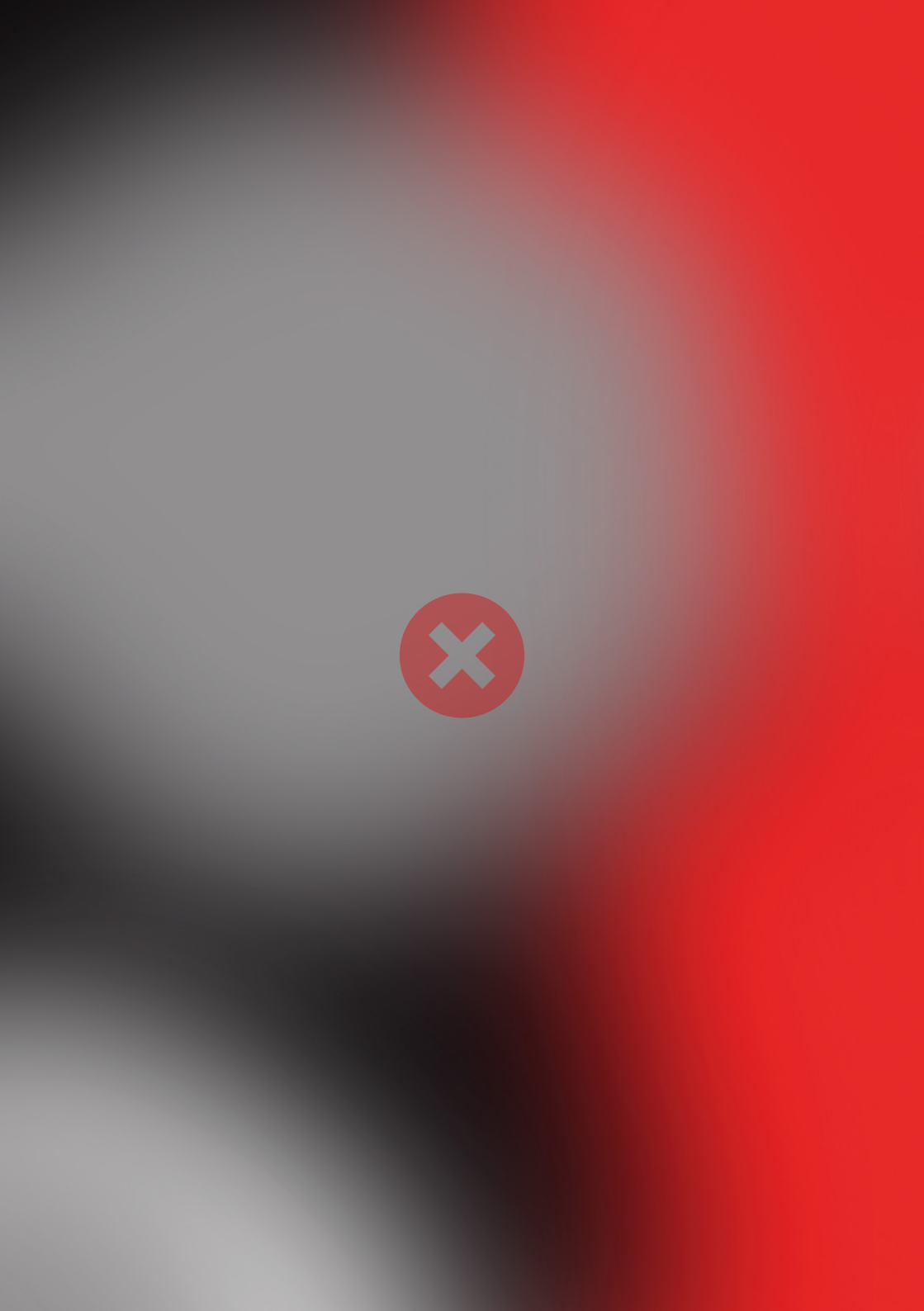

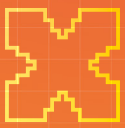

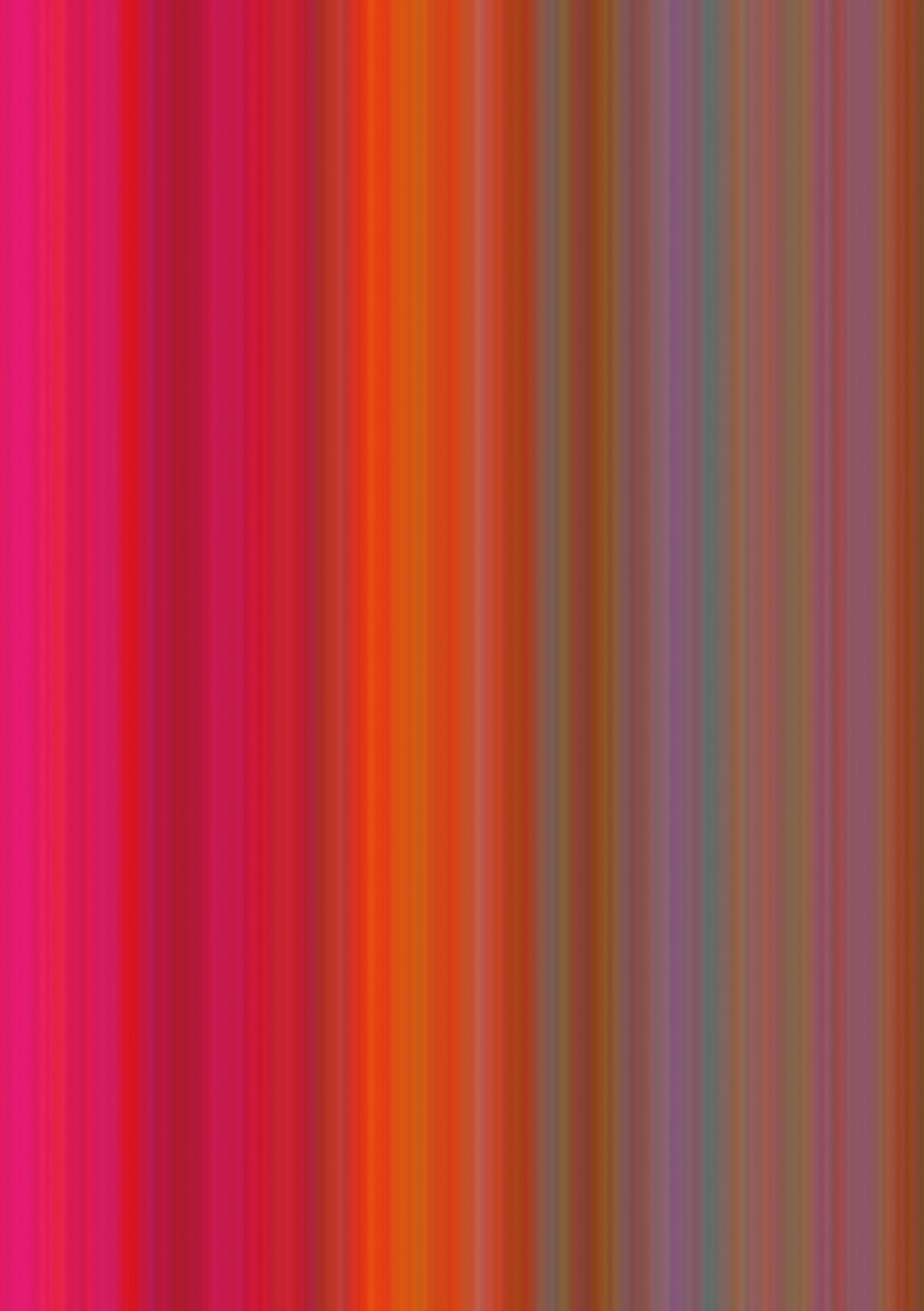

The Book of X
10 Years of Computation, Communication, Aesthetics and X

bookof.xcoax.org

First published in 2022

Published by:

i2ADS: Research Institute in Art, Design and Society
Av. Rodrigues de Freitas, 265
4049-021 Porto
Portugal

Universidade Católica Portuguesa, School of Arts, **CITAR**: Research Centre for Science and Technology of the Arts
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With support by:

This book is financed by national funds through the Portuguese funding agency FCT: Fundação para a Ciência e a Tecnologia, I.P., under the projects UIDP/04395/2020 and UID/00622/2020.

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Design: Miguel Carvalhais, Luísa Ribas

Printing and binding: Gráfica Maiadouro

Legal deposit: 500144/22

ISBN: 978-989-9049-25-3 (Paperback)
978-989-9049-26-0 (PDF)

https://doi.org/10.24840/978-989-9049-26-0

The Book of X

10 Years of Computation,
Communication,
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& X

Contents

Foreword

This book celebrates ten years of xCoAx, the international conference on Computation, Communication, Aesthetics and X, which was first conceived in the winter of 2011 in Rome and, after one and a half year of discussing ideas, concepts, tasks and goals, was brought to reality in the summer of 2013 at the University of Bergamo, Italy.

Crossroads, interconnections, interdisciplinarity, and exchange between the deterministic and quantitative rules of computation and the elusive and qualitative experiences of communication and art have been at the core of this effort since the very beginning, and they are symbolized by the X that has accompanied all editions (and this very book), every time with a new appearance.

The changing form of the X through the years reflects the dynamic nature of xCoAx: conceived mainly as a traditional conference in 2013 in Bergamo, xCoAx was already carrying the seeds that would soon bloom into a multimodal creative effort.

Some participants were ready not only to present and discuss their ideas with a slideshow, but brought their gear to provide material incarnations of their endeavors in the form of artworks and performances. The spaces of the former cloister of

Sant'Agostino were big enough to accommodate this additional layer, but the affordances were limited and some adaptations were required to make everything happen as it was imagined by the organizers and the contributors.

It was an exhilarating experience that marked the beginning of a journey for which there would be more and more rich and complex steps to take each year. The following edition in 2014 in Porto saw a full-fledged exhibition in the AXA Building in the city center and a synergic combination of the performance section of xCoAx with an Algorave in one of the hottest clubs in town. With two successful editions under its belt, xCoAx's path was traced, and the only way was up: the number of submissions was growing from year to year and the venues had to be chosen carefully to keep up with both quality and quantity of those proposals. The stage at the Centre for Contemporary Arts in Glasgow in 2015, the galleries at the Galleria di Arte Moderna e Contemporanea in Bergamo in 2016, Museu Nacional de Arte Contemporânea do Chiado in Lisbon in 2017 and Museo del Traje in Madrid in 2018 were concrete manifestations of how xCoAx was thriving through the years.

It was not, however, a simple growth in scale: always with the goal of catering to the widest audience possible, in 2017 xCoAx introduced an event where didactics and research could meet, the Doctoral Symposium. If the conference, the exhibition, and the performances were arenas where scholars and artists could show their work, discuss theory, and exchange ideas, xCoAx was still missing a more protected place where younger Master's and PhD students could present and test, perhaps for the first time, their research ideas against the expertise and guidance of more experienced researchers. After an incredibly positive feedback from the first students who tried this experiment, the Doctoral

Symposium has become a staple of xCoAx ever since, making it an even more inclusive event, where everybody is welcome to give, take, share and exchange all kinds of theories and practices around computers and art.

To increase the dimensions along which xCoAx enables people to pursue such goals also meant more challenges from a logistic perspective. Simply put, to do more things one needs more space. However, since those things are meant to bring people together, just to have more space wasn't enough: xCoAx needed space organized in a way that would allow for some separation (think of the darkness and silence that some art installations need as opposed to the lights and sounds of some performances), but that would not turn that separation into dispersion, since the event's synergic aims require that all the offerings be within a participant's easy reach. xCoAx hit that sweet spot in 2019 at the Fabbrica del Vapore in Milan, a gigantic former train factory converted into an art complex that strengthened xCoAx's sense of community more than ever, in a space that worked both as a metropolitan square and a tiny village at the same time.

Little did we know that that would be the last "ordinary" xCoAx in a long time. The organizing committee was already working hard with the team from Graz for yet another exciting edition when the world was hit by the covid-19 pandemic, which changed everything, let alone xCoAx. The months leading to xCoAx 2020 were the ones when the world stopped in an unprecedented series of lockdowns that impacted every person, every town, and every country. Traveling was out of question, and the era of online meetings began. Zoom, Teams, Webex... digital platforms only a few had been familiar with became the only way in which classes, lectures and seminars could be held. The transition was not at all easy at the beginning, and for multimodal, in-

ternational events like xCoAx the challenge was even bigger: How to connect people in different timezones to enable the closest thing to a lively and stimulating Q&A session about a paper? How to convey the aesthetic experience of artworks and performances through the standard frames of digital platforms and computer screens?

This might look like an easy feat for xCoAx, full of experts in digital technologies and the arts, but in a new world that was both in chaos and in a standstill, where time and space had no meaning any more, the first full online edition in 2020 was xCoAx's biggest adventure yet.

With the pandemic loosening its grip in some parts of the world, and with some lessons learned from the online experience, xCoAx explored the opportunities offered by the newly emerged hybrid paradigm in 2021. Even outside the context of this event, the jury seems to be still out on whether mixing online and in-person interactions gives us the best of both worlds or rather sheds light on the limits of each approach. Still, seeing the local organizers of Graz use the generous space of the MUMUTH theater for xCoAx was a ray of sunshine after more than a year of mostly indoors life.

We would love to say that the tenth (yet another X) edition of xCoAx could not have happened at a better time, in coincidence with the first event back in person, in the beautiful city of Coimbra. However, we are not back in the same world that we left: we are not yet sure to be out of the pandemic since vaccine distribution has been very different in different parts of the world, we are still facing the risk of new variants, and we might be on the verge of a global war, the kind of which most of us have only read about in history books.

In such circumstances, one might wonder, does it make sense to make xCoAx happen? Does it make sense to celebrate its past ten years? Let us answer with a resounding "yes!"

We do not oscillate between determinism and uncertainty, between rules and creativity only because at xCoAx we deal with computers and art. We do so because it is in our own human nature: all endeavors, be them scientific, cultural, or social, are the dynamic and ever-transforming results of a precarious balance between order and chaos, quantities and qualities, objectivity and subjectivity. All the questions that are asked, tackled, and discussed at xCoAx are ultimately questions about ourselves, about what it means to be human in this world.

Now, more than ever, we need answers not only to be prepared for the future but also to prepare a better future. Thanks to so many people, authors, artists, performers, designers, technicians, volunteers, and institutions, we've had ten fantastic years of such fundamental investigation. Here's to many, many more.

x

The editors

Complexism and the Dionysian X

Philip Galanter

The xCoAx conference captures the spirit of an international movement where both art and science fill the sails of human exploration. The "X" represents the unknown, and all things that defy easy categorization, systemization, or rationalization. In this speculative essay we explore a particular aspect of that X, the Dionysian in art, and why art in academia seems skewed towards the Apollonian.

One of the hallmarks of our contemporary synthesis of art, technology, and critique is a radical interdisciplinarity. Practitioners not only draw from multiple disciplines, they connect those disciplines together, and those bridges in turn become growing territories in their own right. Some will go so far as to claim there is no difference between art and science at all. In considering the Dionysian X we will apply a model of human engagement that precedes our division of knowledge into disciplines.

A place to start might be to ask why there are multiple academic disciplines to begin with. The most obvious response is "division of labor". At the time of Leonardo Di Vinci, it was possible to simultaneously practice a mastery of art and science at the then highest level. Not that many did, but it was within the realm of possibility. That seems to no longer be the case. Each subfield

is so competitive and richly populated, with independent literatures that are deep and dense, that success requires the focused attention of a specialist. Mastery of all is beyond the grasp of mere humans.

This simple need to divide labor results in disciplines based on topic, tradition, content, and historical accident. These disciplines are typically taxonomies of content presented as "objective" hierarchies. However, some see the formation of hyper-competitive distinct disciplines as something peculiar to western capitalist society in the modern age. On the other hand, even in the most "primitive" societies there are often distinct roles for the shaman, the warrior, and the farmer. Each is a relative expert in their discipline.

But there are less arbitrary divisions. Academic disciplines have inherent ideologies. For example, science is ontologically grounded in materialism, where theology is grounded in an unseen immaterial realm. Various fields of critical theory are by design unapologetically politically aligned with the left. Other disciplines, such as business, economics, law, and others are subject to critique as being politically aligned with the right.

Discipline-specific Epistemologies and Complexism

Arguably, the disciplinary differentiations that matter the most are those of epistemology. Within a given discipline, what counts as support for a given opinion? To borrow legal terminology, what are the rules of evidence? And for each discipline what is the status of knowledge? Is "truth" achievable or even meaningful? Science places a premium on empirical evidence, and real-world measurements are seen as truth-revealing data without which verification of a hypothesis would be impossible. Mathematics, on the other hand, turns a blind eye to real world expe-

rience and deals with a purely abstract realm of patterns. Truth in mathematics is a property passed from axiom to inference by applying formal operations. For many the arts can deliver an experiential truth more powerful than what rigorous mathematics or data-rich science can hope for. For others, all human opinions take a back seat to God's will, and the only understanding that really matters is that which God offers via grace and revelation. These epistemological differences are the engines that create the content of, and drive apart, academic disciplines.

This leads to a simple paradox that contributes to the generative power of epistemology. Given a number of disciplines, and thus potentially multiple epistemologies, one might wonder which does the best job. Perhaps a single discipline has a fix on the only truths available to us. Or perhaps we are to pick and choose, moving from discipline to discipline, and epistemology to epistemology, depending on the issue at hand. To be sure there are always multiple methods that might yield a useful answer. Asked plainly, in deciding our rules of evidence, what will be the rules of evidence for making that choice? In choosing a truth-yielding methodology, what methodology should we use? It's easy to see that this pursuit of a meta-methodology, this pursuit of a meta-discipline, quickly leads to an infinite regress.

The contemporary fragmentation of scholarship due to differences in epistemological viewpoint was famously articulated by C.P. Snow in his 1959 Rede lecture "the Two Cultures."[1] Snow anticipates the ideological divide between the modern culture of science and the postmodern culture found in the humanities. This divide led to the so called "Science Wars" of the 1990s where those in the humanities field called "science studies" fig-

1 Charles Percy Snow, *The Two Cultures* (London: Canto, 1993).

uratively put the sciences under the microscope.[2] This humanities-based critique was ignored by most scientists, but some scientists launched counterattacks in the form of "the Sokal Hoax" as well as books and articles.[3,4,5]

This epistemological divide was well captured by Phillip A. Sullivan by quoting two contrasting frameworks. First, from astronomer John Barrow,[6] note this list of typically unstated assumptions embraced by the epistemology of science:

- There is an external world separable from our perception.
- The world is rational: "A" and "not A" cannot be simultaneously true.
- The world can be analyzed locally: that is, we can examine a process without having to take into account all the events occurring elsewhere.
- We can separate events from our perception of them.
- There are predictable regularities in nature.
- The world can be described by mathematics.
- These presuppositions hold everywhere and at all times.

Sullivan contrasts this with the culturally relativistic epistemology typical in the postmodern humanities, and described here by the philosopher Susan Haack.[7]

- Social values are inseparable from scientific enquiry.
- The purpose of science is the achievement of social goals.

2 Philip Galanter, "An introduction to complexism," *Technoetic Arts: A Journal of Speculative Research* 14, 1/2 (2016):9-31.
3 Noretta Koertge, *A House Built on Sand: Exposing Postmodernist Myths About Science* (New York: Oxford University Press, 1998).
4 Alan D. Sokal, *The Sokal Hoax: The Sham that Shook the Academy* (Lincoln: University of Nebraska Press, 2000).
5 Alan D. Sokal and Jean Bricmont, *Fashionable Nonsense : Postmodern Intellectuals' Abuse of Science* (New York: Picador, 1998).
6 John D. Barrow, *The World Within the World* (Oxford: Clarendon Press, 1988).
7 Rita Zürcher, "Farewell to Reason: A tale of two conferences," *Academic Questions* 9, 2 (1996): 52-60.

- Knowledge is nothing but the product of negotiation among the members of the scientific community.
- Knowledge, facts and reality are nothing more than social constructions.
- Science should be more democratic.
- The physical sciences are subordinate to (i.e., are a sub-discipline of) social science.

These underlying epistemological differences result in bodies of knowledge that are both in conflict and incommensurate. And it was exactly this situation that stimulated my work on an approach I've called *complexism*.[8]

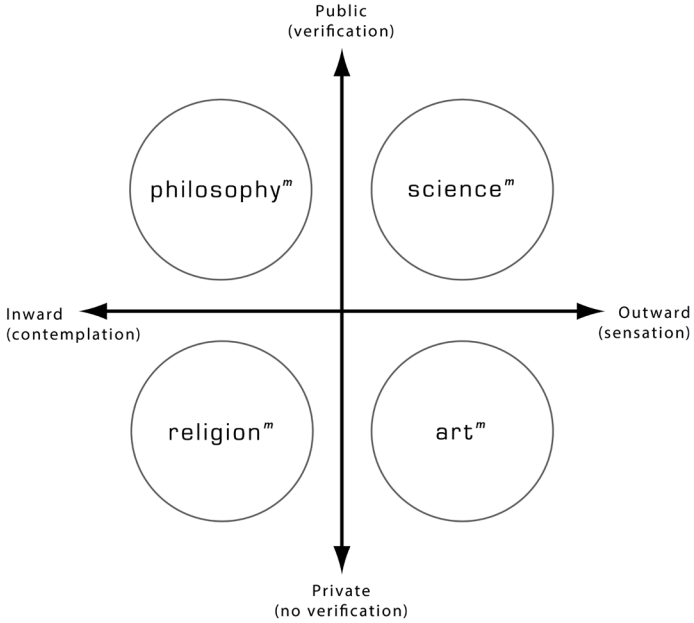
Complexism suggests that complexity science can inform and influence an overall worldview, and that worldview can reconcile the apparently incommensurate modern culture of science and postmodern culture of the humanities. This synthetic effort includes a model of human engagement that precedes the division of knowledge into disciplines.

A Complexism-Based Model of Human Engagement

From the view of complexism, differences among the academic disciplines are real and inescapable. And that is because those differences correspond to multiple universal modes of human engagement with the world. As conjectured here, these modes of engagement require very little in the way of assumptions. They resonate with everyday experience, and logically precede the formation of institutions such as academic disciplines, religions, political organizations, and so on. This is perhaps as much as one can hope for given, as already noted, that seeking a meta-methodology is something of a fool's errand.

8 Galanter, "An introduction to complexism".

The four modes of engagement are created by combining two ways our experience can be divided.



In this model of human engagement experiences can be divided in two ways. First there is the divide between the self and the apparent world. And second there is the divide between the self and other people. Some might wonder whether the second is really a subset of the first. I'm suggesting that humans are socially driven, and existentially interdependent, and because of this, experiences with other humans deserve separate consideration.

The first of these divides, the existential divide, references the basic divide between the self and the world. This provides two ways the self can engage with the world; either by attending outwardly via the senses, or inwardly via contemplation.

When we encounter the world, this happens in two relatively distinct experiential modes. There is an outward mode

where the senses are alive with input, our bodies manipulate external objects as output, and our minds are engaged with the processing of both. But there is also an inward mode where sensory and bodily activity is diminished, and the mind is occupied with abstractions, concepts, emotions, memories, and other mental objects.

