. https://www.theguardian.com/environment/2022/nov/18/cop27-is-it-right-to-talk-of-reparations.

Hayles, N. Katherine. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics.* London: University of Chicago Press, 1999.

Hayles. N. Katherine. "Making the Cut: The Interplay of Narrative and System, or What Systems Theory Can't See." *Cultural Critique* 30 (Spring 1995): 71–100.

Hayles N. Katherine. *Unthought: The Power of The Cognitive Nonconscious.* Chicago: University of Chicago Press, 2017.

Hayles, N. Katherine. "Cybersemiosis: Meaning-Making in Humans, Nonhumans and Computational Media." Guest lecture at Archaeologies of Media and Technology Research Group, Winchester School of Art, Southampton University. 2018.

Karppi, Tero and Kate Crawford. "Social Media, Financial Algorithms and the Hack Crash." *Theory, Culture & Society* 33, no. 1 (2016): 73–92.

Lee, Patricia. *Sturtevant: Warhol Marilyn (Afterall)*. Cambridge, MA: MIT Press, 2016.

Literat, Ioana & Sarah van den Berg. "Buy Memes Low, Sell Memes High: Vernacular Criticism and Collective Negotiations of Value on Reddit's MemeEconomy." *Information, Communication & Society* 22, no. 2 (2019): 232–249. https://doi.org/10.1080/1369118X.2017.1366540

MacKenzie, Donald. "Be Grateful for Drizzle: Donald MacKenzie on High-Frequency Trading." *London Review of Books* 36, no. 17 (September, 2014): 27–30.

Naughton, John. "The Goal is to Automate Us: Welcome to the World of Surveillance Capitalism." *The Observer*. January 20, 2019. https://www.theguardian.com/technology/2019/jan/20/shoshana-zuboff-age-of-surveillance-capitalism-google-facebook

"Paul B. Preciado with Jack Halberstam." Critical Conversations at the Institute of Contemporary Arts. London, 2020.

Preciado, Paul. B. *Testo Junkie: Sex, Drugs and Biopolitics in the Pharmacopornographic Era*. Translated by Bruce Benderson. New York: The Feminist Press at CUNY, 2013.

Preciado, Paul B. "Testo Junkie: Hormones, Power, and Resistance in the Pharmacopornographic Regime." Public Lecture at Wellcome Collection, London, 5 June. In the ublic programme *Transitional States: Hormones at the Crossroads of Art and Science* led by Chiara Beccalossi.

Rosamond. Emily. "Reputation Regimes." *Art Monthly* 461 (November, 2022).

Srnicek, Nick. *Platform Capitalism*. Polity, 2016.

Stephenson, Neal. *Snow Crash*. New York: Bantam Books, 1992.

Sturtevant, Elaine. *Sturtevant: Author of the Quixote.* Cologne: Walter Koenig, 2009.

Wynter, Sylvia. "The Ceremony Found: Towards The Autopoetic Turn/Overturn, Its Autonomy Of Human Agency And Extraterritoriality Of (Self-)Cognition." In *Black Knowledges/Black Struggles: Essays in Critical Epistemology*, edited by Jason R. Ambroise Sabine Broeck, 184–245. Liverpool: Liverpool University Press, 2015.

Biographies

Anna Longo is a philosopher attached at the lab LCSP de l'Université Paris Cité. Her research grounds on the French philosophy of the XXth Century and is situated at the crossroad of the philosophy of technology and aesthetics. She is the author of *Le jeu de l'induction : automatisation de la connaissance et réflexion philosophique* (Mimesis 2022) and *Deleuze. Une philosophie de la multiplicité* (Ellipses 2024).

A.A. Cavia is a computer scientist and researcher based in Berlin. He has lectured and exhibited internationally, at institutions such as Jan van Eyck Academie, ZKM, The Bartlett, AdbK Munich, and the The New Centre for Research. His writings have been published by Routledge, Urbanomic, and the Glass Bead Journal. He is the author of one book, *Logiciel: Six Seminars on Computational Reason* (2022), published by &&&.

Betti Marenko is Reader in Design and Techno-Digital Futures at Central Saint Martins, University of the Arts London, where she directs the Hybrid Futures Lab, a platform for design research at the intersection of philosophy, technology, and future-making, and leads the research group Technologies in Question. Her work explores uncertainty as a critical resource for imagining and designing new modes of being alive. She is the author of *The Power of Maybes: Machines, Uncertainty and Design Futures* (Bloomsbury, 2025), co-editor of *Deleuze and Design* (2015) and *Designing Smart Objects in Everyday Life* (2021). Her new research project focuses on design, translation and transdisciplinarity as technologies for planetary diplomacy.