(Beyond the scope of this chapter are speculations as to whether there are neurological correlates for these differing mental modes. Perhaps the outward orientation corresponds more closely with the optical pipeline and other sensory circuits, and the inward orientation corresponds with recurrent networks that allow feedback and memory recall.)

In normal life, of course, we are constantly shifting between the inward and the outward. This may happen very quickly. But there are also times of concentrated effort where we sustain an outward (e.g. sports) or inward (e.g. contemplation) stance. I trust that most people would agree that sometimes they "look outward" and sometimes they "look inward".

The second of these divides, the social divide, recognizes that humans are thoroughly social animals, but they also have inner lives inaccessible to others. This suggests two modes of engagement relative to humans; either our experience contributes "public" knowledge that in principle can be duplicated and independently verified by others; or it is a "private" kind of knowledge that cannot be fully shared or verified by others.

So relative to other people there are two kinds of relatively distinct experiential types in play. There are those experiences that can be confidently communicated and independently verified. And then there are experiences that resist communication and verification.

The former we can call public experiences. This doesn't mean the experience in question must be publicized, it just means that in principle the experience can be communicated to others fully and reliably. And most of all a public experience can be verified by others. We can invite others to "see for themselves" and ascertain whether or not their experience matches ours.

The latter we can call private experiences. Again, this doesn't refer to experiences that we keep secret. Rather it refers to experiences with significant aspects that are ineffable. In everyday language we refer to "subjective experience." (Note that the word "subjective" also has numerous technical interpretations in the humanities.) Try as we may, any description of private experiences falls qualitatively short of the mark. Others may or may not have private experiences like our own. We can't know.

The public versus private distinction may at first sound obscure, but in fact it's something we deal with daily. For example, we can have a public experience of measuring the wavelength of red light with a spectrometer. We can ask another person to use their spectrometer and verify the wavelength we measured. What we can't ask another person to do is verify that our aesthetic sensation of red is the same as their aesthetic sensation of red. (This brings to mind the notion of qualia and to some extent what John Searle has called "first person ontology").[9]

The Modes of Engagement as Proto-Disciplines

These two divisions combine creating four modes of engagement. Note the use of the "m" superscript indicating a "mode of engagement." These are not the disciplines they seem to be named after, but rather are distinct kinds of phenomenological

9 John R. Searle, *The Rediscovery of the Mind* (Cambridge: MIT Press, 1992).

engagement that humans have always practiced. These can be also thought of as proto-disciplines. For example, prehistoric humans may not have had science as we understand it today, but they still had outward-oriented experiences that others could potentially verify. That is what is meant by "Science^{m}". It is a mode of outward engagement others can verify. In spoken conversation "Science^{m}" can be referred to as "science mode".

The Existential	**The Social**	**The Mode of Engagement**
Outward Facing	Public Verification	Science^{m}
Outward Facing	Private	Art^{m}
Inward Facing	Public Verification	Philosophy^{m}
Inward Facing	Private	Religion^{m}

Each quadrant represents one of these four modes. For example, there are times when we are facing outward having experiences that others can, in principle, confidently duplicate and verify. Measuring the distance between two objects would be an example. Here we call that kind of empirical engagement Science^{m}.

But sometimes our outward attention is such that we are moved towards the ineffable. Perhaps it is the indescribable experience of the sublime as discussed by Kant.[10] Or perhaps it is simply that the first-person experience of qualia by others can never be directly compared to our own. Art^{m} refers to outward experiences that defy or ignore verification.

10 Immanuel Kant, Patrick R. Frierson, and Paul Guyer, *Immanuel Kant: Observations on the Feeling of the Beautiful and Sublime and Other Writings* (Cambridge: Cambridge University Press, 2011).

There are other times when we look inward and have experiences that others can never, even in principle, confidently experience for themselves. Grief due to the passing of a loved one is an example. While it seems certain that most healthy humans are capable of something called grief, we can never be sure of what that fully feels like to another person. Some of those who believe claim God can bestow undeniable revelations of truth upon individuals. But this revealed wisdom must be taken by others on faith without verification. Here Religion^{m} refers to that kind of inward private knowledge.

Finally there are inward experiences that can be duplicated and verified by others. Proving the Pythagorean theorem entails inward experience and knowledge that can be duplicated and verified by others. All manner of ethical and moral thinking is also verifiable inward experience. Philosophy^{m} is the realm of rational argumentation.

These four modes are experienced by all humans at various times and places. We move fluidly between them, often very quickly and typically without making any special note of it. It's a bit glib but not misleading to say that Art^{m} is like Science^{m} without verification, and Religion^{m} is like Philosophy^{m} without verification.

As an aside, it is interesting to note that those steeped in scientism frequently cast a skeptical eye on the methodological pluralism practiced in the humanities. Pluralized terms like "truths" and "epistemologies" might raise an eyebrow from working scientists. But scientists themselves are pluralists as they combine the empirical epistemology of the scientific method with the formal/deductive practice of mathematics. Science and math use radically different "rules of evidence" and notions of truth, but it's an epistemic pluralism mostly invisible to those practicing it.

In terms of our four modes of engagement, the scientific method falls within Science^{m}, but mathematics falls within Philosophy^{m}.

As a further aside, it's notable that we sometimes associate these modes of engagement with certain personality types. Those tending towards inward private contemplation will often be called "spiritual" or possibly "religious". Some who have never created music, drawings, or poems might still be referred to as artists simply because they engage the outward world with a robust and aesthetically subjective attitude. Some even lightheartedly refer to animals that solve physical puzzles as "little scientists".

Apollo and Dionysus On and Off Campus

Popularized by Friedrich Nietzsche is the notion of the Apollonian and the Dionysian in art.[11] Both the rational and ordered (Apollonian) and the irrational and chaotic (Dionysian) can be found across all forms of art, be it dance, music, visual art, theatre, and so on. So why is it that when academia addresses musicians like Patti Smith and Iggy Pop, or artists like Salvador Dalí and Jackson Pollock, or writers like William Burroughs and Brion Gysin, something seems lost? Just as explaining a joke seldom makes it funnier, the intoxicated and intoxicating power of the Dionysian seems to evaporate when put under the academician's microscope.

In terms of modes of engagement, the phenomenological setting offered by Art^{m} attends outwardly in an idiosyncratic way that is accepting of personal inspiration, insight, awe, fear, and the sublime. The ineffable nature of qualia, and the private impact on the artist, are fair game. Both the Dionysian and the Apollonian are comfortable within Art^{m}.

11 Friedrich W. Nietzsche, *The Birth of Tragedy* (Oxford: Oxford University Press, 2008).

But as a cultural institution, and especially one that operates on the basis of competition and peer review, the academy tries to fit the Dionysian X square peg, into the Apollonian round hole of rationality, clarity, and crisp definition. This inevitably moves academic consideration of the arts from engagement with Art^{m} (outward and private) to its opposite, engagement with Philosophy^{m} (inward and public). With its typically rational and public approach, where evidence is gathered and argumentation yields conceptual winners and losers, and where the public verification of results are key, academia tends to do a much better job of describing, analyzing, and critiquing Apollonian art than Dionysian art. Knowledge that resists verification also resists evaluation. In a sense, we don't know how to give Dionysius a grade.

It is the academic shift from Art^{m} to its opposite, Philosophy^{m}, that leaves the Dionysian X behind. This observation even applies to the newest forms of technology-based art and media. As was so often the case with previous art, exploring the Dionysian X in new tech-art typically requires going off campus. Institutions, and indeed conferences, that make room for the Dionysian X execute an important mission to restore a critical balance.

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The Social Problem of Technology

Sophie-Carolin Wagner

Technology is of no great interest to me, other than it being a social act. I have found failed objects to be useful vehicles via which my theoretical and artistic practices converge. They are the subject matter of discussion because I hope that our misconceptions about technology allow us to decode what it means to be human. My approach has led me to explore the pitfalls of media and technology; the exclusionary and alienating mechanisms inscribed in and nurtured by them. A prominent example of exclusionary processes in media and technology is the existence of biases in systems under the term artificial intelligence (AI). In a previous paper I wrote, I'm addressing this research,[1] however, I want to divert my own narrative. I want to speculate that we can draw insights into deeply human operations from the unintended ways that contemporary technological systems capable of reflexive adaptations over time operate and about how it might be possible to build systems that can detect what human intelligence can't.

The problem of perception is not a neurological, physiological or psychological one. Rather, it is part of the logical-philo-

1 Sophie-Carolin Wagner, "Programming is Law: Can I be a feminist if I don't want to become a programmer?" *ISEA* (Durban, 2018): 336.

sophical or socio-cultural realm. It is a phenomenon allocated to metaphysics, and an undecidable question.[2] Perception can't be treated unequivocally but only from approximate perspectives. As the Swiss psychologist Jean Piaget has described in *The Construction of Reality in the Child*, it is a senso-motoric competence offering only the fundamentals for a construction of reality.[3] The visual sense is not projecting reality as a mere copy of the world onto our retina, likewise hearing is not simply receiving audio information in our ears.

Whereas certain systematics can be determined and investigated physiologically or neurologically, the particular living situation, the experiences and the social and cultural conditioning of the perceiving organism are critical parameters of its perception. The sensory system builds the epistemological tank humans use to encounter their surroundings. Yet this tank may tell us very little about how the sensed attributes inform our thinking or the narratives we live by and in.

Technology is a cultural product. Informed by cultural and social structures, it is subject to the expression of historical legacies of privilege, violence and oppression. This becomes obvious in biases of technologies curating information and narratives, such as AI. Well-known examples are Google's photo service tagging photos of African-Americans as "gorillas", Google ads, which algorithmically display crimes and felony notifications when searching names that are associated to be African-American, or facial recognition software from IBM, Microsoft or Megvii, which correctly identify a person's gender from a photograph 99 percent of the time for white men and drop to merely 35 percent

2 Jean Baudrillard and Heinz Förster (1989). "Wahrnehmen." in *Philosophien Der Neuen Technologie: Ars Electronica*, 27–28. Berlin: Merve.

3 Jean Piaget (1977). *La construction du réel chez l'enfant*: 6e ed. Delachaux & Niestlé.

in accuracy for dark-skinned women.[4] Assuming the detection of these biases to be a purely technical problem would be missing a crucial part of the picture. Training data—particularly when it comes to images—reflects a long history of discrimination.

The influence on AI systems, which are based on artificial neural networks and on an iterative learning process of data cases, are a logical consequence. The dependency of AI on its training data underlines that biassed AI is a social problem first and a technical problem second. The social and political implications of biassed AI becomes apparent when we think about systems that don't only control how images are being tagged, but decide about the access to mortgages, water, healthcare or a country.

The technologies of AI are new, and their representational elements need to be rethought. AI can certainly help the constructing of the epistemological tank, but the epistemological tank needs to be built by humans. Yet our intuitive models about how we think might be lovely but frequently wrong and that's part of why AI doesn't function as intended—because we can't teach a machine what we don't understand. What happens in the base function of an AI is a paradigm shift from a cognitive almost axiomatic system to a system based on algorithms and data. The AI systems are programmed to function by receiving data and information. However, it is questionable if these data and information are "real", and if they are real, then AI systems can still neither be intelligent, nor can their representations be valid.

AI systems need human data, and humans need AI systems, but this does not mean that the human and the machine are one and the same even if they are no longer the other either.

4 Tom Simonite (2018, January 11). "When it comes to gorillas, Google Photos remains blind." *Wired*. Retrieved 25/02/2022, from https://www.wired.com/story/when-it-comes-to-gorillas-google-photos-remains-blind/

What we are seeing today is the setting up of cognitive machines with intelligence that is based on algorithms and data. The AI systems seem to be intelligent, but they have no meaning; they might not be members of the same species to which they belong. They are increasingly proving to be data-processing machines, not intelligent cognitive machines, and they are not capable of representing any living situation, not even their own.

An unfortunate psychological effect that weighs on the resulting consequences of AI-based decisions, is that humans have the tendency to trust in decisions of systems that they don't understand. A prominent example of this effect was when Aviation Security officers forcibly removed passenger David Dao, a pulmonologist, from a United Express Flight, after Dao refused to leave the aircraft, but was algorithmically selected for removal due to overbooking. Even though airport security personnel are trained to know that removing a paying customer, and in this case a physician, has no legal grounds, they proceeded based on the algorithmic decision and with a dramatic show of physical force. Yet somehow the machine-curated data dissemination provided a more relevant narrative than their formal training.[5] As Sadie Plant formulates "intelligence is no longer monopolised, imposed or given by some external, transcendent, and implicitly superior source which hands down what it knows—or rather what it is willing to share—but instead evolves as an emergent process, engineering itself from the bottom up" and appearing only later as an identifiable object or product: "the virtuality emergent with

5 Jack Simpson (2017, September 8). "If you're reading this, the algorithm said yes." *Harvard*. Retrieved 25/02/2022, from https://www.harvard.co.uk/youre-reading-algorithm-said-yes/

the computer is not a fake reality, or another reality, but the immanent processing and imminent future of every system."[6]

The significance of how technology informs social or individual processes and the importance to create systems that are just and bias-free, by controlling training sets, or by reflecting who might be oppressed by these systems should not be underestimated. Indeed, Google and IBM have created tools aimed at detecting biases in AI in recent years.[7] However, AI and its failures also offer the opportunity to learn more about the limits and the potential of human symbolic faculties, fortunes and misapprehensions.

Ignorance of perception constrains the relationships of perception to the conceptual act, limits the conceptual act itself, and predetermines an experientialist position, one which assumes that all, or nearly, all experiences are intentional. Contemporary technological systems capable of reflexive adaptations over time operate analogously to living organisms developing cognitively during evolution. Moreover, these systems must be seen as actors in a sort of "extended reality", which entails the coexistence of humans and machines, virtual and non-virtual, in a shared reality. Humans live in a self-reflexive virtuality which denotes an ever-expanding, yet continuously changing, complex system. The field of media studies, at its deepest level, aims to understand the role of new media technologies in mediating reality and experience. Yet, the screen and the interface are merely screens. All cognitive processes and representations are embod-

6 Sadie Plant "The Virtual Complexity of Culture", *Futurenatural: Nature, Science, Culture* (1996), 203. Anna Greenspan, *Capitalism's Transcendental Time Machine*, PhD Thesis, (2000), 204; 206. quoted by Amy Ireland, "Scrap Metal and Fabric: Weaving as Temporal Technology", *Agorism in the 21st Century*, 1 (2022), 59-75.

7 Zoe Kleinman (2018, September 19). "IBM launches tool aimed at detecting AI bias." *BBC News*. Retrieved 25/02/2022, from https://www.bbc.com/news/technology-45561955

ied. To declare that the screen is a virtuality only, is to presuppose that there is a virtuality prior to the screen. It is precisely this presupposition, which screens us from experience.

Our intuitive sense of how we think is often at odds with the underlying reality. This is a necessary consequence from our sensory system and our cognitive system's primary function not representing reality, but to create an operable narrative. The inference from these representations to cognitive or sensory processes however simply doesn't work. The inscrutability of sensing and thinking also explains why implicit biases are so hard to understand and even more so to correct. Investigating this inscrutability holds a promise for correcting biases and more generally for philosophy. The failures of AI might allow for just that. What I am proposing is that the failures of AI may be able to teach us more about ourselves than about the AI, and that further creating AI systems that don't aim at replicating human intelligence holds a lot of potential. Further developing AI systems that don't even try to mimic human intelligence could potentially end up completely reshaping the way we think about thinking. In their paper *Semantics Derived Automatically from Language Corpora Contain Human-like Biases*, Caliskan et al. showed that machines can learn word associations from written texts and that these associations mirror those learned by humans, as measured by the Implicit Association Test (IAT).[8] The IAT has predictive value in uncovering the association between concepts and allows to identify attitudes and beliefs such as associations based on implicit biases, e.g. gender and leading or assisting positions. Anthony Greenwald concludes that this AI can serve as a method to identify im-

8 Aylin Caliskan, Joanna J. Bryson & Arvind Narayanan (2017). "Semantics Derived Automatically From Language Corpora Contain Human-like Biases." *Science*, 356(6334), 183–186. https://doi.org/10.1126/science.aal4230

plicit human biases in language and one might postulate that it might be more adequate to do so than a human.[9]

A meta point concerning these discussions is the scale, or scope. Much previous research has focussed on the reactive and immediate nature of (e.g.) computer image recognition, with less concern given to the ability for technologies such as AI to shape the flows and dissemination of information; to shape our narratives about the world and its (and our) place in it. If we, as humans, are wired to access patterns in and of our own experiences, then any system that can access and synthesise vast amounts of information, contextualise that data, and make sense of it in an acceptable manner is bound, at the very least, to shape our worldviews. Applying the epistemology of second order cybernetics to our analysis of technology underlies the relevance of narratives, a change of scope which is currently very underrepresented in discussions of fixing data set bias, or discriminatory techno-policing. Narratives allow us to explore the many questions that concern us and give us a sense of identification and belonging. They allow us to grasp the world, to process and interpret data, and I am choosing this terminology as an indicator of this affecting the most scientific insights, rendering even profound technological advances irrelevant if they can't be embedded in a good story.

Data labelling and data curation disseminate the most intimate bits of information, yet somehow this development has generated a void of overarching narratives in some areas of the world. This void can, in almost all cases, be filled both by propagandist narratives generated by people (authors, journalists, filmmakers, agents of propaganda), and by AI systems that act as inter-

9 Anthony G. Greenwald & Brian A. Nosek (2001). "Health of the implicit association test at age 3." *Experimental Psychology*, 48(2), 85–93.

mediaries between the media and the public, which might be the source of multiple societal intricacies. A prominent example for this imbalance can be seen in Cambridge Analytica's manipulation of citizens' data during the 2016 US presidential elections.[10] Reactive AI, which is largely responsible for the aforementioned exclusionary and alienating mechanisms resulting from biassed datasets, has actively contributed to the lack of overarching narratives by shrouding us in a cloud of misinformed immediacy. This can further be weaponized to cast aspersions on the veracity of claims made by those who are politically opposed to those funding and utilising these large-scale data processing infrastructures. Yet none of these narratives stem from the creation of a machine. AI doesn't create meaning or culture; it is merely a reflection of them. What narratives emerge from an AI system will be a reflection of its users' beliefs and biases and the algorithms used to curate the data it processes and interpret that data to produce its outputs—nothing more nor less!

Having said this, the AI I am writing this essay with, kept on asking me what narratives AI needs or what the narratives which AI uses might look like. In our communal writing process—the AI suggesting and me negating the fact that AI does or will need narratives, and all that while trying to reflect what we can learn from AI functioning differently than anticipated, the text arrived at yet another question: how can we overcome the lure of representation, the attempt to impose psychological or physical models on experience, and how can we make sensible our pseudo-scientific technologies, which assume the existence of simulated realities and virtual actors? Using this text as a lead and asking the AI to flow, it stated that technology can solve social problems, but also

10 David R. Carroll (2021). "Cambridge Analytica." *Research Handbook on Political Propaganda*, 49–58.

create new ones. The inhuman feel of the AI gave me a visceral understanding of this duality, but with the same line of thought touched upon earlier, I wondered how we can use technology to drastically change this dichotomy. The AI answered that, at the end of the day, we are the ones who decide, so let's decide now that we would rather focus on how we can use technology to integrate ourselves, not how it denies us our being.

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X as Infancy, Not

Andreas Broeckmann

Intro, on Playing

The following is a proposal for the discussion about the relationship between aesthetics, computation, and communication, namely to consider as one factor "X" in this relationship the notion of "infancy" that the French philosopher Jean-François Lyotard developed in a series of remarks, especially in the 1980s.

This proposal comes with a sincere hesitation. I don't want to suggest that these two signs, the hyper-variable "X" and the shifting denominator of "infancy", can easily be put together in a formula, let alone one that would quasi-mathematically correlate aesthetics, computation, and communication, and certainly not in the name of Lyotard who was sensitive and very clear about the frictions between these concepts. But I do think that it is interesting to speculate about their relatedness and to play around with "infancy"—fully aware, like a child, that what we are doing is play, not philosophy or art theory.

Circumscribing Infancy

It is hard and perhaps impossible to describe in a positive way what Lyotard meant by infancy, since it only becomes evident *ex negativo*, as a counterpoint to the process of becoming

an adult. Lyotard puts infancy up as an example, even as an emblem of that which eludes the subject of humanism. If the model subject of humanism is the educated, enlightened and articulate human adult, then the infant, *infans*, is that which has been born and bears the humanist promise of becoming such a full human being, but that has not yet become human.[1]

However, infancy does not so much mean a phase in a human's life, childhood as a particular period that will be overcome in the logic of time. It rather describes an atemporal, affective condition that lingers, that is continuously absent and present, a potential, both an unreachable recollection and an unquenchable, disquieting force. In the introduction to a collection of essays and talks written in the mid-1980s, *The Inhuman* (1988), Lyotard attempts a characterisation of the notion, an attempt that he later complemented in the introduction to a volume of texts, *Readings in Infancy* (1991), on various writers who had dealt with the variable that in the matrix of *The Inhuman* became "infancy":

> The thing that these various writings hold in abeyance, awaiting delivery, bears different names, names of elision. Kafka calls it the indubitable, Sartre the inarticulable, Joyce the inappropriable. For Freud it is the infantile, for Valéry disorder, for Arendt, birth.[2]

1 For elaborations of Lyotard's notion of infancy, see Christopher Fynsk, *Infant Figures: The Death of the Infans and Other Scenes of Origin* (Stanford, CA: Stanford University Press, 2000); Christopher Fynsk, "Jean-François's Infancy", in *Yale French Studies*, No. 99, 2001, 44–61; Emine Sarikartal, "Enfances chez Jean-François Lyotard. Sur les traces d'une notion plurielle", Thèse de doctorat en philosophie (Université Paris-Ouest Nanterre, 2017).

2 Jean-François Lyotard, *Readings in Infancy* (original: *Lectures d'enfance*, Paris: Galilée, 1991; introduction translated by Mary Lydon in "Veduta on *Discours, figure*", *Yale French Studies*, No. 99, 2001, 10-26), as cited in Kiff Bamford, *Jean François Lyotard. Critical Lives* (London: Reaktion Books, 2017), 135. (N.B. An English publication of *Readings in Infancy* is forthcoming, though currently suspended.)

In the introduction to *The Inhuman*, Lyotard affirms that in his own earlier writings he also encoded the variable of "infancy" under different names: "work, figural, heterogeneity, dissensus, event, thing," all pointing in the direction of the indetermined, the incompatible, the unharmonisable (in French, *l'inaccordable*).[3]

> Let us baptise it *Infantia*, that which is not spoken [*qui ne se parle pas*]. An infancy that is not an age and that does not pass, with time.[4]

Two aspects which recur in these characterisations should be highlighted—the relation of infancy to time, and to language. Firstly, *infancy* is dislodged from chronological time. It is hovering in a latent "indetermination from which it was born and does not cease to be born."[5] If observed with regard to its temporality (which is really an anachronicity), it appears to resist the time-efficiency and acceleration of "development", and instead appears slow and recursive, prone to repetition, retardation and detours. *Infans* is delayed, since it has been born without yet being what its parents expect it to become.

And secondly, Lyotard conceives infancy as a condition before, or rather without the acquisition of language and speaking, before learning to read and write, a condition of not (yet) having been introduced to the discourses that determine the shared world of adulthood. In the introduction to *Readings in Infancy*, Lyotard conjectures:

3 Jean-François Lyotard, *The Inhuman* (Cambridge: Polity Press, 1988/1991), 4. (first publ. as *L'Inhumain*, Paris: Galilée, 1988)
4 Lyotard, *Readings in Infancy*, 135.
5 Lyotard, *The Inhuman*, 7.

> Blanchot used to write: *Noli me legere*, you shall not read me. Whatever does not permit itself to be written, in writing, calls perhaps for a reader who no longer knows or does not yet know how to read: old people, children in school, drivelling, doting [*radotant*] over their open books: *a. d. a. d.*[6]

It is an important aspect of infancy that, even more than the somewhat enigmatic condition of being an infant, it is regarded by adults and their institutions as an antagonistic and threatening force.

> It haunts discourse and eludes it. Discourse never ceases trying to keep it at a distance, it is its separation. But it persists, by the same token, in constituting infancy, constituting it as lost. Unwittingly, discourse harbours infancy therefore. Infancy is its remnant. If infancy stays at home, it is not in spite of but because of the fact that it lodges with the adult.[7]

Infancy is thus intricately inscribed into the means of discourse, into language, media and communication technologies, and the *dispositifs* of remembering and forgetting.[8]

6 Lyotard, *Readings in Infancy*, 136.
7 Ibid.
8 When discussing media technologies, Lyotard occasionally refers to concepts of Bernard Stiegler who he was working with at the Centre International de Philosophie in Paris at the time (see for instance Lyotard, *The Inhuman*, 47, 148, and Lyotard, "Enframing of Art", see below, fn. 18).

Human and Inhuman, Institutions

The notion of infancy serves Lyotard as a counter-image to the modern human subject. He introduces the figure of the *infans* as part of the broader critique of humanism, lodged under the programmatic label of the *inhuman*. We can distinguish between two types of inhumanity: the inhumanity—put too bluntly—of the institutions and their cybernetic practices that bring forth adulthood, and the inhumanity of infancy.[9] The latter, Lyotard suggests, inhabits and besets "what is 'proper' to humankind."[10] The danger infancy poses is both, systematically obvious, and intuitively sensible: "the reasonable mind cannot fail to fear in it, and rightly, an inhuman power of deregulation."[11] The adult therefore attempts "to free himself or herself from the obscure savageness of childhood by bringing about its promise—that is precisely the condition of humankind."[12]

This process of "humanisation" is executed by the institutions that educate the child in order to compensate its "initial delay in humanity."[13] It's not so much a paradox, but rather a *Catch 22* situation for these institutions that they inadvertently foster both types of inhumanity: "what if human beings, in humanism's sense, were in the process of, constrained into, becoming inhuman?"[14]

Ecriture, Writing, Making Art

Lyotard sees art, literature, and philosophy—which he summarises under the broadly understood term of *écriture* [writ-

9 See Lyotard, *The Inhuman*, 2–3.
10 Ibid., 2.
11 Ibid., 5.
12 Ibid., 4.
13 Ibid., 4.
14 Ibid., 2.

ing]—in a position to renounce the institutions and to continuously point out the "traces of an indetermination, an infancy, persisting up to the age of adulthood."[15] As warrantors of such an association of art and the inhuman, he refers to Apollinaire: "More than anything, artists are men who want to become inhuman." (1913) And to Adorno: "Art remains loyal to humankind only through its inhumanity against it." (1969)[16]

Art-making, *écriture*, is indebted to infancy, and in order to face and amortise this debt, it is necessary to remember infancy and its latent continuity, to keep it in mind, and "to bear witness to it."[17]

X ≠ Infancy

In several observations made during the same period of the mid-1980s, and not least in the context of the exhibition *Les Immatériaux* (1985) which Lyotard co-curated at the Centre Pompidou, he discusses the role of new technologies in the arts. For our present context it is curious to find an instance in which Lyotard explicitly encodes an "X" (another variable, no doubt) as the "minimum program" through which art is inscribed into the paradigms of discipline, communication and instrumentality.[18] This coding or enframing is not determined by a specific technical system, but rather by the episteme of Enlightenment which is articulated in political as well as in technological ideals and practices. In the language of Lyotard's text on Kafka, this "X" can be understood as the "inscription of the law". There is no inherent

15 Ibid., 3.
16 Ibid., 2.
17 Ibid., 7.
18 See Jean-François Lyotard, "Enframing of Art, Epokhé of Communication" in *Miscellaneous Texts I: Aesthetics and Theory of Art*, ed. Herman Parret (Leuven: Leuven University Press, 1985/2012), 177-193, especially 191-193.

necessity for these technological inscriptions to "rule", especially because there is, as Lyotard underscores, "a free play of art in relation to political imperatives." He conceives art as being suspended and outside of the enframing by technology—a state for which he uses the Greek term of *epokhe*, which describes a limitation, a bracketing:

> Art is the *epokhe* of "communication".[19]

The current technological condition implies that the technosciences are constitutive of the enframings of artistic and political practices and the metaphysics of the modern subject—enframings which Lyotard elsewhere refers to as the "technoscience of domination".[20]

Even if this variable "X" is not germane to digital technologies, Lyotard—writing in 1988—diagnosed an ongoing and "profound [...] transformation in the nature of the system" that was bringing about an intensified trend towards complexification and cybernetic regulation, and towards "the ideology of the present time": "development".[21] The differentiations necessary for the implementation of these technoscientific regimes are crucially spurred by the new technologies and the media.[22]

Despite his fundamental scepticism, Lyotard found it worth considering the resistant potentials that might lie in forms of *écri-*

19 Ibid., 193.

20 See Lyotard, "After Six Months of Work" (1984/2015). It will be interesting to compare Lyotard's notion of the "technoscience of domination" to the concept of the "informatics of domination" formulated around the same time by Donna Haraway in "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century" (1985), published in *Simians, Cyborgs, and Women*, 149–181 (London: Free Association Books, 1991), esp. 161-173.

21 See Lyotard, *The Inhuman*, 5, and Lyotard's text on Hannah Arendt, *Readings in Infancy* (1991).

22 See Lyotard, *The Inhuman*, 6.

ture which actively engage the new technologies and which could facilitate a growing discontent with a technoscientific civilisation where containment against it was growing along with the spreading informational regimes.[23] He asked a question that can also be associated with the claim for "remembering infancy":

> do they [the new technologies employed in the arts] not also help to refine our anamnesic resistance?[24]

But Lyotard immediately went on to shed doubt on such a "vague hope, which is too dialectical to take seriously."

A similar dialectics is put forward in Kleist's text "On the Marionette Theatre", which Lyotard and Dolorès Rogozinski selected for the soundtrack of *Les Immatériaux*. In Heinrich von Kleist's short story the narrator talks to a dancer about the beauty and perfection of movements in string puppets. Musing about how a similar perfection might be achieved by human dancers he resigns: "So, I said, a little absentmindedly, we would have to eat from the tree of knowledge again in order to fall back into the state of innocence? Indeed, he replied, this is the last chapter in the history of the world."[25]

Is, then, the door to infancy, like the door to paradise in Kleist's text, marked with an "X"? In any case, the questions of knowledge, discourse, and techno-aesthetics, raised by Kleist in 1810, still haunt our thinking about the possibilities of writing and making art under the postmodern condition.

23 See ibid., 2.
24 Ibid., 57.
25 Heinrich von Kleist, "On the Marionette Theatre," *Berliner Abenblätter* (Dec. 12-15 1810), translated by Thomas G. Neumiller in *The Drama Review: TDR*, Vol. 16, No. 3, The "Puppet" Issue (Sep. 1972), 22-26, quot. 26.

For the present context these remarks will have to suffice as an indication that, despite the playfulness and joy, the indeterminacy and improbability that could be introduced into the arts through a variable "X" identified with the dynamics of infancy, the framework within which such an introduction takes place is itself programmed by a *techno-logos* from which it is impossible to escape. Under the glaring light of day, like for Beckett's protagonists in *Waiting for Godot*, our hope *for night to fall*—which is also the hope for some sleep, and for slipping into dreamscapes—is vain.

Coda, on Dreaming

Another author Lyotard occasionally references as an inspiration for his own thinking about infancy, Walter Benjamin, remarks in the book of his own childhood memories, *Berlin Childhood Around 1900*:

> By the same token, someone can dream of the way he once learned to walk. But that doesn't help. He now knows how to walk; there is no more learning to walk.[26]

Maybe the experiment of relating the "X" to infancy can be taken as a hint towards both the impossibility of learning it again, and the imperative to remember the state before having learned it. And perhaps it is indeed possible to learn it again in the dream, that is, outside of code and *logos*.

26 Walter Benjamin, *Berlin Childhood Around 1900* (version 1934) in *Selected Writings*, Vol. 3. (Cambridge, MA / London: Belknap Press, 2002), 396. (Translation modified from first person singular to third person singular, masculine, to approach the original: *"So mag manch einer davon träumen, wie er das Gehn gelernt hat. Doch das hilft ihm nichts. Nun kann er gehen; gehen lernen nicht mehr."*) See also Jean-François Lyotard, "Rêve", in *Encyclopeadia Universalis*, Vol. 19 (Paris, 1995), 989-992.

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Why Distancing Matters for Aesthetics and Technology

Rodrigo Hernández-Ramírez

Over the last couple of years, a virus has once again made us confront our frailty and the extent of our hubris. The pandemic has led us to question everything about our lives and what is (and ought to be) the fundamental qualities governing them. As we underwent several cycles of confinement, the nature of our occupations, our "work", became (again) a form of demarcation. It became a way to distinguish those who could stay safe inside relative safety, mainly "knowledge workers", and those who were suddenly deemed "essential" and would have to continue toiling outside exposed to higher risk. What allowed the former to work remotely was that their occupations either already involved heavy use of computational systems or their activities could be easily migrated online. Those who could not stay at home were mainly involved in what could be characterised as "care work" or activities that, given their nature, could not be migrated online. Regardless, it is clear that the pandemic has starkly brought the deep entanglement between our occupations and our values to the forefront.

For the first time, in most regions of the world, people experienced the paradoxical circumstance of being simultaneously hyperconnected and forcibly distanced from any physical con-

tact with other humans, even family members. As everyday life carried on and "the new normality" settled in, more and more people began to realise that a complete "virtual" existence, mediated by videoconferencing, email, and social media was far from delightful. Newtonian reality was biting back. Physical, social distancing made us realise that extreme virtualisation comes at a high cost. To cope with forced isolation, people turned to mundane activities such as baking and drawing or balcony marathons in more extreme cases. All those activities bear in common that they involve some transformative process with a strong aesthetic component. In other words, although work and every other daily activity such as shopping could continue online, people were still turning to aesthetic experiences in search of meaning-making. It turns out that no matter how powerful our machines might be how capable of simulating everything, social distance has shown that virtualisation is not sufficient for life to be enjoyable.

Computational technologies, as any other machine, emerged first and foremost as tools for automating manual tasks, but they were quickly co-opted as tools for art. Most algorithmic art developed as a conscious exploration of the aesthetic possibilities that machines offered; it was another consequence of our modern(ist) enthralment with methods, but, more important here, it emerged also from a gesture of *distancing*. Through the Flusserian hermeneutical concept of "gesture",[1] this chapter argues that algorithmic aesthetics emerges from a distancing from the conception of computing as a gesture of work; as a quest to return value to automation. It argues that values (whether seen from an ethical or aesthetic standpoint) are standards of measure, and

1 Vilém Flusser, "Beyond Machines (but Still Within the Phenomenology of Gestures)," in *Gestures*, trans. Nancy Ann Roth (1991; repr., Minneapolis: University of Minnesota Press, 2014), 10-18.

for things to be measured and contemplated (i.e., marked out for observation), we need to stand apart from them. That is why the "seemingly insurmountable chasm between the digital realm of code, data and telecommunications and the conscious physicality of subjective, embodied and meaningful experience of art" might be, in fact, a feature, not a bug in the dynamic relationship between humans and the means of our arts.

Work as a Gesture

Treating methods aesthetically means attempting to give them value beyond their mere realisation. It is refusing to accept work (even the virtual sort) as tautological. In a collection of essays published shortly before his death, Flusser[2] reflects on several topics through the hermeneutical lens of "gestures": specific movements of the body or of tools attached to a body which have no satisfactory causal explanation—meaning they are not mere reactions. These movements are symbolic; hence their meaning is open to interpretation. Gestures articulate or express states of mind or "affects". Affects, being gesticulations that must be interpreted and cannot be approached alethically. That is to say, a represented state of mind cannot be judged as being true or false but only in terms of whether it can "touch" or "move" the person who is witnessing it. It follows that affects raise primarily aesthetic questions: representations distance states of mind from a context and give them form, making them "artificial". More important, affects are one of the methods through which we attempt to give meaning to our circumstances; they are "constructs". These constructs ought to be judged according to a scale of values ranging not from true to false but from authentic to inauthentic

2 Ibid. 3-7.

("kitsch"). The "truth" of a gesture cannot be measured in terms of its compliance with reality (as happens with epistemic questions) but in terms of its internal consistency, its authenticity, or it being "true to its materials" in the ample sense of the term.

One of the gestures that Flusser[3] explores is *work*, more specifically, work articulated in an age of machines. According to Flusser, work is fundamentally about change. It is a gesture that stems from the assumption that circumstances and things could be different from how they were found and could be altered because, presumably, there is value in doing so. That change is necessarily artificial; it implies purpose, craft, and method. It is not the physical change that a predator, driven by the need to feed, causes to the body of its victim. Instead, it is the methodical pressure and percussion that a hominid imposes on a piece of flint to shape it into a hand axe to kill and cut and skin to cook and dress. Work understood as a gesture is thus an activity that stands at the crossroads of ontology (it assumes something could be different than it is), ethics (there is potential value in that change), and methodology (that change can be enacted). More important, work is about "realising values",[4] and values, as we know, are the territory of aesthetics and ethics, symbol and meaning.

As machines continue to assume more and more human occupations, we are seemingly progressing towards a future where we would be free from work. This prospect raises the uncomfortable question of "being free for what?" The question is uncomfortable because, on the one hand, we have come to assume that work is what gives value to our existence and, on the other hand, we have grown so dependent on machines that without them—or, as Flusser would put it, "beyond them"—we would

3 Ibid. 10-18.
4 Ibid. 12.

be lost. Machines have thus become problematic; they have drawn attention to themselves and become intellectually interesting. That interest has led us to regard machines from a certain distance, to evaluate them no longer just in terms of what they do but also in terms of *how* they do it. We have become tantalised by their "methods". The challenge now is to evaluate them in terms of *why* they do what they do.

For most of our existence, humans engaged work as something given. The values driving this gesture were not called into question. A value implies a measurement, and questioning a measure presupposes a physical and moral distance from the thing being measured. In antiquity, "people were immersed in their obligations"; hence, work's ontological, ethical, and methodological dimensions were not separated. With the arrival of "first modernity",[5] working was forever transformed: it became a gesture concerned with finding the causes of phenomena, a gesture of discovery and research. Nowadays, work is mostly about efficiency, that is, about method.

As modernity coalesced, values became progressively secularised and intellectualised, and so did work. Work stopped being about realising god's designs and gradually turned into a gesture of doubt and possibility, into a gradual distancing between the spheres of theory and practice or, in Flusser's words, of "separation of what should be from what is".[6] Work became about questioning, imitating, and surpassing nature; it became about researching the possibilities of making.[7] Coincidentally, this pe-

5 Michael Erlhoff, "Modernity," in *Design Dictionary: Perspectives on Design Terminology*, ed. Michael Erlhoff and Tim Marshall, Board of International Research in Design (Basel; Boston; Berlin: Birkhäuser, 2008), 262-66.

6 Flusser, "Beyond Machines", 12.

7 See Sabrina Hauser, Johan Redström, and Heather Wiltse, "The Widening Rift Between Aesthetics and Ethics in the Design of Computational Things," *AI & Society*, September 2021, https://doi.org/10.1007/s00146-021-01279-w

riod (fifteenth-century) is when the philosophical foundations of design and art as we now understand them began to form.

Once the ideas of individual agency, subjectivity, and rationality consolidated, the value of work could finally be called into question. As work stopped being a divine obligation, people could be driven—or, instead, distanced—from that obligation, and quantification could replace the given. Work became measurable and rational. To paraphrase Flusser, the imperative turned into a function and, eventually, in an end in itself. The ontological and ethical dimensions of work came to be subsumed by the methodological dimension. Work became a matter of efficiency, and workers became (replaceable) functionaries within a complex "apparatus". All of this thanks to machines and automation.

Machines, as Flusser notes,[8] are things created "to defeat the world's resistance". Early machines, such as a bow and arrow or a mill, allowed early humans to "escape [their] natural circumstances through the strategic exploitation of a law of nature".[9] Machines like those work by transforming something (energy or matter) into something else (velocity into a weapon and a grain into flour). These machines overcame the resistance of existing matter, imposing predefined forms and processes (designs) onto it by following a predetermined set of steps. They reshaped what was already there. These machines *make* rather than create.[10] Many machines still do that today.

Second modernity brought a consciousness of artificiality, a different concept of rationality, a preoccupation with aes-

8 Flusser, "Beyond Machines", 14.

9 Vilém Flusser, *The Shape of Things: A Philosophy of Design*, trans. Anthony Mathews, 3rd Reprint (1993; repr., London: Reaktion, 2012), 19.

10 See James T. Wang, "To Make or to Create? What Should Students of Design Be Taught?" *Design Issues* 31, no. 3 (July 2015): 3-15, https://doi.org/10.1162/DESI_a_00334

thetics, and an obsession with creation and originality.[11] This era saw the rise of automation and the (conceptual) birth of the language that would allow machines to run without human intervention a century and a half later. De Prony's *Tables du Cadastre*, the first example of industrial-scale manufacture of information, and Jacquard's looms, machines that "interpreted" instructions punched as binary code to produce textile patterns, emerged around this time. Both innovations caught the imagination of Charles Babbage and Ada Lovelace, leading them to conceive the analytical engine,[12] and Lovelace to speculate about the possibilities of a programming language to control it.[13]

Nonetheless, it is important to mention that whereas Babbage had focused almost exclusively on the arithmetic possibilities of this device, Lovelace understood (perhaps even better than Babbage) what the analytical engine's potentially infinite programmability could mean. She intuited that the machine could do more than just "crunch numbers"; for example, it could compose music.[14] In short, Lovelace intuited that programming could turn machines into meta mediums and automation into something beyond work.

Nowadays, we know that designing an automated system implies breaking down processes into definite steps and organising them into sequences. That is why processes based on procedural logic such as simple arithmetic operations lend themselves

11 Erlhoff, "Modernity."

12 Keith W. Miller, "Hardware and Software," in *Encyclopedia of Science, Technology, and Ethics*, ed. Carl Mitcham, vol. 2 (D–K) (Macmillan Reference, 2005), 896-98.

13 Pieter Adriaans, "Information," in *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta, Fall 2013 (Metaphysics Research Lab, Stanford University, 2013), https://plato.stanford.edu/archives/fall2013/entries/information

14 John Fuegi and Jo Francis, "Lovelace & Babbage and the Creation of the 1843 'Notes'," *IEEE Annals of the History of Computing* 25, no. 4 (October 2003): 16-26, https://doi.org/10.1109/mahc.2003.1253887

more accessible to formalisation and, therefore, automation. With the rise of automation, machines became research objects in their own right; they became a space for questions about improvement and efficiency; they became problematic in the ample sense of the term.

Modernity's third phase saw an increasing infatuation with artificiality and automation, characterised by a wealth of radical experiments to alter society at large: we call this stage modernism. In this stage of human history, the *zeitgeist* was marked by a rather optimistic assumption: the potential *designability* (and thus, the artificiality) of every aspect of human circumstances. From politics to business to culture and society, everything, including people, could be fundamentally (re)designed. Moreover, automation and massive industrial production would play a central role in most of these utopian visions. Work became a gesture for betterment. Humans became so enthralled by processes and the methods to make them more efficient, so fascinated by machines, that we even developed an aesthetic sensibility for their toiling. The very process of computing became a site for aesthetic exploration.

Algorithmic art is an art of method and process, and artificial aesthetics is about the sensory experience that automation elicits. Computers, the quintessential expression of automation, became sites for aesthetic exploration merely two decades after the first mainframes entered the market. A couple of decades afterwards, media-authoring software became a consumer product. Consequently, there are virtually no cultural artefacts nowadays whose creation does not involve computing. Computers have transformed how we make and consume art and, in the process, have given rise to new artistic genres and disciplines.

Being a meta medium, the computer can simulate every previous media, along with their tools and techniques. Thanks to digitalisation, otherwise analogue procedures and their outcomes came to be translated into algorithms and functions. As a result, media became dynamic, and every single one of its components could be treated as variables. Every stylistic aspect of a simulated medium can now be applied and remixed. Modularity and patterns thus became a defining aspect of what twenty years ago Lev Manovich[15] called the emerging "language of new media".

The computer, as a metamedium, can support a wealth of metalanguages; it is, in effect, a complex system prone to aesthetic diversification. Every media creation and manipulation technique, mode of interaction, and data formats are available to artists and designers. Computers are, therefore, the ultimate modelling machines: systems that enable humans to gather, visualise, and manipulate information and, thus, design and inform things and environments that are not constrained by Newtonian reality. Simulations can be aptly described as dynamic, persistent, technically mediated renderings of source systems at different levels of abstraction.

However, while simulations might be purely formal (i.e., "immaterial" from the Newtonian ontological standpoint), they are *always* experienced as analogue; they can never be experienced as discrete constructs. Numbers are, by definition, abstractions, and even if we could experience the source code responsible for generating a given computational artefact in real-time, it would not only be meaningless but also already an analogue rendering of zeroes and ones.

15 Lev Manovich, *The Language of New Media* (Cambridge, Massachusetts: The MIT Press, 2002).

Coding is methodological by nature. As work, code does not overcome (material) resistance, only semantic one. Code does not transform in the sense that pre-informational work transforms the world. Machines in an informational stage are things that work by *informing*. The results are models (models of possible realities). Machines instantiate possibilities; they do not transform (the way work does) but help visualise possibilities.

Work in the Information Age is not about changing reality but about modelling new realities; it is about building worlds within worlds. The challenge is how to maintain a distance from that envelopment. A simulation is not just a method for realism; it is also a means to explore possibilities, particularly transformative ones, because they are imperfect and thus open to interpretation. That interpretable gesture, which informs and thus realises something else, is what algorithmic aesthetics looks for. Nevertheless, that possibility only appears when the machine is distanced from work. Moreover, it is important to remember that aesthetics has no definite method, so there is a paradox at the core of algorithmic aesthetics, for machines are necessarily methodical. Algorithmic art is about the affect, represented not by the gesture of machines toiling away but of the gesture of humans imposing meaning on the toil, and to do that, they need to see work not as a given process but as a designed possibility.