Roberto Bottazzi is an architect, researcher, and educator based in London. He studied in Italy and Canada before moving to London. He is currently Programme Director of the Master in Urban Design at the Bartlett School of Architecture, University College London (UCL). He is the author of *Digital Architecture beyond Computers: Fragments of a Cultural History of Computational Design* (Bloomsbury, 2018, 2021) and co-editor of *Walking Cities: London* (Camberwell Press, 2017, Routledge 2020). Bottazzi's research analyses the impact of computational technologies on architecture and urbanism, and has been exhibited internationally at venues including the Centre Pompidou, Venice Architecture Biennale, FACT Liverpool, and Future Places Porto. His forthcoming book *The Architecture of Void* (Birkhäuser, 2026) will be a monographic study on the work of architects Leonardo Mosso and Laura Catagno-Mosso.

Renzo Filinich is a media artist and researcher based at the Origins Centre, University of the Witwatersrand, working at the intersections of art, technology, and philosophy. His research investigates the relationships between sound, digital media, and human perception, with a particular emphasis on cosmotechnics and post-anthropocentric thought from a Latin American perspective. He has collaborated on interdisciplinary projects such as Quantum Echoes of Humanity, which employs artificial intelligence and anthropological data to reimagine the Anthropocene from the Global South. Filinich's artistic and scholarly work engages with simulation, machinic agency, and the technological individuation of media. He has exhibited and presented internationally and contributes to advancing interdisciplinary dialogues between media arts, digital aesthetics, and scientific research.

Christo Doherty is Associate Professor and Deputy Head Innovation at the University of the Witwatersrand, Johannesburg, where he leads the postgraduate programme in Arts & Science. His research and creative practice operate at the intersections of art, technology, and conflict, focusing on the visual and media representations of militarization, surveillance, and trauma in contemporary society. He has exhibited and published internationally, combining documentary strategies, critical theory, and experimental media to interrogate

the aesthetic and political dimensions of warfare and security in post-apartheid and global contexts. Doherty is also active in practice-based research supervision and has contributed to the development of interdisciplinary art-science collaborations within the South African and international research landscape.

Sebastian Rozenberg is a PhD Candidate at the Department of Culture and Society, Linköping University, with a research focus on media aesthetics and media philosophy. He has a background in Art History and Film studies, and holds an MA in Aesthetics as well as an MS in Information Science. His work integrates aesthetics, phenomenology, media theory and philosophy of technology in order to interrogate the computational basis of everyday visual appearances and experiences, developing a concept of format phenomenology.

Keith Tilford is an artist and writer based in Brooklyn, NY. He is co-creator with Robin MacKay and Reza Negarestani of the graphic novel *Chronosis* (Urbanomic, 2022). Recent essays include "Performing Creativity: Text to Image Synthesis and the Mimicry of Artistic Subjectivity" (2023) and "Deskilling and the Dataset: On the Antagonisms of Automating Diegetic Representations in Comics" (forthcoming).

Ella Dawn McGeough negotiates sticky sites of affection & infection, influence & inheritance, obligation & commitment, encounter & entanglement, inside & outside, you & me, they & we. Their doctoral research drew on the vast potential of beds, human and otherwise (York University, 2023). Alongside Liza Eurich and Colin Miner, they co-edit the publishing project Moire.ca. They recently relocated to Saskatoon (Treaty 6, homeland of the Métis), where they became area chair of Sculpture at the University of Saskatchewan's School for the Arts.

Brendan Flanagan is a visual artist and researcher whose work examines the entanglement of painting, authorship, and generative AI. He is a PhD candidate in Visual Art at York University where his research is supported by a SSHRC Doctoral Fellowship. He holds an MFA from Concordia University and after graduating was a recipient of the Claudine and Stephen Bronfman Fellowship in Fine Art. In the past his work has been written about in *The Globe and Mail*, *The National Post*, *Magenta Magazine*, and *Bad Day Magazine*. He has exhibited in Canada, the United States, and Europe.

Ami Clarke is a visual artist who's practice critically engages and explores ways of living with complexity and uncertainty, drawing out interdependencies across finance, the environment, and ideological apparatus such as neoliberalism, from a critical xeno-feminist post-human position. Their practice spans film, video, sculpture, and sound, often integrating game engines, VR, CGI, and 3D modelling to create multi-dimensional experiences in both real and virtual environments. There is an emphasis upon grasping something of the complexity of the multi-temporalities and scales, cross-species contaminations and alliances that come of posthuman studies, with an evolving awareness of power relations, which necessarily take into account colonial histories as well as neo-colonial extractions of value. Their work is conceptually framed in ways that critique is articulated through it's production, drawing out new behaviours emerging from human engagement with technology, through performative modes. Experimental writing/publishing methods and strategies often drive the work, in both an on and offline context, as well as informing spoken word performance.