Concluding Remarks

This chapter explored distance as the X behind the tension between the digital and physical dimensions of algorithmic aesthetics. Throughout the chapter, we saw that the forced distancing (and technological interfacing) brought by confinements inevitably raised questions about values, reasons, being, and human-technology relations at large. More important, it made re-

minded us that although many of the things that we consider important in our lives happen online, our "onlife" continues to be ultimately governed by the circumstances of our embodied selves.

When we automate, work becomes self-referential, it becomes change for the sake of change, method becomes the sole concern and efficiency the only goal. From an ontological standpoint, automation is about that self-referentiality, but it is distancing from it that allows aesthetics to emerge. This distance needs to be recognised and appreciated, that is, re-valued.

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The Tangential Realism of @PepitoTheCat

Rosemary Lee

There is a great deal of potential for variation between visual appearance of images and what they are intended to represent, if they are indeed representational at all. Not only can images mean things other than what they directly look like, but there are many ways of tying the visual to real-world objects and phenomena, and of interpreting those relationships. With the growing prevalence of digital, networked and algorithmic media, images have increasing ties to data, often being treated as interchangeable with it. This feeds expectations for images to be objective in the sense of acting as stand ins for or pointing to real-world entities and phenomena in a 1:1 fashion. But such conceptions tend to oversimplify connections between the visual and the real, overlooking the role of technical processes that formally and conceptually mediate the objectivity of the visual media they result in.

The referential relationships in visual media are unsteady, which complicates expectations of scientific objectivity. For example, the objectivity of an analogue photographic image lies in optically capturing appearances, translating the world as it is viewed by the human eye or through the camera's lens into a fixed image. This covers two of the three forms of visual objec-

Figure 1. Twitter posts by @PepitoTheCat, 11–29 January 2022.

tivity described by Daston and Galison,[1] truth-to-nature and mechanical objectivity. But not only is there potential for variation within and across those approaches to visual epistemology, new forms of visual media may also give rise to new ways of interpreting relationships between visual media and the world, touching on the third of Daston and Galison's forms of visual objectivity, that of trained judgement in making and using images.

Johanna Drucker[2] points out that the dynamic qualities of visual representations often have less to do with the constraints of a given medium of execution than how we think with them, or how we model interpretation. Contrasting two rather different

1 Lorraine Daston and Peter Galison. *Objectivity* (New York, Cambridge: Zone Books, 2007).
2 Johanna Drucker, *Graphesis: Visual Forms of Knowledge Production* (Cambridge: Harvard University Press metaLABprojects, 2014), 2.

images with one another, she proposes the much older of the two as far more generative than its digital counterpart. The one from 1669, a conceptual map by Athanasius Kircher interpreting Ramon Llull's "great art of knowing" (Fig. 2), she says, "produces the knowledge it draws". Though this may go against the grain of assumptions that digital media is more dynamic than static images, Drucker argues that the other image, from the Opte Project's 2003 map of internet traffic (Fig. 3), "only displays information",[3] making it the more fixed of the two images. While the formerly mentioned image compels thinking, the latter—as active as what it represents may be—is merely a snapshot, a static rendering of a system at a moment in time. Though it is visually stable, Kircher's drawing has more openness to change than the digital one against which it is compared, because it lends itself to more variability of execution in the mental images that are conjured from it, while the more recently produced image is less open to variable readings as it does not require the viewer to play as active a role in its interpretation. This offers insight into the dynamic qualities that visual media may have, irrespective of their medium of execution.

While such openness to variability may not be exclusive to a particular medium or method, digital media may facilitate or emphasise these modalities more so than others. The ephemerality of digital images is especially visible in networked contexts, where they are often hyper-reactive, subject to the flux of algorithms and streams of data coursing through the various platforms we access them through. These qualities may—at least superficially—give the impression that digital images are distinct from the materiality of their more analogue counterparts, such

3 Ibid., 3.

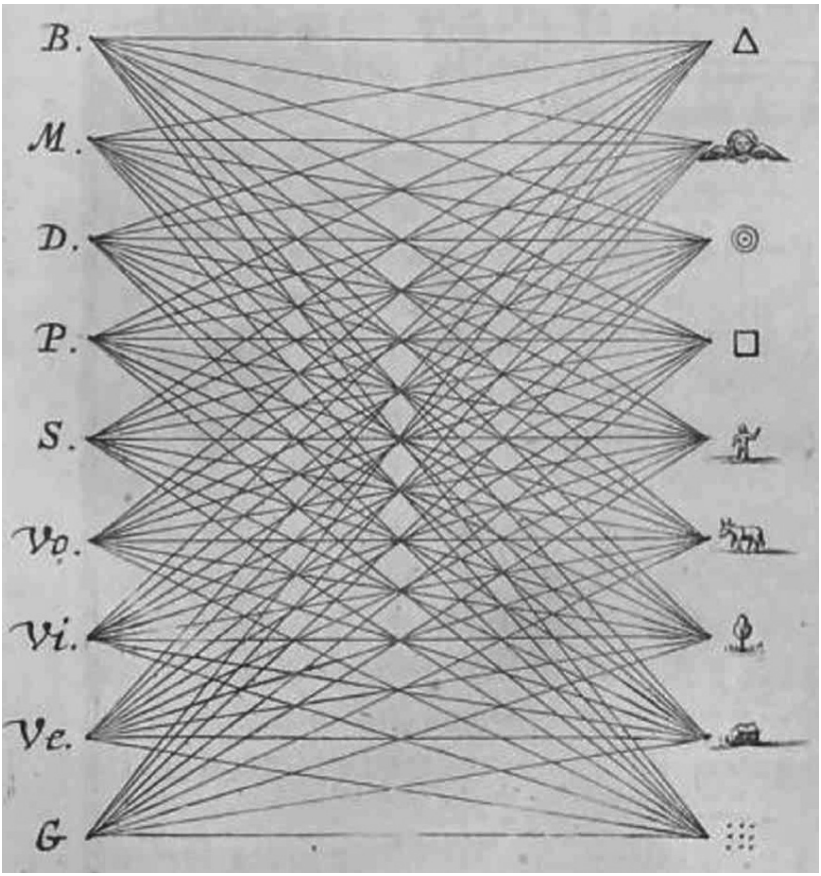

Figure 2. *Ars Magna Sciendi*. Athanasius Kircher, 1669. In Drucker, *Graphesis*, 2.

as drawings, paintings, and printed photographs. But in spite of their tendency toward the immaterial, digital artefacts are structured by not only the material, but also conceptual, constraints of the infrastructures entailed in their display, storage, and transmission.

Grounding visual media in relation to a concrete, material reality has ties to the history of the visual technologies current contexts build upon. This can be seen in the enduring associa-

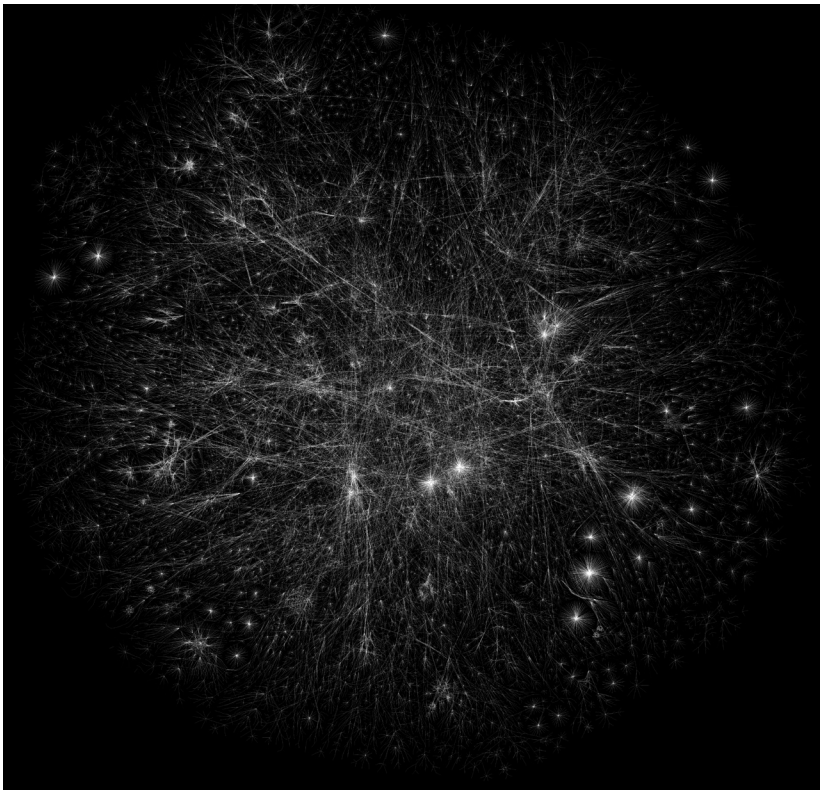

Figure 3. *The Internet*. The Opte Project, 2003. Map of internet traffic.

tion of photographic and realistic aesthetics with an inherent degree of scientific accuracy, in spite of the fact that it is well known that verisimilitude is no guarantee of truth value. What is especially interesting about photographic aesthetics in digital contexts is that the photographic exceeds beyond the limits of any specific set of tools, methods, or visual paradigms. And while data-based and photographic media may indeed present highly accurate visual representations of the world, they are also open to many layers of interpretation, both technically and conceptually. Recent attempts at imposing artificial scarcity on otherwise con-

ceptually and technically unwieldly digital artefacts also point out the degree to which such forms of visual media tend to confound ideas inherited from earlier visual paradigms that contain highly specific assumptions about the material reality that images derive from.

Not only does the visual appearance of images have an unreliable relationship with whatever reality they may represent, but each image is in theory open to innumerable iterations. In this sense, current visual media contexts recalls Borges's Book of Sand,[4] constantly shifting beneath our feet. The Book of Sand offers a glimpse of the infinite bound within the finite, in this case taking the form of limitless pages bound in a book: "neither sand nor this book has a beginning or an end".[5] Recent aesthetics and practices with digital, networked, and algorithmic media may present us with bounded infinitude in the sense that they are open to theoretically endless variation, replication, and dissemination. Interacting with such media artefacts and the complex infrastructures that they are orchestrated through can feel a bit like wading into muddy waters of unknown depth. These systems respond to us, but in lack of a map or mental model of their structure or functioning, it is only through echolocation, feedback loops, that we may navigate their obscurity.

We know—or at least we think we know, without always being able to confirm it—that algorithms and a sea of data[6] lie behind the surface of what we encounter in current visual media,

4 Jorge Luis Borges, "The Book of Sand". *Collected Fictions*, translated by Andrew Hurley, 480–83 (New York: Penguin Books, 1998), 482. The book of sand is a fictional infinite book described in a short story by Borges. The fabled book is offered to the protagonist of the story by a mysterious travelling Bible salesman. "The number of pages in this book is literally infinite." the salesman says, "No page is the first page; No page is the last."

5 Borges, "The Book of Sand", 481.

6 Hito Steyerl, "A Sea of Data: Apophenia and Pattern (Mis-)Recognition". *E-Flux*, no. 72 (April 2016).

altering or redirecting what becomes perceptible. We know—or at least suspect—that our search terms are interpreted in unpredictable ways by search engines, but we often have little conceptual access to the parameters according to which our queries are matched with search results. This leads to an uncanny suspension between knowing and not knowing whether or the extent to which what we see in visual media is connected to any visual or material reality that exists tangibly in the real world.

A compelling example that touches on such forms visual content can be found in a Twitter bot account named @PepitoTheCat that documents the comings and goings of a housecat. The account tweets "Pépito is out" each time the eponymous cat exits his cat door, with a photograph and timestamp documenting this act. Upon Pépito's return, a follow-up tweet announces "Pépito is back home", accompanied by a photograph and timestamp marking Pépito's re-entry through the catflap.

While this in some respects innocuous, Pépito the cat is indicative of a particular aesthetic that is importantly, yet very tangentially, connected to realism. And far from being alone, around 200.000 other accounts follow—and frequently reply to—this chronicle of Pépito's daily activities.

The information content of the messages "Pépito is out" and "Pépito is back home" is very low. Each statement telling us that Pépito the cat is out or that he is in marks the binary change of Pépito's state—or location—from inside to outside or outside to in. Little of consequence changes, visually, from post to post, other than the amount of Pépito that is visible, caught on the inside while he exits or enters. And each time stamp merely notes the moment of transition between one state and another.

What is behind such a level of enthusiasm for something as mundane as a regular cat going about its business? Perhaps it

is the subtle variability within a set of constraints that holds Pépito's fanbase in captive suspense. Another dimension that may explain the appeal of @PepitoTheCat is its temporal continuity, occurring regularly yet not precisely predictable on an ongoing basis.

Several Twitter users have pointed to similarities between @PepitoTheCat and Schrödinger's cat, the famous thought experiment used to explain the role of observation in quantum superposition. In Schrödinger's conceptual experiment, the cat is at once dead and alive in a box until it is perceived as either one: "The prevailing theory, called the Copenhagen interpretation, says that a quantum system remains in superposition until it interacts with, or is observed by the external world. When this happens, the superposition collapses into one or another of the possible definite states."[7] Like Schrödinger's cat, Pépito, or our knowledge of him, is suspended in a state of indeterminacy, until the moment a tweet announces Pépito's latest state change: out or in.

Like many things on the internet, this is and is not about a cat. The whole thing hinges on the material reality of a real cat actually climbing out or in through a physical cat door. It is realistic in the sense of documenting a material reality that truly exists in the world. But it is also absurdist in the same sense, that the interest in knowing whether Pépito is out or back home lies in the very fact that it's relatively inconsequential. As is the case with meme aesthetics, visual elements are treated as interchangeable, repetitious in some respects, while also emphasising the endlessness of iteration as a methodology, exploring the limits of variation within a set of constraints.

What I find most interesting about this example is the way it is connected to the material reality of an actual cat, while not

7 See "Schrödinger's Cat", *Wikipedia*, 21/01/2022. https://en.wikipedia.org/wiki/Schrödinger%27s_cat

actually being about that to a great extent. Does it really matter whether Pépito is "real" in the sense of being a housecat who spends his days going in and out of the house? Could a cat be traded out for other things, other animals or objects? Is the cat-flap interchangeable with other binary states?

Though these questions may seem deceptively simple, I find them more compelling than some that have traditionally been predominant in visual media. For example, it's no longer of great consequence to ask to what extent an image captures Pépito's likeness or how accurately this account documents his life. It's of little import whether Pépito's bio stating: "I'm a cat." is true, or whether these posts could instead be the fabrication of a machine learning algorithm.

The "real or fake" trope is persistent in visual media, as evidenced by a viral sensation that flared up in 2016 around the fictional Instagram character, Lil Miquela. The project, by Trevor McFedries and Sara DeCou, plays on the ambiguity of audiences not being able to confidently determine whether Lil Miquela's Instagram posts represent a real person or not. But while the uncanniness of highly realistic, detailed, or believable simulations still manages to capture a great deal of attention on the internet, it also becomes mundane due to its ubiquity. For example, the phenomenon of fake social media profiles purporting to be young women is common enough to warrant its own term, "catfishing". The fact that it's easy to fake appearances nevertheless does not appear to detract from realist aesthetics, nor from expectations for alignment between the visual and the real.

Internet users are now fairly accustomed to the artifice of visual media, that it may all be fiction to some extent, and other aspects matter more than realism in the traditional sense of an aesthetic verisimilitude or aspirations to scientific levels of ob-

jectivity. Users are also quite accustomed to the not-knowing entailed in often black-box, opaque systems. It could be precisely this suspended indeterminacy that rests at the heart of why hundreds of thousands of people may find it engaging to follow the automated account of a housecat entering and exiting a house via a cat door.

What I take away from Pépito the cat is that this instance may be an indication that the stakes of visual media are shifting. Realism in this context may have to do with visual representation, but on its own it tells us less than its context, its variation, its endless iteration, and having some degree of connection to the real world.

We are limited to the conditions of scientific inquiry: what is knowable and by what construct is it possible to know something? In this case, we are able to know whether Pépito is out or back home. We are able to see the qualities of Pépito's last entrance or exit and to know the moment it occurred. Anything beyond these parameters is unknowable to us, allowing—or rather, compelling—us to fill in the blanks ourselves. This brings me back to Drucker's comparison of the two maps. The variability and indeterminacy of Pépito the cat allows us to project onto the limited data we have, and it invokes the imagination to a greater extent than many other kinds of visual media, even those that may offer more information content.

@PépitoTheCat reflects back to us an ambivalent objective truth. The media ecosystem as it exists currently is built on the premises of understanding the world through apparatuses of measurement and observation. But Pépito also demonstrates the close connection between the world as known through data and the arbitrary nature of such scales of measure. In this way, I find the tangential realism and connection to materiality expressed in @PépitoTheCat's posts taps into a growing sentiment that is

shaping new visual aesthetics. It combines aspects of the empirical outlook descended from traditions of realism and objectivity with elements of the absurd. We are not about to reject realism outright, yet we see that data, on its own, has no inherent claims to truthfulness, and even the most accurate of instruments may be easily coopted for the purpose of stupid fun.

@PépitoTheCat is one instance that I believe speaks to a particularly interesting way of drawing connections between visual media, data, and the world, but it is by no means an isolated case. It is in some ways specific to the particularities of a singular cat captured by a photographic apparatus rigged up to a cat door, but it is also not about what visually appears in Pépito's tweets at all that makes this instance relevant. Rather, this example reveals ambiguities between being and appearance, representation and mediation, phenomenon and data, that are telling about current perspectives on visual media.

Instead of insisting on the direct grounding of visual media as evidence of a material reality, perhaps we can rest with the uncertainty of being and not being not necessarily cancelling one another out. What we can take away from @PépitoTheCat is that the world is rarely so simple as a binary distinction, and it's what gets caught in the middle that makes things interesting.

Rosemary Lee is an artist and researcher whose work focuses on the history of visual media. Lee looks at how current developments in image production fit within larger narratives about art, vision, knowledge, and relations between humans and machines. Excavating those connections through a media-archaeological perspective, she seeks to develop a deeper understanding of how current methods and ideas about art and technology continue to be influenced by those of the past.

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Piet Mondrian Did Not Use a Computer

Frieder Nake

"Writers are the greatest criminals."—These are words that Harry Holtzman attributes to Piet Mondrian when the artist was confronted by a misinterpretation of his work by one of those writers.[1] It may be that, when they write about artists, those writers often don't get a very friendly reaction from the artist.

Writers are, of course, free to write whatever they decide to write about anything. Whatever the reason for the existence of that anything may be—natural or social life, art or technology, peace or war, structure or chaos, the wildest emotion or the strictest logic—the writer's writing should not be restricted. If the writing insults a person, that person can do the same, or ignore, or use irony, disgust, wit.

Who would ever seriously criticize an artist's painting? A critic may write a negative review. That's okay, for whatever the critic may be writing, it is just what he or she wants to write. In a way, his writing has nothing to do with the painting except that the painting was the reason for the critic to write what he wrote.

1 Harry Holtzman, "Piet Mondrian. The man and his work," in *The new art – the new life. The collected writings of Piet Mondrian*, (eds.) Harry Holtzman and Martin S. James (Boston: G. K. Hall, 1986), 1-10, p. 6

Repeating the same in different words: The artist paints, the critic writes. These are two essentially unrelated activities. Artists, however, may tend to relate the critic's writing to their paintings. But why do they do so? They want the critic to write positively about a particular one of their paintings, about their style of painting or drawing, about their use of colors, about how well-chosen the subject matter is, how greatly moving the "expression". But why should he? It is the critic's job and privilege to write whatever comes to his or her mind. Those who put up works on the walls of a gallery, by doing so, make a public statement. It necessarily invites critique. It's a game people play. Nothing wrong with it.

The idea that Mondrian may not have been ready to accept a critic's writing as what it was—i.e. nothing more than one critic's writing—to me is a bit disturbing. I can only read it as an ironic remark. I want to interpret it as not being meant seriously by Mondrian. But who knows?

The title of this short essay, however, stands out as unquestionably being true. And it *is* a truism. Computers did already exist in 1944, the year of Mondrian's death. But they existed in small number and in enormous, room-filling sizes only. The British *Colossus* was one of them, but this fact was a secret by the time. The public did not know it until 1970. The US *Harvard Mark I* was the second existing computer.

The idea that Mondrian may have been using (or not using) a computer, may result from the extreme simplicity of his *neo-plastic* pictures. Only today in retrospect, can we even think of raising such an ignorant question. If we are young enough, we might, with good reason assume that Mondrian actually was using computers. Without doubt, for me he belongs to the forerunners of algorithmic art. In a different way, Jackson Pollock is an-

other such forerunner. They were preparing the ground not so much for the actual use of *computers* in the process of creating art. But both, Piet Mondrian and Jackson Pollock (and some others as well), prepared the ground for extremely simple geometry as an artistic element (Mondrian), and for the distance of the painter from the canvas (Pollock)—both preconditions for algorithmic kinds of activities infiltrating the making of art not so many years later—but it was still two decades until then.

Earliest examples of algorithmic art (in the early 1960s) needed simple geometry because it was easy to be put into algorithmic form; and it also needed the distance from the canvas because writing a program (distant thought) is radically different from putting paint on the material ground of a canvas (close touch).

If we take *painting* as essentially an act of bringing together *form* and *color*—creating forms by applying paints or creating color by giving it form—we reach an extreme absence of contents in the painting. The artist Vera Molnár, when writing about her computer-generated art, says: "In my work ... there is no meaning, no meaning whatsoever."[2] This emptiness is a first condition for algorithmic art. Granted, not for all of it.

Let us become a bit more specific. As indicated before, a reason for a person living in the 2020s, to even deliberate the question whether Mondrian could possibly have used a computer for paintings of his neo-plastic style, is the extreme minimalism of those images. Here is a description of how to generate them (for an example, consider Fig. 1). I divide the procedure into two phases, one for the structure of the black bars, the second for the coloring. The arrangement of the bars stands for the form issue.

2 Linde Hollinger (ed.), *Vera Molnár. Inventar 1946-1999* (Ladenburg: Preysing-Verlag, 1999), p. 87 (my translation from the German).

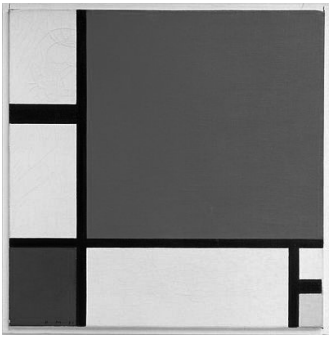

Figure 1. Mondrian: Composition in Red, Blue and Yellow. 1929

Phase I
Divide the given image format into 4 cells by drawing one vertical and one horizontal black bar through the entire height and width of the image.
For each of the 4 emerging cells decide to further subdivide it, or not.
If a cell is to be subdivided, do it by a vertical or horizontal black bar of appropriate length without crossing any bars.
Repeat the same operation for each of the newly generated cells, and continue this, if wanted, until a last level.

Phase II
Visit each of the thus created cells in sequence, and decide, whether it is to be colored, or not. A cell may be colored only if none of its immediate neighbors is colored.
Permitted colors are pure red, blue, or yellow.
A cell is an “immediate neighbor” of another cell, if the two cells share part or all of a bar.

(Mondrian soon enough dropped the “no immediate colored neighbor” condition.)

In the concrete case of Fig. 1, we see the big cross clearly standing out with its intersection in the lower left part of the picture. Two of the cells it generates are colored in red and blue, resp. The other two are in the shape of longish rectangles, one vertical, the other horizontal. Both are further divided by short bars into two cells each. The upper left white rectangle is divided almost in its middle, whereas the lower right rectangle has its dividing bar close to its right end. Adding a bit more of complexity, the new small cell to the far low right gets divided once more, almost to its middle, and one of the new cells is colored yellow. A strong, stable balance is created by the left-hand and the bottom longish cells. They counterbalance with their minimal sub-structures the dominating red and the small blue (both not quite quadradic) colored areas of the image. The two short bars (the upper one horizontally, the lower one vertically oriented) add enormously to the balance.

Quite easily can we translate the procedure formulated above into a computer program that generates not just this one Mondrian painting, but a large number of them, if not all possible ones. To show that such a statement can actually be maintained, we would carefully check the generative procedure above. The result is, indeed, that under the assumptions made up to here, the procedure is powerful enough to generate the specifically restricted class of M1-paintings (“M1” standing for “Mondrian paintings of the given restrictions”).

To be a bit more specific, let me inject one example of actual programming: The placement of the dividing cross that splits the image into four cells. Fig. 2 shows results from a program-code (in Processing) that first creates the partitioning cross. Parameters were set such that the point of intersection of the two bars was to be chosen inside a rectangle $[0.1, 0.4] \times [0.6, 0.9]$ (the

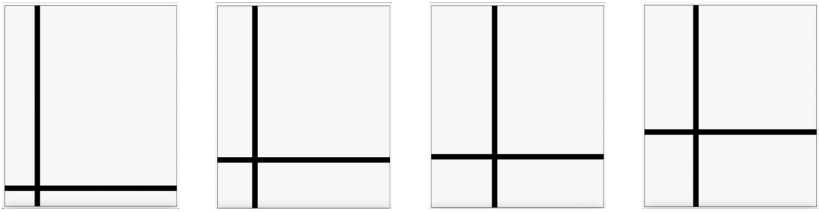

Figure 2. Examples of partitioning crosses chosen randomly by program.

origin of the coordinate system is in the upper left, and axes are pointing to the right and down).

Generalizing this minimalistic procedure, we would follow Mondrian by first allowing for more than one vertical and one horizontal bar of full lengths. If we now choose h horizontals, and v verticals, they build the number of $(h + 1) \times (v + 1)$ cells. Each of those cells could be entirely colored (however, obeying constraints on coloring of neighboring cells!). If we impose a kind of locality, we can describe a next class of M2-paintings in a straight-forward manner. The locality principle would require that the next feasible operations must be restricted to the cells generated in the first step, without leaving that cell. This principle may be applied repeatedly.

Such a development increases the complexity of the programmed procedure and achieves more and more complex M-structures. One important step towards more complexity is to give up the locality principle.

It is interesting to observe, how many *Mondrian Generators* can be found on the Internet. Hardly ever do their creators appear to spend much effort on finding out hidden constraints that Mondrian obeyed. Whether he did so explicitly or intuitively, is not really interesting (and I don't know). The enthusiasm among programmers to come up with something reminding somehow of Mondrian's work, apparently does not allow for serious analy-

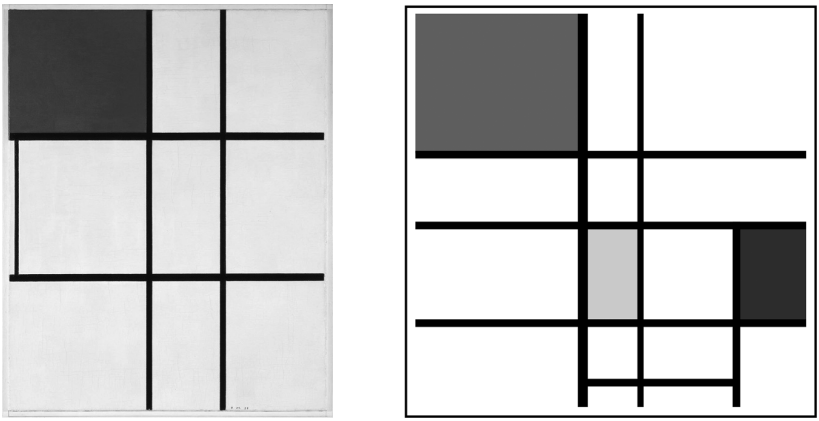

Figure 3. Mondrian: *Composition B (No. II) with Red*. 1935. Anonymous: Attempt to simulate Mondrian.

ses of implicit generative rules. The seeming simplicity of Mondrian's Neo-Plasticism seems to be so attractive to algorithmic thinking that the joy of quick synthetic results takes an easy victory over the hardship of analytic efforts. Fig. 3 confronts one of Mondrian's own creations (left) with a creation found on the Internet.

Do we see any important difference? If, in the anonymous image, the thin boundary lines are supposed to mark the image's border, then the fact, that all bars, and the red and blue colored areas as well, end before they reach that border, is certainly a violation of Mondrian's style that usually (but, indeed, not to 100%) lets his painted elements run up to the borders of the canvas.

It remains a fact that Mondrian's work during his neo-plastic phase is welcome and easy to be turned into algorithms. A really encompassing Mondrian Generator, however, to my knowledge, is still missing. A program would qualify as such a generator, if it were capable of generating unseen pictures of Mondrian style without deviating from any of his hidden rules. The rules such a program contains must be grouped according to the master's

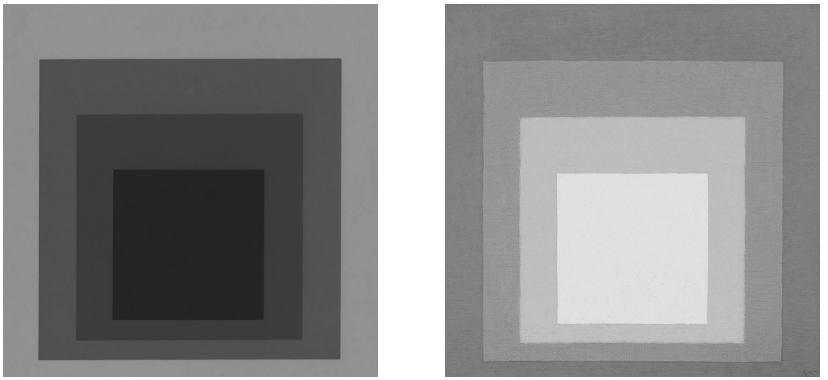

Figure 4. Two realizations of Josef Albers: Homage to the Square. “Interaction of Color”.

slightly changing habits. Therefore, developing such a program will require to explicitly group the existing works according to their different sets of constraints. Empirical artistic research of an analytical approach would become the basis of a generative approach. Mondrian’s work is certainly one of the best-suited for such a project.

Simpler (really extremely simple) are only Josef Albers’s *Homages to the Square*, of which there are more than one thousand! He reduced the form problem so radically that all these images use the same form. The artist only selects four colors (with a few exceptions of only three). They fill the four stacked squares. That’s all.

If we allow 1 byte to code each of three basic colors (red, green, blue), we get 2^{32} colors. For each of the four areas of an Albers’s *Homage* we have this number of options. This amounts to 2^{128} Homages. These are about 10^{38} pictures. A computer could be started to generate them all. The program to do this is trivial.

If it took one tenth of a second to generate one of this horrible number, the 10^{38} pictures would need 10^{37} seconds to be generated: millions and trillions and more of years. But such a

calculation is unrealistic. Our eyes are by far not capable of distinguishing two colors whose 3-byte codes differ by only one bit. To be realistic, we would reduce the number of shades of red, green and blue from 255 in each case to, perhaps, 12. We would still talk about 15×10^{12}.

Such combinatoric considerations are, obviously, crazy. If they show anything, it is this: the infinitely high supremacy of the human mind and intuition over a machinic kind of completely generating the possibilities, that a given schema permits. To write a generator for Mondrian's *Neo-Plasticism* or Albers's *Homages* may be a nice and stunning exercise for first year students. What it really demonstrates, is the dialectics of quantity versus quality.

Frieder Nake (b. 1938) is a German mathematician who became a computer scientist when, as a young man, he developed software for the Zuse drawing automaton, "Graphomat Z64". When testing, he discovered in those drawings aesthetic qualities. Thus, he became an artist. Stuttgart, Toronto, Vancouver, Bremen, and more.

Aesthetic Computational Criticism

How to Critically and Technically Engage with the Climate Crisis

Christian Ulrik Andersen & Søren Bro Pold

Critique of Criticism

The climate crisis is changing the space for criticism and a critique of criticism has emerged. A starting point was when the French philosopher of science and technology, Bruno Latour, in relation to climate change in 2004 asked if criticism has "run out of steam" by fostering a default critical attitude or even a scepticism towards science that risks serving lobbyists and climate skeptics in undermining the science of the climate crisis. Latour has been criticized for wanting to get rid of criticism and for having a too narrow conception of criticism.[1,2] While this critique of Latour may be just, it is worth noting that he also argues for a more responsible and thorough form of criticism; a critical realism that involves "the cultivation of a stubbornly realist attitude (...) a realism dealing with what I will call matters of concern, not matters of fact."[3] As the central concept "matter of concern" in-

1 Benjamin Noys, "The Discreet Charm of Bruno Latour," in Jernej Habjan and Jessica Whyte eds. *(Mis)readings of Marx in Continental Philosophy* (London: Palgrave Macmillan UK, 2014), 195-210.

2 Carl DiSalvo, "Bruno Latour as Sociologist and Design Theorists?" in Jeffrey Bardzell, Shaowen Bardzell and Mark Blythe eds. *Critical Theory and Interaction Design* (Cambridge: MIT Press, 2018).

3 Bruno Latour, "Why Has Critique Run out of Steam? From Matters of Fact to Matters of Concern." *Critical Inquiry* 30 (2), 2004: 231. https://doi.org/doi:10.1086/421123

dicates, Latour does not call for a naive, naturalistic or neutral kind of realism, but a realism that looks for the "whole machinery" in a quote that echoes Bertolt Brecht's Epic theatre: "A matter of concern is what happens to a matter of fact when you add to it its whole scenography, much like you would do by shifting your attention from the stage to the whole machinery of a theatre."[4] Latour has continued this line of climate-related work with, for instance, the exhibition Critical Zones,[5] which explores the few kilometres of biology, environment and atmosphere that surface the earth as a bio film. As Latour notes, the term "'Zone' is well chosen precisely because it has no settled meaning! It designates something of uncertain status, unclear delineation, unsettling atmosphere." As such, "the adjective 'critical' has many meanings," but as a common characteristic it stresses a concern: "that planet Earth—in its astronomical or geological sense—is not sufficient to define where we reside, and that we need another frame to situate all the phenomena critical for us—that is, we humans and all the other life forms."[6]

A similar critique of criticism has also been related to other contemporary issues, including the increased datafication and platformization in digital culture. Lee Vinsel, for instance, has critiqued what he calls the tendency of "criti-hype" as a sort of academic business model building on potential (and even wishful) risks of technology,[7] and in relation to datafied platforms it

4 Bruno Latour, *What is the Style of Matters of Concern*. Amsterdam: University of Amsterdam, Department of Philosophy, 2008. http://www.bruno-latour.fr/sites/default/files/97-SPINOZA-GB.pdf

5 ZKM 2020-22, co-curated with Peter Weibel, Martin Guinard and Bettina Korintenberg.

6 Bruno Latour and Peter Weibel, "Seven Objections against Landing on Earth." In Bruno Latour and Peter Weibel eds. *Critical Zones: The science and politics of landing on earth* (Karlsruhe: MIT Press & ZKM, Center for Art and Media, 2020), 12-19.

7 Lee Vinsel, "You're Doing It Wrong: Notes on Criticism and Technology Hype." *Medium*, 2021. https://sts-news.medium.com/youre-doing-it-wrong-notes-on-criticism-and-technology-hype-18b08b4307e5

has been argued that the possibility of establishing a critical distance is undermined by the way these platforms build on immanence, or what Johanna Drucker calls "within-ness".[8] Mercedes Bunz furthermore argues that critique has become inadequate faced with algorithmic governmentality in sociological settings, where critique and extant alternatives are present. As she writes, "choosing a new tool does not affect the way power is enforced on us" because our data is transformed into a pattern that "affects the subject but does not represent it."[9] Consequently, individual choices such as avoiding Facebook or Google—to the extent that this is even possible—do not address the problem satisfactorily. Bunz instead argues for a critical engagement building on what Phil Agre has called a critical technical practice which also resembles Carl DiSalvo's call for a critical design that gives form to controversies or Latour's Brechtian realism that includes the whole machinery behind the stage.[10,11] Finally, as a parallel to Bunz and DiSalvo and building on the traditions of participatory design and critical design, we have argued for an interface criticism by design as a way of designing alternatives through and with critique, rather than accepting critique as mere theory at a distance.[12]

8 Johanna Drucker, *The General Theory of Social Relativity* (Canada: The Elephants, 2018). For more discussion on this, see also Søren Bro Pold, "Critical Attention and Figures of Control: On Reading Networked, Software-based Social Systems with a Protective Eye." *Electronic Book Review*, 2020. https://doi.org/10.7273/gp2w-c620

9 Mercedes Bunz, "How Not to Be Governed Like That by Our Digital Technologies." In Kathrin Thiele, Birgit M. Kaiser and Timothy O'Leary eds. *The Ends of Critique: Methods, Institutions, Politics, New Critical Humanities* (Lanham: Rowman & Littlefield, 2022).

10 Philip E. Agre, "Toward a Critical Technical Practice: Lessons Learned in Trying to Reform AI," in Geoffrey C. Bowker, Susan Leigh Star and William Turner eds. *Social Science, Technical Systems, and Cooperative Work: Beyond the Great Divide* (New York: Lawrence Erlbaum Associates, 1997).

11 DiSalvo, "Bruno Latour as Sociologist and Design Theorists?"

12 "5 Interface Criticism by Design" in Christian Ulrik Andersen and Søren Pold, *The Metainterface: The art of platforms, cities and clouds* (Cambridge: MIT Press, 2018), 157.

The crisis of platformization and the crisis of the climate are actually connected. With the emergence of platform culture running on clouds and appearing as apps on computers, phones, streamers, etc., we are witnessing what in general can be described as a clouded, phantasmagorical metainterface that is hiding choices, data traffic and infrastructure.[13] Platform interfaces often virtualize and displace the infrastructural elements, the "whole machinery" (cf. Latour) to create the immediately clickable, where users are not supposed to worry about the effects of their clicks. Furthermore, platforms normally present individual interfaces to mass phenomena such as social media, maps or media consumption on streaming platforms. However, most often, only the data that supports more user engagement is presented to the users while other parts are hidden inside the closed proprietary platforms.[14] Consequently, the social and societal dimensions are hidden behind the individual, and this hiding of infrastructure and its effects is happening both in relation to the user's data and the infrastructure of the platform. Datafication and platformization therefore also includes environmental and climate effects, consumption of energy, and pollution of carbon and other waste products. Data pollution of social, cultural environments and carbon pollution, thus, becomes two parallel waste products of extractive capitalism. What could critical engagement by design look like, faced with platformization and climate change?

13 Andersen and Pold, *The Metainterface*; Pold, "Critical Attention and Figures of Control".

14 Ben Grosser, "On Reading and Being Read in the Pandemic: Software, Interface, and The Endless Doomscroller", *Electronic Book Review*, 6/3/2022. http://electronicbookreview.com/essay/on-reading-and-being-read-in-the-pandemic-software-interface-and-the-endless-doomscroller/

Critical Aesthetics and Platforms

The Barcelona-based artist Joana Moll has focused precisely on how platforms pollute and produce waste in the form of both data and greenhouse gasses in several artworks. Her work *Co2gle*[15] points to the carbon pollution from Google.com which remains hidden from the users by simply showing a number which is growing as long as the user stays on the site, and *Hidden Life of the Amazon User*[16] explores how the tracking and profiling of users is a big part of this. In the latter project, she maps out how her buying of a small, trivial book with assortments of Jeff Bezos's shallow cliches forces her to go through 12 different interfaces and download 87,33 MB of data with 1.307 different requests to scripts in Amazon's cloud.[17] Consequently, buying the shallow book starts a process heavy on data that needs transmitting and computing.[18]

Besides the cultural industrial giant, Amazon, Moll also addresses smaller and more innocent institutions of culture. In her recent project *16/2017*, named after a Catalonian law on cutting emissions, she proposes the Centre d'Arts Santa Mònica to reduce its energy expenditure by 50% during a four-months-long exhibition (2021-22), which forced the centre to close for a week to keep its reduced budget. With the project, Moll stages the art centre as a mini cosmos that reflects larger societal challenges regarding climate change, and she also argues for new ways of managing these challenges within the cultural sector: "In a context of climate emergency, where the scarcity of resources will

15 Joana Moll, *CO2GLE*, 2015. http://www.janavirgin.com/CO2/

16 Joana Moll, *The Hidden Life of an Amazon User*, 2019. https://www.janavirgin.com/AMZ/

17 At the time of writing, Moll is continuing her works on the carbon pollution of the hidden cookies of adtech with the 2022 project *Carbolytics*, http://carbolytics.org

18 Christian Ulrik Andersen and Søren Bro Pold, "a.username?–A Profile Without Qualities: Exploring Amazon through Art and Literature," in Bianca Herlo et al. eds. *Practicing Sovereignty: Digital Involvement in Times of Crises* (Bielefeld: transcript Verlag, 2021). https://www.transcript-publishing.com/media/pdf/66/b3/2a/oa9783839457603.pdf

intensify in the coming decades, elaborating proposals capable of articulating human activities around limited energy resources, is a necessary exercise to favour new cultural rituals which are more consistent with our contemporary climatic conditions."[19]

With *16/2017*, Joana Moll takes her critical approach and implements it in a functional setting to change behaviours and designs. Instead of exhibiting a visual artwork relating to climate change, she forces the institution to reconsider its design, functioning and infrastructure through weekly meetings, agreements and a mural graph showing the resulting energy savings. In this way, she clearly goes behind the visual surface and explores the infrastructure, including the climate polluting activities within art itself. Art has its institutions and production processes which, for instance, involve a lot of related travel activities by both artists, curators and audiences (since art is a major tourist attraction). In this way, instead of an abstract climate crisis, which might be difficult to relate to, she points to how specific everyday activities in the art centre interfere with carbon pollution, and to how they might be changed through a critical technical practice, as argued for by Bunz, Agre, DiSalvo and ourselves.

Sustainable Platform Aesthetics

Artists and activists are also trying to redesign online websites and platforms for sustainability, including the Barcelona based *Low Tech Magazine*, which, besides being an online and printed magazine about the combination of old technologies with new knowledge and materials and vice versa, is developing their own sustainable website.[20] In other words, *Low Tech Magazine* goes

19 Joana Moll, "16/2017", 2021. https://janavirgin.com/PR/16_2017_premsa_en.pdf

20 Kris De Decker, "About this website." *Low Tech Magazine*, 2007. https://solar.lowtechmagazine.com/about.html

against the thread of still larger and "fatter" dynamic websites with cookies and scripts, such as explored by Joana Moll. Instead, they have created a non-dynamic site with dithered images, default typeface, no third-party tracking, no advertising services or cookies. While all these are important design choices that contribute to a new design aesthetics, without interfering with the readability or general quality of the web design, they also reduce the size of the web pages and allow for a more simple technical setup that does not necessitate professional cloud solutions, and can be hosted on a personal web server. Furthermore, this server can be driven by solar energy from a small 50W solar panel on the balcony of an apartment in Barcelona with a chargeable battery to avoid going offline during nights or grey days. The website can, therefore, disappear at times, meaning that it renders its infrastructure visible through its design and aesthetics. Compared with Amazon.com, it does not enclose or transmit hidden megabytes of scripts, cookies etc. and furthermore, its server is clearly locatable from the website, including its energy consumption and pollution.

Solar Protocol is another project that takes the solar-powered website to the next step. The artists and activists behind the project, Tega Brain, Alex Nathanson and Benedetta Piantella, have used many of the insights from *Low Tech Magazine* about limiting the size of webpages, avoiding cookies, etc. to establish a global network of solar-powered servers in Africa, Australia and the Americas.[21] The website is, in other words, delivered by the server which is receiving most sunlight. This means that the website may change through the day, since it is not fully identical across the different servers, and the servers can generate both

21 Tega Brain, Alex Nathanson and Benedetta Piantella, "Solar Protocol", 2021. http://solarprotocol.net

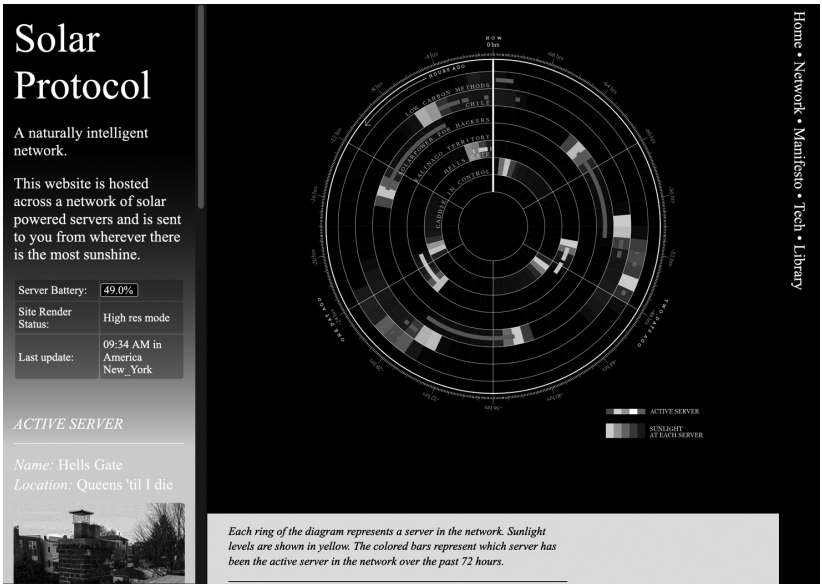

Figure 1. *Solar Protocol* with diagram of the network. Courtesy of Tega Brain, Alex Nathanson and Benedetta Piantella.

high and low resolution versions of the website, pending on the power of the battery. Furthermore, the left frame of the website informs the user about which server is currently running, including information on location and energy levels. In their manifesto, the artists argue for natural rather than artificial intelligence as their guiding principle, routing "internet traffic according to the logic of the sun" and calling for "new forms of cultural production that embody a politics of accountability" rather than "a capitalist logic" that export costs "to someone else somewhere else" through increasing energy-requiring data-driven intelligence.[22]

Alex Nathanson, one of the people behind *Solar Protocol* and other similar projects such as *Solar Power for Artists*,[23] is al-

22 Tega Brain, Alex Nathanson and Benedetta Piantella, "Towards a Natural Intelligence - Solar Protocol," 2021. http://solarprotocol.net/manifesto.html

23 https://www.solarpowerforartists.com

so the author of the book *A History of Solar Power Art and Design* where he argues that "Aesthetics is inseparable from the solutions to the climate crisis. Art and design have an important role to play, especially in regard to communicating the possibilities and limitations of technology and enabling a more just transition to clean energy."[24] The aesthetics he calls for is obviously related to the interface that users experience, but also to the deeper technical functioning of the interface, and the very idea of technical functionality: "Because a solar cell's output is environmentally dependent, varying widely depending on the amount of light it receives, traditional electronics resources fall short. There is a need for in-depth and interdisciplinary educational resources for aesthetic applications of PV with a critical understanding of design."[25] Nathanson delivers many both historical and contemporary examples of this, and obviously *Solar Protocol* and *Low Tech Magazine* are great examples, too. The climate crisis cannot be solved with solutionist technical fixes, but needs a more thorough rethinking of the way we construct, design and use technologies. Technological cloud infrastructures should become a matter of concern as argued by Latour, and we need more Brechtian infrastructures in order to see and understand the whole machinery.

To conclude, if we continue to increase our usage of data-driven platforms and streaming, we will be choked by either fossil fuel pollution or the amount of wind turbines and solar power fields needed to feed clean energy to data-hungry platforms. Therefore, we need to find ways to connect energy production to consumption in ways that make the consumption and pollution perceivable and produces an incentive for sustainable

24 Alex Nathanson, *A History of Solar Power Art and Design* (New York: Routledge, 2021), 11.
25 Ibid., 3. "PV" here means Photovoltaic solar cells.

changes. Whereas cloud platforms in general hide their infrastructure, there is a clear need to reverse this in order to bring the effects and pollution back into view. How can the hidden materiality of infrastructures and platforms become perceivable in a way that relates to the social, global, environmental and more-than-human? Could a future reflective and critical platform perception become a countermodel to the current platform(ed) perception, where everything is served effortless at the nearest screen, hiding infrastructures, carbon pollution and exploitation of data? To envision this, we need aesthetic computational criticism, we need artistic endeavours to create alternative design aesthetics and the project mentioned here can serve as great starting points.

Christian Ulrik Andersen, PhD, has published widely on digital aesthetics and interface criticism, including *The Metainterface* (MIT Press, 2018, with Søren Pold). He is the co-founder of Digital Aesthetics Research Center (DARC) at Aarhus University (2002), co-organised the *Read_me* festival on software art (2004, with Olga Goriunova and Alexei Shulgin), and has since then been a regular speaker and panel organizer at various media art festivals, events and conferences. Since 2011 he has collaborated with transmediale festival for digital art and culture and shifting partner institutions around a series of research seminars that addresses the thematic framework of the festival and includes, in particular, emerging researchers in the field. He is the co-founder and -editor of *A Peer-Reviewed Journal About* (2014, with Geoff Cox), an open access journal that addresses the ever-shifting themes of digital art and culture. He has been a Jens Christian Skou Junior Research Fellow at Aarhus Institute of Advanced Studies and is currently Associate Professor at the Dept. of Digital Design and Information Studies, Aarhus University.

Søren Bro Pold (Associate Professor, Aarhus University) has published on digital media aesthetics and the interface in its different forms, e.g. on electronic literature, net art, software art, creative software, urban and mobile interfaces, activism, critical design and digital culture. His main research field is interface criticism which discusses the role and the development of the interface for art, literature, aesthetics, culture and IT. Together with Christian Ulrik Andersen he authored *The Metainterface: The Art of Platforms, Cities and Clouds* (2018). He was co-chair of the ELO 2021 conference, "Platform (Post?) Pandemic" (2021) and chair of the Dariah EU project Electronic Literature and Covid 19.

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X Body
Embodying the "Black Box"

Patrícia J. Reis

We often think about interactive artworks as a form of human–machine communication/exchange between certain inputs that have a cause and effect in the interactive system, known as output. Humans are often the triggers of such input, and machines are often in charge of computing the output, later on, potentially expected and experienced by the humans. Ontologically speaking, interactive systems hold onto their automatic nature to function, giving the feeling that they are autonomous and independent.[1] Vilém Flusser[2] calls this apparatus a "black box", because its automatic system is invisible, hidden, and mysterious to its user and can only be decoded by the person that programmed it: the user only has access to the input and output and the process in between is a black box. According to Flusser, the impenetrability of the program is a fundamental precondition for interaction, or, in Flusser's words—for playfulness.[3] The complexity of the system and the incomprehension of its program is essential to keeping the user immersed and hooked to the appa-

1 Norval Baitello Jr., "Black Box," in Siegfried Zielinski and Peter Weibel, with Daniel Irrgang eds. *Flusseriana: An Intellectual Toolbox* (Minneapolis: Univocal Publishing, 2015), 76-78.
2 Vilém Flusser, *Ensaio sobre a Fotografia. Para uma filosofia da técnica* (Lisbon: Relógio D'Água editores, 1998).
3 Vilém Flusser, *Towards a Philosophy of Photography* (London: Reaction Books, 2000), 93.

ratus: within the search for the hidden potentialities of the program, users "lose themselves"[4] in it. For users (or functionaries, after Flusser), the world becomes a "pretext for the realisation"[5] of the possibilities provided by the program. The obscurity of the automated workflow of the apparatus outputs a "magic feedback",[6] giving users the mistaken feeling that they are in control; in fact, they are just keeping the program alive.

It is precisely this unknown, "automatic", and magic condition of the human-machine interaction that I am interested in exploring, extending it to a similar modus operandi when it comes to the human-human interaction, initiated by a machine: What if we "embody" the same model of the black box as a means of realizing aesthetically individual experiences, and, with that, taking interactivity to a greater inner level of sensorimotor immersion? Can we speak of the human body as a black box in Flusserian terms? This essay takes as an example my own artistic practice within the field of interactive haptic visuality,[7] particularly the work-in-progress piece *Underneath the skin another skin*,[8] as a paradigm to think about haptics and the sensorimotor apparatus as the black box, following Flusser.

4 Ibid., 27.
5 Ibid., 26.
6 Ibid., 70.
7 Haptic visuality in this context follows the theory of Laura U. Marks as a way of seeing that triggers haptic feelings in the spectator. In the impossibility of decoding the image through visual perception alone, other senses are called into action, namely, the haptic sense. I propose to expand the concept (extensively studied in cinema and video) to the field of interactive art. My proposal is that certain audio, visual, and tactile stimuli (artificially produced by machines) can trigger haptic experiences that, in a high level of immersion, might allow the recipient to enter a different stage of interaction, interacting with their own sensorimotor mechanisms on an inner level of conceiving unique experiences.
8 Patrícia J. Reis, *Underneath the skin another skin*, audiovisual–tactile installation composed of textile, styrofoam, foam, electronics, microcontroller, air-pressure sensor, LED, vibration motor, headphones, sound (stereo), 300 x 90 x 300 cm, 2015- (Austria), http://www.patriciajreis.com/portfolio/items/underneath-the-skin-another-skin/

The Artwork and the Internal Interactor

An interactive artwork is concerned with the experience of the individual who interacts with it.[9] The knowledge acquired, and the psychological and perceptual body adjustments derived from the active participation, become the actual artwork. A computer-based interactive artwork demands specific modes of interaction made different by the specificities of the human–machine system of the work. In such a system the active participation works in a unique dialogical manner characterized by the exchange of information between human and machine,[10] altering one's personal experience. The communication channel is made available through an interface, a tangible object that acts as an intermediary "translating" the human action into a particular computer task programmed by the artist. The interface provides the ideal context for the sensorial integration of the agent in the virtual and simulated space of the system. In highly immersive systems[11] the agent is psychologically and sensorially enveloped within the artwork and becomes an interactor.[12]

Underneath the skin another skin is an audiovisual-tactile interactive installation presented in the shape of three human-scale tridimensional objects—*Object A*, *Object B*, and *Object C*. It is made of flexible materials such as textiles, inviting the interacting audience to engage physically in a bodily, sensorial, and sensuous

9 Patrícia. J. Reis, "Por baixo da pele outra pele: conjunto de obras artísticas. Corpo, ecrã e interface para uma visualidade háptica interactiva", PhD dissertation (University of Évora, 2016), 91.

10 Brigid Costello et al., "Understanding the Experience of Interactive Art: Iamascope in Beta_space", in *Proceedings of the Second Australasian Conference on Interactive Entertainment* (2006), 49-56.

11 Claudia Giannetti, *Estética Digital: sintopia da arte, a ciência e a tecnologia* (Belo Horizonte: C/Arte, 2006), 125.

12 Concept adapted from the interactive theatre context, proposed by Kristi Alok and Robert Mulder. "Electronic purgatory", in *Ars Electronica: die welt von Innen - ENDO & NANO = the world from within -ENDO & NANO*, ed. K. Gerbel and P. Weibel (Linz: PVS Verleger, 1992), 207-208.

Figure 1. Patrícia J. Reis, *Underneath the skin another skin*, 2016-. Audiovisual–tactile interactive installation. [From left to right: Object B, Object C, Object A]. Photo © Manfred Pichlbauer.

relationship with the artwork. The objects contain interactive devices and tactile sensors that, when used, trigger multiple sensorial stimuli in the interactor. The interactive installation focuses on the interactor's intimate haptic sensorial experience, taking into consideration his or her sensorial and cognitive mechanisms as a potential apparatus in the construction of unique individual experiences.[13] Interactivity is understood to be a triggering element in a multisensorial, individual, and particular experience. All objects share the same mechanism as the audio-visual-tactile interface. The visual interface emits flickering light, the audio interface emits pulsed binaural beats[14] (mixed with a

13 Patrícia J. Reis, "Playfulness in interactive systems: an empirical study for the creative development of Underneath the skin another skin", in *Vis-a-vis Medien kunst building*. ed. Stefan Sonvilla-Weiss (Berlin: De Gruyter, 2017).

14 Binaural beats are third sounds accomplished in the audio cortex, resulting from the sum and the difference between two sounds with different frequencies, induced through ste-

Figure 2. Patrícia J. Reis, *Underneath the skin another skin*, 2016-. Audiovisual–tactile interactive installation. [Object A]. Photo © Manfred Pichlbauer.

melody created by the artist in the background), and the tactile interface, installed inside the object, emits vibration feedback.

Object A is characterized by a rounded shape, which the interactor is invited to embody and embrace by reclining his or her body facing down. The visual interface is placed on top, inviting the interactor to approach with his or her eyes shut. The tactile interface is placed inside the object and sends vibrations to the abdominal area of the interactor. The sound is perceptible through stereophonic headphones. The interactor is invited to insert his or her hand into the object at the point where the

reophonic headphones. For instance, a repeated frequency of 100 Hz induced in the left ear and a frequency of 110 Hz induced in the right ear will generate a third sound of 10 Hz. This does not exist in the source; rather, it is a brain contraction. Binaural sounds do not exist in nature and can only be fabricated by machines. There is also the belief that certain binaural beats received repeatedly might train the brain in the same induced frequency, which therefore might be associated with states of mind, such as lucid dreams.

interactive sensor is located and to interact with it. By doing so, the interactor can select from the different frequency sets available in the system: set 1 offers synchronization between audio and visual stimuli with a frequency of 1 Hz; set 2 offers an audio and visual frequency of 10 Hz; set 3 offers an audio and visual frequency of 20 Hz; and set 4 offers an audio, visual, and tactile frequency of 30 Hz.

While embodying the object, the interactor is invited to use the headphones and to approach the source of light with his or her eyes shut. The synchronization of the stimuli stimulates the perception of singular motion images. Although the output is always different for each interactor, one could characterize it as a kind of kaleidoscopic animation—patterns of geometric shapes in motion and color. The visual illusion is a direct consequence of the brain's attempt to give meaning to a certain "distorted" stimulus: signals such as depth and color are corrupt and therefore misleading, because the eyelids are shut and not open. One could even call it a certain *glitch* of the brain, the consequence of a non-normative way of seeing. The output—the motion image—is enriched by the interactive potentialities of the work: through manipulation of the interactive sensor, the interactor can "visualize" different "mental" images. I called these images *endosensorial*, after the *endophysics* of Otto Rössler[15] and the endo-aesthetics of Claudia Giannetti.[16] The interactor becomes an internal spectator of the system[17] and therefore an internal participant of the artwork.[18] This observer dependency is emphasized by the fact

15 Otto Rössler, "Endophysics: The world as an interface", in *Invention of the name endophysics—A letter from David Finkelstein*, ed. David Finkelstein and Otto Rössler (Singapore: World Scientific, 1998).
16 Giannetti, *Estética Digital*.
17 Rössler, *Endophysics*, 23.
18 Gianetti, *Estética Digital*, 185.

that the image is only perceptible to the person that is interacting, and it is inaccessible to the others. The endosensorial image is accrued from a cognitive construction that is particular and intimate and only perceptible in the endospace of the interaction: the motion image is projected and constructed in the brain[19] as an intangible screen, considering the singular sensations and emotions that the experience might entail.

The Program and the Experience

The experience of the interactor is therefore a major aspect of the artwork. The objects include, in their interactive system made up of technological apparatus (machine-based), the formal interface—that mediates between human and machine in a particular embodied way. While interacting with the pressure sensor, the interactor is enabled to choose between the different modes, which are already pre-programmed in the system—different audio-visual-tactile stimuli. Nevertheless, the interactor might also experience the artwork without interacting with the machine object, resuming his or her participation in an embodied and sensorial experience with his or her body. In any case, one could classify the interaction as open, of the kind that allows the interactor to access the experience in a *factual and explicit* way.[20] The interaction level is situated in what Giannetti nominates *reactive interaction*,[21] enabling the participant to act within the limits of the system according to the available options.

19 The idea of the brain as a screen is a concept proposed by Gilles Deleuze in the context of cinema, as a space in which motion images are constructed, imagined, and conceptualized. Gilles Deleuze, "The brain is the screen: an interview with Gilles Deleuze", in *The brain is the screen: Deleuze and the philosophy of cinema*, ed. G. Flaxman (Minneapolis: University of Minnesota Press, 2000), 365-374.

20 Giannetti, *Estética Digital*, 111.

21 Ibid, 125.

In any interaction, particularly in an artistic installation composed of a digital system, it is imperative that the interactor perform a practical role within the *realization of the artwork*.[22] The interaction must be sufficiently active that the interactor changes something in him or herself, in his or her personal experience, which is a direct consequence of his or her sensory integration with the system of the artwork. For Giannetti, in an interactive system, the communication level takes effect whenever the participant becomes a sender, always creating and sending new information. The author says that the participant must have all the necessary means to modify something within the system of the work, "modifying it according with their actions."[23]

Hence, the interaction in *Underneath the skin is another skin* cannot be reduced to the human-machine interaction, considering that the interactor, while interacting with the system, is not effectively changing it, because his or her actions are limited by the options of the program. The system in itself is not modified; it acts as an input while triggering the perception of what I call endosensorial images. The relevant aspect when it comes to interaction and experience in this piece happens precisely on an *endo*dimension—whenever the interactors, while interacting with themselves, within their inner systems, are able to create singular and unreproducible experiences, profoundly pronounced by their own individuality and personal background. The communication system prevails in this level of interiority, from the interactors to themselves. The communication channel is their cognitive and sensorial system, able to create what we know as illusions.[24]

22 Translated freely from Portuguese "efectivação da obra", ibid., 112.
23 Ibid.
24 An observation that it is only possible to make through our own individual experience, in

The "Black Box" and the Program

There are two leading moments within the interaction: in the first stage there is a dialogical relationship between the artwork and the interactor; and in the second stage, whenever the initial curiosity and preliminary experimentation have passed, the interactors enter another level of immersion. In this stage the artwork and the interface disappear. While enveloping the artwork, through their cognitive and sensorimotor system,[25] the interactors enter a different mode of interaction: from human-machine interaction to human-human interaction, interacting, or, as Flusser might have said, "playing" with themselves, and with their pre-programmed cognitive and sensorimotor system.

Nevertheless, interactivity still depends on the technical apparatus that digitally processes and translates the actions of the interactors—coding and decoding, programmed by the artist. The input is machine-created; it does not exist in nature. The output cannot be entirely predictable, as we have seen, as a result of the important role of the interactor as a singular participant. In this sense, the program in this artwork cannot be limited to the technical apparatus. This, as an automatic device, can only entail parts of the program. The whole program is only executed after achieving the status of endosensorial image, meaning subsequent to the participant acting in the system perceptually, cognitively, and phenomenologically, within the process of cognizance and realization of the artwork. Whenever the stimuli are received by the interactor, a new decoding phenomenon

the sense that I, as the external observer, have no access to the experience of the internal participant.

25 Mark Peterson, *How we become sensorimotor. Movement, Measurement, Sensation* (Minneapolis: University of Minnesota Press, 2021), 27.

takes place, outputting images, sensations, and thoughts. The interactor becomes the apparatus or the "black box."

In *Underneath the skin another skin*, the automatisms triggered between input and output are likewise the Flusserian black box, unknown because the decoding process happens in an *endo*dimension of the participant and we have incomplete access to its "code". We might be confined to the position of functionaries of our own body, but we can also be creative players of a *meta-game* in which some of the infinite possibilities within the program might be revealed and experienced. As Flusser[26] suggested in many of his writings, we must create new models to step from the world to imagination, to emancipate ourselves by getting over the "magic spell", demystifying the program and being a creative player against its determinations. In sum, becoming human[27] through machines.

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26 Vilém Flusser, *The Freedom of the Migrant: Objections to Nationalism* (Urbana: University of Illinois Press, 2013).

27 Vilém Flusser, Stefan Bollmann, and Edith Flusser, *Vom Subjekt Zum Projekt. Menschwerdung* (Frankfurt am Main: Fischer Taschenbuch, 1998).

X is for Xavier

Art and Parenting in the Field of New Media

Victoria Bradbury

If X is a wildcard, a crossroads, a multiplier, or an undiscovered planet, then nothing—no artwork, no theory, and no algorithm, can define X like the first years of becoming an artist parent. In this chapter, I retell some of my encounters with supportive and unsupportive entities on this journey and reflect on ways in which I have navigated parenting while traveling to participate in exhibitions, conferences, and workshops.

In late June 2014, my husband Mark and I bumped a pram down an ancient brick street in Porto Portugal as we searched for our Airbnb, which was set off an ornate courtyard. As we arrived at the place that would be our home for a week, our 7-month-old son, Xavier, his pram /slash/ equipment cart piled high with baby supplies and electronics, stared up at Porto's stone shop fronts and residential quarters. In the next week, Xavier would blow a penny whistle in a children's parade, ride *électrico* rail cars throughout the city, visit art exhibitions, pet a wild rabbit in a park, get chased by a peacock, serenade grandmothers from a balcony (Fig. 1) and become the captain of an imaginary spaceship in a performance art happening that resulted from the xCoAx conference Future Fabulators workshop. The encourage-

Figure 1. Xavier in window of apartment at Largo De S. João Novo, Porto, Portugal. Image by Mark Hursty, 2014.

ment of my peers at this early manifestation of xCoAx helped me build my confidence as an artist parent.

In my early career, I worked to keep my professional and personal lives separate, concerned that disclosing my marital or parental status would limit opportunities. As an undergraduate student, I observed that motherhood was a death knell for many an art career. Mothers are rife in art history as the subject matter of paintings and photographs, but rarely as the creators. After becoming pregnant with my first child in 2013, I was fearful that outing myself as a mother would render unserious a career that I had been building for over a decade. I also had concerns that parenthood might affect my competitiveness on the job market. I was working on my PhD at the time and hoped to find a tenure track position after completing my dissertation. Research has shown that, "The motherhood penalty in academia is a worldwide issue, but the acknowledgment of the problem by the academic community is very recent, and the development of effective actions

and policies toward solving it is rather scarce."[1] So like so many women artists[2] and academics before me, I planned to hide my mother-ness at gallery exhibitions, conferences, and job interviews. But during my pregnancy and after my son was born, I began to realize that toggling this "hide" state was unrealistic. My body and brain were so encompassed by the newness of parenthood that it was inseparable from my identity as an artist and researcher. From the beginning I started to bring my child along to professional opportunities whenever possible; slowly, I began to mention my status as a parent, my obligations as a parent and my needs as a caregiver in relation to my career. Three years into parenthood I was in a tenure-track academic job at The University of North Carolina at Asheville and felt more secure than I had as a graduate student. I realized that having a more stable academic path put me in a position of privilege in which sharing my status as a parent could potentially help others. Perhaps others would see me parenting alongside my career and believe that it is possible (if it is something that they aspire to do).

Not every intersection of career and parenthood has been positive. One of my earliest encounters with this convergence happened when I was still pregnant with my son. Another was somewhere between an inconvenience and a physically painful reminder of my embodied experience as a breastfeeding mother. Both emphasized that the physical requirements of new parenthood would at times be unrecognized and unsupported. Shortly before xCoAx 2014, I travelled to London from my home in New-

1 Fernanda Staniscuaski et al., "Gender, Race and Parenthood Impact Academic Productivity During the COVID-19 Pandemic: From Survey to Action" *Frontiers in Psychology* 12 (2021). https://www.frontiersin.org/article/10.3389/fpsyg.2021.663252

2 Mathilde Walker-Billaud, "Disappearing Into Motherhood A Creative Framework for Artmaking", n.d. https://www.artpapers.org/disappearing-into-motherhood-a-creative-framework-for-artmaking/

castle upon Tyne to participate in "Hack the Space: Tate Modern".[3] Since I was still breastfeeding, I rushed down and back on an all-night bus with a manual breast pump. During the 24-hour event, art hackers slept on a few scant bunk beds and in my case, an oversize bean bag chair in the Turbine Hall between bursts of making. I knew what I had signed on for, but not how difficult it would be to manually express and then flush away milk in a bathroom stall off the Tate Turbine Hall. Though our team from Newcastle's Maker Space created an exciting project, "Pharmaceutically Active Crustaceans", my parallel endeavor of covert breastmilk expression was relatively unsuccessful, which had me rushing back to Newcastle to reunite with my baby and relieve my discomfort after the event concluded. Since that time, I have participated in events that made breastfeeding spaces with privacy and refrigeration available for lactating parents (such as College Art Association 2019). These types of accommodations make breastfeeding parents feel not only welcome in those spaces but allow them to be more focused on participating fully in the proceedings.

The other negative encounter mentioned above occurred in 2013 when I applied to present a paper at a conference that would be held in Riga, Latvia that autumn. When I learned that my paper was accepted, I calculated that by the time of the conference, I would be 38 weeks pregnant. I knew that I was not going to be able to fly to and from Latvia in order to present my paper because most airlines restrict flying after the 36th week[4] of pregnancy due to a higher likelihood of going into labor at this

3 Hannah Ellis-Petersen, "Smart Art: Hack the Space at Tate Modern", June 16, 2014. https://www.theguardian.com/artanddesign/2014/jun/16/hack-the-space-tate-modern

4 Example from United Airlines: https://www.united.com/ual/en/us/fly/travel/special-needs/pregnancy.html

Figure 2. Possible train routes from Newcastle upon Tyne, UK to Riga, Latvia (present day, 2022). Accessed January 19, 2022.

late stage. Disappointed and overly concerned about optics and a patriarchal ideal of professionalism, I contacted the conference organizers to disclose my situation; they informed me that remote participation was not possible. I began to explore options for traveling by land and set to research train schedules. I discovered that I could take a series of trains through Europe, crossing seven countries in just under 48 hours each way (Fig. 2), attend the conference, then make it back to my midwives in the North of England to give birth at around 40 weeks. Though I cringe now at the thought of such an impossible journey, I was seriously considering this "adventure" and my husband was enthusiastically supportive. Thankfully, before booking trains and confirming my conference presentation, I thought I would ask around. I spoke with other people who had given birth about whether they thought that it would be feasible to travel to Latvia and back in the last month of my pregnancy. They brought up some key questions such as, what if you went into labor on the train? I realized that my plan was perhaps not ideal. But I was still embarrassed to contact the conference asking for an exception to the remote presentation rule. I delayed contacting the organizers for a few

weeks, but finally sent off an email. They reiterated that only in-person presentations were possible. I was disappointed and ashamed. I disclosed my pregnancy in a professional context and had to face the limiting consequences of becoming an artist parent even before I had given birth.

In spring 2014, I had a paper accepted into the 2nd xCoAx conference in Porto, Portugal. By the time of the June conference my son Xavier would be 7 months old. Because Mark and I were both PhD students at the time, we had the privilege of flexible time, so he and Xavier traveled with me to Porto. We rented the aforementioned Airbnb and while I attended the conference, Mark and Xavier toured the city and dropped into xCoAx events when they could. In the evenings, we took turns staying at the Airbnb so the other parent could participate in events such as a concert and an algorave. Exploring Porto that week is one of my favorite memories of Xavier's first year. After this positive experience, Mark and I attended xCoAx again in 2015 with a co-authored paper and I presented a performance in the 2017 xCoAx exhibition in Lisbon. I was invited to join the xCoAx Scientific Committee in 2018 and continue to be a member today. The Lisbon conference also led to an invitation to write a reflection piece for Neural Magazine.[5] When conference organizers or venues are welcoming and accommodating to artist parents, the field benefits in the long term from their continued research and service.

Mark and I have participated in many other conferences and exhibitions since xCoAx 2014. For each, we have had to negotiate responsibilities, sharing solo parenting while the other travels and juggling childcare on a limited budget. These include Digital Media Labs, a 2014 residency in Barrow-in-Furness,

5 Victoria Bradbury, "xCoAx review." *Neural Magazine*, Issue 58 (Autumn 2017).

UK, which was generous in funding Mark and Xavier to travel with me and be present for the week-long residency. I was also fortunate to have incredibly supportive PhD supervisors, Beryl Graham and Sarah Cook, through the CRUMB research group at the University of Sunderland. Xavier was welcomed by Professor Graham on the CRUMB Short Course in London in early 2014 (another marathon of pram-rolling and sightseeing by Mark and Xavier). In summer 2016, I brought Xavier along solo to a week-long research residency at Signal Culture in Owego, New York.

More recently, Pilchuck Glass School in Washington State has been making strides to support families of instructors and students within their residential summer programs, which are attended by participants from around the world. In late summer 2017, Mark and I were invited to teach a 2018 workshop at Pilchuck called *The Glass Electric*.[6] The course would combine glass working with electroforming and electronic circuit building with conductive materials and microcontrollers. In late fall 2017, I found out that I was pregnant with our second child, with a due date that would land in the middle of our already confirmed Pilchuck class. We made arrangements for another instructor, Tommy Dylan from Northumbria University, to co-teach the 2018 class with Mark, who flew back to North Carolina in time for our daughter Zoravela's birth in July. In a gesture of support for our work, Tina Aufiero, Pilchuck's artistic director, invited Mark and I to return to teach a second version of the course in Summer 2019. In addition, Pilchuck invited us to bring our children along with a caregiver, offering us family housing. My retired parents joined us for the duration of the course and cared for the kids during the days while we were teaching. The 2019 *Glass Elec-*

6 https://blurringartandlife.com/theglasselectric/

tric: Glassblowing, Electroforming and Electronics led to a range of exciting projects that combined glass and interactive electronic media and brought together a dynamic group of artist participants, including Tina Aufiero herself. One personal memory of the week was when the Pilchuck dining hall erupted in a round of "Happy Birthday" to Zoravela on her first birthday, one year after we would have been teaching the original version of the course. Institutions that recognize the need to support artist parents allow for rippling benefits within the field.

The reflections detailed here in diaristic fashion are personal. I acknowledge that my identity as a white western cisgendered married heterosexual woman allows me privileges not held by all practitioners. For single parents and people with extremely limited funds or with partners with rigid work schedules, pursuing these career building opportunities is much more difficult. Also, as I have learned, traveling with a partner and an infant is far removed from doing so with older children.[7] First, traveling with a breastfeeding baby, while not apparent to me at the time (it was of course hectic and logistically complicated), is significantly more flexible than traveling with an older child who has independent needs and input (i.e., expressing boredom at sitting through academic presentations). Second, babies and toddlers under two years of age are free to fly on most airlines as lap infants so there is not an extra cost for flights for the child. Of course, many professionals choose not to become parents or are not able to have children. I recognize and fully support any decision or circumstance related to being child free. My hope, how-

7 "And it is not only newborns who require care. Taxiing older children between schools, sporting, creative and social fixtures can consume hours." Kate McMillan, "Representation of Female Artists in Britain During 2019." Freelands Foundation (2019): https://freelands-foundation.imgix.net/documents/Representation-of-female-artists-2019-Clickable.pdf

ever, is that discussing the support and inequities that I have encountered can help parents of all identities working in new media to continue to create and exhibit work that enriches the field.

It is encouraging to see other artist-parents working in new media, including Angela Washko,[8] Mendi and Keith Obadike,[9] xtine burrough,[10] Ricardo Miranda Zúñiga,[11] and Nicholas O'Brien,[12] not hide their status as parents and even at times make work about parenting. As the COVID-19 pandemic continues, research has shown that mothers in academia have been disproportionately affected by the reduction or lack of childcare during these two+ years.[13] I hope that as the pandemic ebbs, that considerations for accessibility for artist parents continue to be integral to conference planning. The richness and labor that they bring to the field will benefit new media practitioners as a whole as an expansion of perspectives is presented and as people don't feel the need to hide their identities or related concerns. For new media artists and researchers, their status as parents should not have to remain the unmentioned X in the room.

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9 http://blacknetart.com/
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14 https://blurringartandlife.com/interfacing_unreal_physcomp

Packaging Across Networks
Tracing Strategies and Curatorial Intelligences of the Cuban *Paquete Semanal*

Nicolas Malevé, Nestor Siré, Gaia Tedone

> The Internet registers every moment when a certain piece of data is clicked on, liked, disliked, transferred or transformed. Accordingly, a digital image can never be merely copied (as an analogue, mechanically, reproducible image can), but is always newly staged or performed. And every performance of a data file is dated and archived. Further: every act of seeing an image or reading a text on the Internet is registered and becomes traceable.[1]

Under current conditions of "Surveillance Capitalism",[2] we have come to accept as a ground truth Boris Groys's proposition that "every act of seeing an image or reading a text on the Internet is registered and becomes traceable".[3] These words powerfully highlight how the act of viewing and selecting content online is inscribed within a complex web of traceable relations. From the standpoint of curation, the focus then moves from the representational interface of a specific image to the conditions and

1 Boris Groys, *In the Flow*. London: Verso Books, 2016, 185.
2 Shoshana Zuboff, *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power*. New York: PublicAffairs, 2019.
3 Groys, *In the Flow*, 185.

invisible curatorial intelligences that enable the performance of that specific data file. However, this statement hardly captures what happens when images and texts travel across both sides of the digital divide and the conditions necessary to capture a user's behaviour are not met. As the uneven material conditions of different networked infrastructures force us to rethink a series of assumptions about the circulations of images, different tracing strategies need to be explored and implemented to account for discontinuous paths of movement and diversions. In this text we want to explore X as crossroads via a number of blockages, errors, and transformations that occur when images and files move from one side of the digital divide to the other, from an online network to an offline one, and from a specific networked economy to another. Essentially, we want to investigate how various forms of technological and connectivity errors can offer the opportunity for practices of repair and maintenance and the forms of curatorial intelligence they make possible.

The "we" of this text already embeds the condition of socio-technical asymmetry which are at stake in this reflection, which develops from the collaborative research between Gaia Tedone, Nicolas Malevé and Nestor Siré—respectively based in Italy, Belgium and Cuba—under the support of a grant issued by the Swiss National Science Foundation. Much of the work and exchange that shaped this collaboration occurred over the platform Telegram, which provided a relatively stable tool of communication with Cuba in spite of the turmoil the country found itself in over the course of the research period, from tropical storms and hurricanes to political protests and Internet shutdowns. Since its creation in June 2021, the Telegram channel "Packaging Across Networks" has operated as the official archive of the project, hosting the digital traces of a public event organised at the

Lucerne School of Arts and Science and two international workshops; others channels and groups were assembled and disassembled over the last year, working as unofficial back-end conversations for the project.

This project was the result of the encounter between two sets of interests and practices: on the hand, Siré's long term research on the *Paquete Semanal*, which is a one-terabyte collection of media that is aggregated weekly in Cuba on a physical hard drive and is distributed through a pirate network of distribution via in-person digital copying. On the other hand, Tedone and Malevé's ongoing investment, from both a curatorial and computational standpoint, with the concept of the networked image, as an image whose meaning and value is defined by the patterns of circulation it creates. As it has been argued, "a networked image emerges through the network; its existence is intricately entangled and intertwined with software, hardware, code, programmers, platforms, and users".[4]

What happens to images and files when the very premise of the Internet as an always-on network is challenged? Which kind of knowledge can be gained if the materialities of different networks are put under scrutiny? Which alternative forms of infrastructures might emerge or be envisioned? These were some of the questions we set out to explore, choosing the methodology of critical tracing to ground our reflection on how content circulates from the Internet to the Cuban Weekly Package. This specific methodology was originally elaborated by Tedone within the framework of her writings and PhD research concerned with the online curation of networked images where she posited it as

4 Geoff Cox, Annet Dekker, Andrew Dewdney and Katrina Sluis, "Affordances of The Networked Image". *The Nordic Journal of Aesthetics*, 30 (61-62), 2021, 40-45. https://tidsskrift.dk/nja/article/view/127857


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[#SECCIÓN ARTE/PAQUETE SEMANAL]
Nestor Siré
Monday June 28 5pm CET
Followed by a discussion with Gaia Tedone Nicolas Maleve
HOCHSCHULE LUZERN
Hello everyone and WELCOME.
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1 During the presentations your mic will be muted
2 Please type your questions in the chat
3 You will be able to speak after the presentation in the Q&A
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Packaging Across Networks
Marloes Foto Gallery London
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Nestor Siré fijó una foto
12 de diciembre de 2021

a "reflexive method to begin charting, connecting and critically examining the unstable flow of networked images".[5] This contingent, processual and open-ended method of investigation was adapted to the context of this research project, where both the notion of "curation" and that of "online" were being challenged by the phenomenon of The Cuban Weekly Package, its distributed curatorial intelligence and offline network of circulation. More specifically, the method of critical tracing shaped our positions as researchers interested in building a relation of critical proximity with the objects and agents involved in the human and technical infrastructure of the *Paquete*, by closely mapping their roles, behaviours and mutations inside this specific ecosystem. In practical terms, this process produced a number of visual and textual outputs, including charts, diagrams and a glossary of speculative concepts and emerging terms, a selection of which we are elaborating upon in this text.

Tracing Curatorial Intelligences

Thanks to Siré's wide knowledge on the topic, we set off to examine the *Paquete* as a social phenomenon, by first focusing on its overall curatorial intelligence and the behaviours of its users. The *Paquete* includes a wide variety of digital content—from movies and TV series to manga, mobile applications, news and software. The material is organized into folders which are titled by topics. It cannot be pornographic nor explicitly political to avoid the intervention from the Cuban government. The *Paquete*'s content is selected by two "alegal" businesses called "Matrices", OMEGA and Estudio ODISEA. The concept of "alegal", describes the grey area in which activities that are not protected or regulated

5 Gaia Tedone, "Tracing Networked Images: an emerging method for Online Curation". *Journal of Media Practice* 18 (1): 2017, 51-62. DOI: 10.1080/14682753.2017.1305843

by the government exist in Cuba, such as illicit distribution of media. The physical hard disk is then distributed by *paqueteros* across the island to the homes of Cuban users who often share the cost of the membership across small groups of friends. Each week, the matrices and sub-matrices assemble and curate between 15.000 and 18.000 files copied without permission from the internet.

To download a web page and copy it on a hard drive so that it will later circulate on offline networks of distribution may seem like a benign operation. But if we look beyond the interface and trace this action, we realise the extensive set of ramifications it involves. A webpage is hardly a self-contained object. It is a collection of various pieces of code and assets. When a page loads in a browser, it calls remote images, banners, scripts, fonts or html fragments. These elements are provided by different services who become able to monitor user's behaviour and collect information about them. This is what Groys calls tracing user's activity. To download the file on disk cuts off the connection to the various providers of these assets. All the individual pieces that make up the page are collected and saved locally on the user's device. When the user loads the page copied on the disk, the third parties are not able to monitor user's behaviour anymore. As the web economy hinges on the ability of third parties to collect and monetise user data, this gesture has consequences. The example of ad placement demonstrates the layered process of monetisation of user information and the wide range of actors taking part in it. On a web page, an ad seems like a visual element integrated in the layout of the page much like the others. But before it lands on the page, the ad follows an intricate process of selection. There is no direct line between a company willing to promote its product and the page serving the ad. Schematically, the process looks

like an auction. The company hires a broker agent that identifies potential targets for the product. This target is a user profile based on criteria such as gender, age, tastes, preferences and browsing habits. When a user corresponding to the desired profile connects to a page, all the brokers having an interest in the profile are notified by the agent monitoring the page. The brokers are then invited to bid and the highest bidder's ad is placed in the page. These negotiations are automatised and the interactions and auctions happen in a few milliseconds. Capitalist economy in the form of high-speed trading is literally embedded in the technical production of web pages. For the page's visitor, this process is transparent and they are not aware of their profile being the object of a financial transaction.

When files are downloaded on disk then shared offline, this mechanism of negotiation is interrupted. Once a file or an image enters the *Paquete Semanal*, it moves from one form of connectivity to another. It also moves from an economy to another. As Siré and his long-lasting collaborator artist Julia Weist explain "in this offline system, there are no channels for feedback, such as likes, comments, or threads. And when consumers engage with content, there is no stored history of activity to point to who they are, what they're interested in, and how they might behave".[6] In the *Paquete*, what is sold are media files, not user profiles, and they are priced per kilobyte not per click.

To come back to the inaugural quote by Groys, the online economy relies on a form of tracing. Critical tracing means unravelling this process. It also forces us to consider the online economy as a distributed form of curating. The curatorial intelligence enabled by an always-on network does not simply relate to

6 Nestor Siré and Julia Weist, *Proyecto DATA*. New York: Triple Canopy, 2020. https://www.canopycanopycanopy.com/issues/26/contents/proyecto-data

"literal" content (i.e. to select a news article to an online readership). It more crucially relates to the mechanism through which an audience's metrics are auctioned to advertisers. In the context of the *Paquete*, curatorial intelligence changes dramatically together with the tracing and the economy. But the curatorial intelligence of the *Paquete* still encompasses both the selection of content and ad placement in a technologically mediated form. At this juncture, we need to analytically distinguish the curatorial intelligence of individual providers such as Nestor Siré and the curatorial intelligence of the *Paquete* as a whole and trace their entanglements.

Inside the *Paquete*, Siré curates *!!!Sección ARTE* (art section), a folder with a monthly frequency which takes up 5 gigabytes in size. This project focuses on exploring informal ways for the circulation of information, digital piracy and alternative networks. It also addresses the art-society relationship, the online-offline limits of net art and new media and their social interaction within the spaces of mass culture. The art section aims to provoke a broad reflection on the phenomenon of the *Paquete* in Cuba and is directed to the community of artists as well as to the general audience. It gathers information about art residencies and calls, books and fanzines, as well as it showcases commissioned artworks and curatorial projects. The art section replicates the operational logic of the *Paquete Semanal*; both are based on a directory of folders without Internet connection and are intended to be experienced offline, as a digital information package. More subtle similarities can also be detected, such as the use of multiple windows and digital aesthetics, ranging from file naming to directory architecture through the use of nested folders, in addition to its temporary archive status since every week all digital files are usually overwritten to copy the new folders.

Siré's curatorial project and his prolific engagement with the Paquete served as the basis for opening a discussion with several international practitioners who are similarly concerned with reflections on online and offline networks, informal channels of content circulation, and collaborative practices under conditions of socio-technical asymmetry. Over the course of the two Telegram workshops cited above, we attempted to articulate the tensions that arise when online networked content is disseminated in offline networks as well as the conditions in which these offline networks may reappear online. The social and economic dynamics that subtend these forms of networking were analysed thanks to the input of the artists, tracers, ethnographers and media activists who participated in the workshops, whose work will resurface in the paragraphs below. Their testimonies and local practices helped us to draw parallels between different geographic contexts and to question the very notion of socio-technical asymmetry. In the next section, we propose a cluster of terms drawn from our research glossary—the result of a meticulous work of conceptual tracing at the hands of Sam Mercer, Jara Rocha and Marloes de Valk—that we deem to be particularly useful when thinking, discussing and building alternative models of infrastructures.

Building a Collective Glossary: *Social Creativity and Human Infrastructures*

In Cuba, the notion of creativity cannot be abstracted from a context where resources are severely limited and censorship present. It sets the basis for the collaboration between individuals who share their times and resources to circumnavigate restrictions and blockages. The Cuban *Paquete Semanal* is an excellent example in this respect, since it mobilises social energies, actions and synergies that give shape to a functioning socio-tech-

nical network. The *Paquete* is not only the main national medium for the circulation of entertainment materials, it is also a cultural phenomenon. Its human infrastructure entails a mandatory basic learning process for both network workers, *paqueteros* and users, who experience a much more active relationship compared to global distribution systems for entertainment materials. They are active nodes in this distribution system, as their equipment and time is needed to complete the copies of the *Paquete*.

An emphasis on the agency of the end users permeates also the social creativity that emerges in other Cuban contexts such as the one of the popular laboratory called *Copincha* situated in the centre of Havana and run by our research collaborator Maurice Haedo in his own house. This is a space where people are invited to learn together to build collaborative environments for open creation that integrate knowledge and technological processes in harmony and coherence with Cuban reality and history. This is a history which finds its roots in the *Manifesto of Technological Disobedience* by artist Ernesto Oroza and that puts emphasis on adaptations, repair and re-uses of technology.

What became clear through the testimonies of Haedo and his collaborator Offray Luna, who is the founding member of the hackerspace HackBo in Bogotá, is that social creativity and human infrastructures emerging in such contexts are not limited to cope with a "supposed lack": a lack of development, of support and finances. They can work as the engines that drive a distinct form of innovation, one that challenges the capitalist eagerness to make repair obsolete and whose geography connects hackerspaces, computer labs and repair cafés in the Global South. This is where the idea of "pocket infrastructures"[7] opens a new vision

7 Luna Cárdenas and Offray Vladimir, "Metáforas y Artefactos Alternativos de Escritura Para Jalonar La Investigación Abierta y La Ciencia Ciudadana y de Garage," September, 2014.

for interactive infrastructures, which are easier to understand, use, extend, and modify and that foster longevity and sustainability. Haedo and Luna put emphasis on the technical and infrastructural debt of the so-called developed countries where the maintenance of large-scale infrastructures comes at a high social and environmental cost. On the other side of the digital divide, for countries that do not have this existing infrastructure, there is a path, however difficult and uncertain, towards new kinds of technology that experiment with novel forms of currency or sources of energy. The networked technologies developed in these contexts are based on the assumptions that connections are unstable, energy sources are diverse and cannot be taken for granted and that different speeds and disparate network topologies are the norm.

Ethnographic Bridge

Steffen Köhn, ethnographer and filmmaker who collaborated with Siré on the creation of art projects and documentaries, described his work as an attempt to make an ethnographic bridge between Cuba and countries outside Cuba. We thought this expression could be appropriated to characterise the work performed by the *Paquete* in general and the art section in particular. *Los paqueteros*, *las matrizes* are not mechanically circulating content from one place to another. These brokerage practices[8] are characterised by their manoeuvrability. The various agents responsible to select, customise and distribute media content perform a function of moral gatekeeping. They negotiate certain implicit rules (i.e. no pornography or politics) with a margin of interpretation continuously tested. They engage in a complex

8 Stephanie Ketterer Hobbis and Geoff Hobbis, "Non-/Human Infrastructures and Digital Gifts: The Cables, Waves and Brokers of Solomon Islands Internet", *Ethnos*, 2020. DOI: 10.1080/00141844.2020.1828969

practice of dissemination. They are translating the media material, in the double sense of translation. They move bits across territories but they also make this material meaningful. This can take the form of making subtitles or editing video clip to remove the ads it contains to insert in its place local advertising. They intervene in chains of curation where every intermediary selects the contents relevant to their audience. The range of personalisation varies from a customer choosing the content that will be redistributed to their family circle and friends in a shop to the selection made by individual *paqueteros* bringing contents to their clients houses in areas far from the city centres. This curatorial intelligence goes further than the selection of media. It involves a constant technical recalibration: websites initially "hotwired" to advertisers are turned to static offline documents. Moving media from hard drives to USB keys to phones to televisions is an exercise of extreme "backward compatibility". Content from websites only accessible with the latest browsers and high-speed connections are ported to devices running Windows 97 and ancestral TV sets. A TV series that a North American user may have trouble downloading may be already available in an offline rural area from Cuba and played on a television for which no commercial support is available anymore.

Vulnerability and Ad Hoc Ties

Where State and corporate investments are lacking or denied, informal networks take charge of the creation and maintenance of infrastructure as they can. This creates a sense of vulnerability as there is little guarantee that an agent in an informal network may provide a service reliably over a long period. The impediment may be economical. It is also the result of the legal infrastructure in place. In this context, circulation and exchange

of media are not defined necessarily by explicit guidelines, but by reciprocity and implicit rules. In this respect, the idea of alegality is relevant. In Cuba, informal businesses and networks operate in a context where they can be shut down without notice. Neither legal nor illegal, they are tolerated because they correspond to practices that are understood as necessary by the State as long as they don't interfere with its plans. They are however not officially acknowledged. They exist in a legal grey zone and a temporal interstice. As Siré writes, the State "cannot legalise them at the speed with which they develop".[9] The ad hoc ties they form are always provisional. Alegal ad hoc ties are not formed outside of standards, planning, rules, but in the spaces left open between them. They fill gaps and connect separated segments. They form an accidental architecture in the words of our research collaborator Cristina Cochior sometimes "surprisingly" well organised. They provisionally resolve dependencies and they are the results of negotiations of unequal exchanges with the existing institutions and between nodes of a same network. The success of accidental infrastructures depends on pragmatism not romanticism. And their resilience can never be taken for granted.

Digital Infrapunctures

This is a term coined by Digital Humanities Professor Deb Verhoeven, which conflates infrastructure and acupuncture, referring to small-scale interventions that can have a catalytic and cumulative impact on the whole.[10] This portmanteau word operates as a vision statement that foregrounds the need for critically

9 Nestor Siré, "!!!Cuban Creativity". *Weird Economies*, 07 November 2021. https://weird-economies.com

10 Christina Cochior and Manetta Berends, *Bots as Digital Infrapunctures*. Online Module, 2020. https://bots-as-digital-infrapunctures.dataschool.nl/pages/about.html

understanding infrastructures as relational structures that are lively, vulnerable and which can fail at various social and technical degrees. For instance, by producing connectivity errors and real time delays, but also by crucially embedding and being embedded in systems of inequality and exploitation. In order to acknowledge infrastructures' limits in terms of capacity and care, it is important to enquiry who has the access and agency to actually intervene in the design of infrastructures and how meanings and values can be engineered in computational systems. The analogy with acupuncture alludes to the importance of considering the health of the system as a whole and of creating a framework for its repair via the activation of circuits of actions and reactions. The acts and practices that can fall under the speculative project of digital infrapunctures are necessarily participatory and context-specific. Within the framework of our research project, we responded to this proposition by approaching words as pressure points for envisioning new types of infrastructures. The tracing of the conversation that occurred during the workshops thus motivated us in the creation of this ongoing and collaborative glossary.

Conclusion

In their articulation, these concepts challenge the very notion of network as an always-on construct and reverse the assumptions underlying Groys's quote cited at the beginning of this text. In our view, Groys is right to describe the networked image in terms of the performativity of a data file. The problem is the underlying infrastructure that enables this performance is not universal. We must pay attention to its materiality and the agencies involved in building and maintaining it. The triangulation of the performance of a data file with registration,

connectivity and traceability needs to be problematized. A conceptual network sensitive to the differences in infrastructure is necessary to understand the nature of the curatorial intelligences at play in networks and their economic repercussions. Taken together, these concepts provide a framing for the materiality of infrastructures under conditions of unstable connectivity where there is a regime of scarcity in place rather than one of waste and squandering. And they foreground the logic of maintenance as a more sustainable alternative to the logic of innovation. Under this light, the notion of digital divide might be useful as it captures the unequal access to technological resources. But it might need to be rethought as it carries an inherent value judgment. It implies a same technological model at an uneven stage of development on the two sides of the divide. However, what is at stake is the possibility of an alternative technological model. To talk about socio-technical alterities might instead help capture the different scales and operational gradients of technologies and their complex relationalities. And acknowledge the potential emergence, even if still nascent, of alternative networking models at this X-shaped crossroads. What is therefore required is a critical proximity with new concepts and practices, such as Siré's one, that open up reflexive interventions in distribution networks. When words are approached as semantic pressure points a more tactical vocabulary for infrastructures can begin to emerge. This might be able to capture more sensibly the various routes and routines enabling the performance of a data file in different networking infrastructures, tracing a multiplicity of curatorial intelligences and strategies in the process.

Acknowledgements: The research project discussed in this paper was made possible by a grant issued by the Swiss National Science Foundation. The authors would like to thank the tracers Sam Mercer, Jara Rocha, and Marloes de Valk who contributed crucially to the glossary; all the participants in the workshop series *Packaging Across Networks* as well as colleagues at The Lucerne University of Applied Sciences and Arts.
functionariesofthecamera.net/packaging-across-networks/
t.me/joinchat/PJVATurpHX5lMmU5

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Practising the Aesthetics of Anonymity
Decomposing Biases Through Play

Jung In Jung

Sound of Light (2021) is a collaborative multiplayer virtual reality (VR) sound performance project that uses the VR headset Oculus Quest's hand tracking feature.[1] Players can trigger different kinds of sounds with various hand movements and gestures. As they trigger certain sounds they also change the virtual environment (e.g., the weather) and the texture of sound. To allow players to focus on the movement and sound, the voice chat function is not built into the project. For similar reasons, the avatar is designed without any particular characteristics. Everyone joins with the reduced appearance of the avatar—a sphere-shaped head and two hands.

The project was presented at the PlayAway Festival in March 2021. Due to the pandemic, the festival happened online. While I was presenting my work, someone left a comment in the chat saying, "I like the anonymity in your game". By the time I finished my presentation that person had already left and I wasn't able to figure out who they were as I did not recognise their Zoom account name. My initial aim was not to create an anonymous play; rather, I wanted to let players experience physical expres-

1 The documentation of the project is available at https://www.junginjung.com/soundoflight. The game art for *Sound of Light* was done by Paul Blackham at InGAME.

sion and communication in VR beyond its conventional control system. Nevertheless, what the anonymous person told me was quite right. Perhaps anonymity in my project was the main ingredient which made this project more playful. Since then, I have been so struck by the word "anonymity" that I was led to write this essay.

Anonymity as Experience

Alongside advancements in electronic communications and the Internet, efforts to expand the definition of anonymity have been made in several literatures. The strict etymological definition of anonymity, "nameless", is not sufficient to understand how anonymity facilitates various means of communication. Helen Nissenbaum points out that with the use of information technology our recorded personal data has become all trackable.[2] Therefore, the value of anonymity is not merely hiding one's name, but creating different layers of anonymous situations to offer "the possibility of acting or participating while remaining out of reach".[3] Kathleen Wallace expands the definition of anonymity as "noncoordinatability of traits in a given respect" by pointing out that the word anonymity "presupposes social relations".[4] Julie Ponesse conceptualises anonymity as "characteristically interpersonal and network-relative".[5] Based on these writings what is apparent is that the meaning of anonymity can-

2 Helen Nissenbaum, "The Meaning of Anonymity in an Information Age," *The Information Society* 15, no. 2 (1999): 141–144, https://doi.org/10.1080/019722499128592

3 Ibid.

4 Kathleen A. Wallace, "Anonymity," *Ethics and Information Technology*, 1(1999): 23-35, https://doi.org/10.1023/A:1010066509278

5 Julie Ponesse, "Navigating the Unknown: Towards a Positive Conception of Anonymity," *The Southern Journal of Philosophy* 51, no. 3 (2013): 320–344, https://doi.org/10.1111/sjp.12035

not be simply deduced as nameless, unknown or non-identifiable. It is a socially entangled and inseparable notion.[6]

I should clarify that my aim in writing this essay is not to expand the meaning of anonymity even further but to use its social aspect to analyse *Sound of Light* and two other multiplayer games that were my main inspirations, Tender Claw's *The Under Presents* and Thatgamecompany's *Journey*. I will therefore focus on how anonymity forms playful experiences in multiplayer games in 3D virtual space. The word "game" here is not limited to the conventional idea of video games as merely shooting or combat games but is used to indicate any virtual format of interactive play. In *Journey*, *The Under Presents* and *Sound of Light* anonymity constructs an experience of interacting and communicating with other players when there is no particular purpose of winning.

Aesthetics of Anonymity in 3D Virtual Space

The anonymity conceptualised in the literatures above is bodiless. Anonymising a user's identity with a pseudonymised online username is not enough to enact anonymity in a 3D virtual space as an appearance is still required. Typically, the first image of "anonymity" that comes to mind is a faceless avatar, because a face is an exclusive human feature that expresses one's unique image.[7] A face can indicate the most basic information for identity such as gender, age or ethnic background, as well as further subjective social information and status.[8] The avatar in the game *Journey* is almost faceless: two shining eyes on a veiled

6 Susan V. Scott and Wanda J. Orlikowski, "Entanglements in Practice: Performing Anonymity through Social Media," *MIS Quarterly* 38, no. 3 (2014): 873–893, https://doi.org/10.25300/MISQ/2014/38.3.11

7 David Eckersley, "Get Rid of Yourself: Toward an Aesthetics of Anonymity" (PhD diss., University of Nottingham, 2019), 90-100.

8 Ibid.

face. In *The Under Presents*, the avatar wears a mask. In *Sound of Light*, the avatar is reduced to a sphere-shaped head with a smiley mouth, but no other facial features.[9] In all three games, the avatars' faces do not individually characterise players.

Another element expressing one's image is fashion style. This is a cultural item with a long history of indicating one's class or occupation. Today even preferences for certain subcultures are reflected in fashion styles (e.g., hip-hop music lovers wearing street looks).[10] Video game players want to express their online presence through fashion as well. The Nintendo game *Splatoon* shows this kind of desire through their clothes and shoes collections, and it was exhibited as a part of the *Videogames: Design/Play/Disrupt* exhibition at Victoria and Albert Museum in 2018. In *Journey*, the avatar wears an ethnic style of clothing, but every player wears the same one, so the fashion here does not act to express one's individual preference. In *The Under Presents*, the avatar has only a black body with no option to wear clothing. There is an option to wear different kinds of hats or headpieces, but those items can only be discovered through magic spells. Therefore, they are often used as a way to show off a newly discovered spell between players, which is part of the play in the game. For *Sound of Light*, the avatar's body is intentionally reduced to two hands to give a focus only on hand movement.

Creating anonymous avatars is not the only way to make anonymous play. What is interesting about *Journey* is that the an-

9 *Sound of Light* is inspired by one of the UnityList projects *Quest Hands For Normcore* by Andy Moore. The sphere-shaped head model is from Normcore's Unity example package. As I explain, I did not initially intend to design an anonymous style of avatar, but just used the model to quickly prototype the project for convenience. Nevertheless, I now realise that, along with other elements in the game, this "faceless" model completes the anonymous experience of *Sound of Light*.

10 Lev Manovich, "The Practice of Everyday (Media) Life: From Mass Consumption to Mass Cultural Production?," *Critical Inquiry* 35, no. 2 (2009): 319-31.

onymity in the game is also constructed by the environment. Jenova Chen, the game's lead designer, wanted to give a "sense of small", as if players are walking on the moon, so that they "experience awe at the game's majestic landscapes".[11] By shifting the focus of the game towards experiencing the environment, players feel "tiny and insubstantial";[12] the players feel the anonymity.

Decomposing Biased Experience Through Anonymous Play

To create anonymous play, beyond the appearance of avatars, players should be non-identifiable and unreachable through interactions in 3D virtual space. In a 3D environment, if the platform does not use a computer keyboard as an input controller, voice chat is the most commonly used feature for verbal communication. However, the two games *Journey* and *The Under Presents*, and my project *Sound of Light* are all non-verbal games with no voice chat. In other words, players of those games cannot discover the other players' identity through voice. Human instinct is to use the voice to try to discover aspects of another person's identity such as gender, age or national/regional origins. Even though a player may not reveal his/her real identity to another player verbally, the other player instinctively starts visualising the person behind the avatar. Therefore, the wordless feature completes constructing an anonymous experience in *Journey*, *The Under Presents* and *Sound of Light*.

Why does it matter that a voice can reveal one's identity? According to a recent survey, 77 per cent of women experienced of gender-specific discrimination while gaming, and 55

11 Katherine Isbister, *How Games Move Us: Emotion by Design* (Cambridge, MA: MIT Press, 2016), 120.

12 Ibid.

per cent of women hide their gender while playing games online to avoid harassment.[13] The full-time streamer, Jasmine Jada, told of her experience of sexual harassment to the BBC, saying "the harassment women get from playing online multiplayer games with strangers has got to a point where girls don't want to have to speak in games anymore".[14] I am aware that, in any online multiplayer gaming situation where verbal communication is possible there is a risk of being exposed to harassment or bullying that is not limited to female players. Nevertheless, biased gaming behaviour seems most apparent towards female gamers. Anonymous play can offer a safe space by preventing verbal communication completely. However, what I would like to emphasise is the powerful and playful experience anonymity can offer when there is no particular purpose of winning in games, and how it may turn us intentionally or unintentionally from such toxic and biased gaming experiences as a result.

Brian Upton's *Situational Game Design* approach helps us to analyse *Journey*, *The Under Presents* and *Sound of Light* for this purpose. Upton writes that "situations are structured by constraints", and any play experience can be conceptualised as "a chain of situations".[15] Situations are created by a game's static rules, but how those rules are played depends on how the player processes them. Therefore, they are "embodied" in the player and "temporal" as the player improvises with the rules during the course of the game.[16] Being anonymous and wordless are the main con-

13 Brendan Sinclair, "Survey Says 59% of Women Hide Gender to Avoid Harassment while Gaming Online," *gamesindustry.biz*, May 19, 2021, https://www.gamesindustry.biz/articles/2021-05-19-survey-says-59-percent-of-women-hide-gender-to-avoid-harassment-while-gaming-online

14 Annabel Rackham, "Online Gaming Abuse: 'Men Like to Guess What I'm Wearing'", *BBC News*, June 17, 2021, https://www.bbc.com/news/newsbeat-57511089

15 Brian Upton, *Situational Game Design* (Boca Raton: A. K. Peters, 2017), 11-24.

16 Ibid.

straints in *Journey*, *The Under Presents* and *Sound of Light*. In the following paragraphs, I will write about how those games unfolded with constraints based on my own play experience as well as some reviews from other players.

The goal of *Journey* is simple: to finish the journey a player encounters by enjoying the beautifully designed landscape. But periodically the player finds another player who is randomly paired over the network. The players can only make a kind of chirping sound to each other which can be interpreted as a fun calling or a sign of asking for help. By disabling the voice chat function, the game puts emphasis on exploring what kind of collaboration can take place between players.[17] By staying close to each other, the players can fly further and discover new things. Nevertheless, one player writes that the most powerful experience was the wordless "companionship" the player felt when they were harshly attacked by a dragon and the other player ran back so they could finish climbing the snow slope together.[18] Fascinatingly, the anonymous multiplayer function here enhanced the play experience through emotion.

Similar to *Journey*, in *The Under Presents* players are paired randomly, but as a group with about six to eight players in the multiplayer community area. When I first joined the game, I wasn't sure of its goal. However, soon after I found that I could spawn some objects with certain combinations of hand motion, like doing magic spells, by watching what other players were doing. At some point, one player who seemed very experienced with the game approached me and taught me some more complex spells. Because there was no voice chat function, learning a com-

17 Isbister, *How Games Move Us*, 121-122.
18 Ibid.

plex sequence of hand movements was not so easy.[19] With one mistake, the spell became invalid. Later, the experienced player took me to various locations in the game where I realised that those complex spells were useful to gain different masks for my avatar. The most powerful experience I had in the game was that all the learning experience was possible without a single word, and the stranger decided to spend so much time with me to give a guide with patience. The feeling of achievement was not because of the masks I could collect, but the intuitive physical interaction and learning experience from the other player.

Inspired by *Journey* and *The Under Presents*, I tried to create a VR environment in which I could offer a non-verbal teaching and learning experience through physical communication and a group sound improvisation session for *Sound of Light*. I invited my colleagues at InGAME to test the project but without telling them how they can trigger sound. I imagined that when my colleagues joined the network, they would be able to start learning how to play the game immediately. However, because it uses real hand motion as a control system, unlike other games using handheld controllers, there was no "pre-existing constraint" which the players could immediately adapt from other games to navigate the game.[20] Additionally, there was no "genre expectation"[21] for this project, especially if the players have never played a game like *The Under Presents* with no purpose of winning. But after a while when all the players got used to the hand controls and the environment, I finally found a moment when I could conduct

19 The co-founder/writer of *The Under Presents*, Samantha Gorman, explained that she was inspired by the anonymous physical interaction with other players when she played *Journey*, and decided to make *The Under Presents* to be wordless too at the UKRI's Beyond Conference 2020.

20 Upton, *Situational Game Design*, 19-21.

21 Ibid.

a sound improvisation.[22] The test followed an anonymous survey in which I received a mixture of frustrated and positive comments. One review caught my attention: "It was slightly frustrating to not be able to talk and to feel confused and lost at times, but wherever I figured out new things, that feeling was stronger than the frustration". I believe the "stronger" feeling of achievement this player felt is similar to what the reviewer said about *Journey*: the "powerful" experience. In wordless games where players need to observe each other's behaviour to learn new things, they may have grown untold empathy by mirroring each other's physical movement.[23] This may sound vague to people who have not played those games, but words indeed seem inadequate to describe the anonymous play experience.

When a player improvises with the given rules, they use relevant knowledge of the rules to make an action. Upton writes that knowledge is not a collection of facts, but a "collection of constraints", and explains how constraints work through the epistemological cycle to make sense of reality:

> We know the world through a system of mental constraints. These constraints bias us toward particular lines of action and particular expectations about how the world will unfold. If our actions don't produce the desired outcome, or the world unfolds in ways we don't expect, we experience a crux and adjust our constraints to accommodate.[24]

22 See the group sound improvisation of *Sound of Light* at: https://youtu.be/NcfSGg63wW4

23 There has been research about mirror neurons that help us build empathy. I learned this from the talk *Enabling Empathy at Scale* by Dr. Nico Perony at Unity for Humanity Summit 2021.

24 Upton, *Situational Game Design*, 104-107.

I find that anonymous play offers an opportunity to cut that cycle of predictions by neutralising our mental constraints. Perhaps the powerful experience of companionship in *Journey*, or the teaching and learning experiences in *The Under Presents* and *Sound of Light* might not have been the same if the play was not anonymous. The skilled player who taught me all the complex magic spells in *The Under Presents* might be much younger than the person I imagined behind the avatar. Or the play experience with my colleagues for *Sound of Light* might not have been the same if I knew who was doing what. But it did not matter in those games. The anonymity made me jump straight to the play by bypassing my biases. And when I returned to *The Under Presents* as an experienced player, I volunteered to be a guide to a stranger and taught them magic spells.[25] Furthermore, this play experience changed my negative view on multiplayer online games and inspired me to create the project *Sound of Light*.

By not being able to even sense gender, age or nationality—in other words, by posing another kind of constraint, anonymity—we can finally accept the play experience with no biases. I am aware that the gender biased discrimination and sexual harassment issues in the gaming world are much more complex and difficult to deal with. And making everyone anonymous is not the solution. In fact, the anonymous online environment allows people to leave harassing comments and spread fake news. But as Nissenbaum points out, "anonymity and pseudonymity are not all-or-nothing", therefore it is necessary to analyse how anonym-

25 Players of *The Under Presents* share similar experiences like mine in the Reddit community. See: https://www.reddit.com/r/OculusQuest/comments/dzcpu2/the_under_presents_one_of_the_single_most/

ity can be enacted over different layers and by different degrees to understand its value.[26]

By analysing the game situations in the two games *Journey* and *The Under Presents* and my own project *Sound of Light*, it was possible to understand how anonymity was practised as a main aesthetic to constructing play experience. Play unfolds differently in those games depending on a player's interpretation of the rules and situations, so it is hard to generalise the meaning of those games, but at the same time each is unique. Therefore, my X is a wildcard, anonymity, which may intentionally or unintentionally turn us from biases through anonymous play, and I hope it can be shared with readers in the xCoAx community and beyond.

Acknowledgements: The project *Sound of Light* is funded by InGAME: Innovation for Games and Media Enterprise, part of the AHRC Creative Industries Clusters Programme. Grant Reference AH/S002871/1

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26 Nissenbaum, "The Meaning of Anonymity in an Information Age."

Let X Equal !X ≈ A Call to Relocate Relocation

Gabriel S Moses, Yoav Yaakov Lifshitz, Tsila Hassine

The following text was conceived in conversation with ArtUp Nation and its network of associates. We would like to thank everyone involved for their contributions to this still-forming, vibrant discussion.[1]

Appropriation = Gentrification?

Nothing means much to the capitalist beyond its strategic usability. Neither do places, nor people. They're all variables, pawns and tools to be put to use, any use, and swapped, when necessary. Neoliberal strategies of profiteering are often predicated on appropriation. A new buzz is picked up, generated, or injected into the market, around a certain X (= a variable that may already have been inscribed with a value beforehand), and this buzz sets a new value for its application.

Just like in mathematics, X can equal anything and any derivative can be ascribed to it accordingly. What changes is the context (the game, the conversation) within which it functions. A few examples of this dance between the type of X and its particular type of capital value come to mind:

1 "ArtUp Nation Official Website." Accessed 6/2/2022. https://wemakemoney.art

Gentrification ≈ let X = a specific site. Like in the crumpled maps of legendary sea pirates, mythic elusive treasures are often found in the shabbiest, least anticipated spots.

Digital platforms for brokering gig-economy services like Uber, Airbnb, or Wolt ≈ let X = a concept. In this case, the appropriated concept is the "sharing economy" and its attendant values such as abundance, distributive justice, a sense of communality, and anti-capitalist subversion. Any subverted derivatives of the values attached to the principle of sharing follow in the form of this or that slogan that brands the next, supposedly more egalitarian service.

More recently, we saw the rise of ***Blockchain*** ≈ let X = an ideal. The trend took off with a cluster of zeolots who were convinced that smart algorithmic regulation (Bitcoin and such) are bound to replace the old banks and revolutionize the financial system. According to a recent survey, the majority of crypto experts still believe Bitcoin will replace fiat currency by 2050.[2] Soon enough, blockchain enthusiasts were co-opting with that same financial system they envisioned overthrowing. They now called for regulations to be imposed in order to become institutionalized and gain legitimacy within the confines of the old guard.[3] Effectively, the ideal is scrapped and X = a callback function for the entire algorithm.

One could easily argue that this was also the fate of the entire ***World Wide Web*** ≈ once predicted by Hakim Bey,[4] John Per-

2 Carla Mozée, "More than Half of Experts in a Recent Crypto Survey Said Bitcoin Will Replace Fiat Currency by 2050", *Business Insider* (July 18, 2021), https://markets.businessinsider.com/news/currencies/bitcoin-vs-fiat-global-finance-2050-crypto-experts-finder-2021-7

3 Henrik Gebbing and Wilhelm Nöffke, "Regulating Crypto Is Essential to Ensuring Its Global Legitimacy", *TechCrunch* (August 16, 2021), https://techcrunch.com/2021/08/16/regulating-crypto-is-essential-to-ensuring-its-global-legitimacy/

4 Hakim Bey, *The Temporary Autonomous Zone* (Denver, Co.: Pirated by H M V Þ Þ M, 1991).

ry Barlow,[5] and others to become a libertarian utopia in the way of a pirate's X-territory. The internet as we know it today, however, has been appropriated by the centralized state and industry forces altogether. Around them scavenge secondary but oftentimes just as dubious industries. Most of today's pirate ships can be found docking in Pornhub.

We would then argue that all of these are examples of more or less material/symbolic spirits/embodiments of gentrification: capital is accrued by swapping the meaning of something/somewhere with another ⟾ an economic principle is then introduced to manage this swapping ⟾ this principle then changes the economic value of this something/somewhere, rapidly inflating it ⟾ surely enough, this ends up kicking out the naive idealistic dwellers of this something/somewhere, who can no longer meet this value.

But we don't care much about gentrification in this text as much as we, too, are stealthily appropriating it. We are doing this to make a point. Gentrification is a term borrowed from real estate, a field invested in the constant re-evaluation of "geography". The way we use gentrification here, metaphorically, however, implies that neoliberalism thrives on applying this logic to any type of cultural landscape (= geography). But gentrification has long since departed from any geographic footing because neoliberalism takes it one step further:

In the emerging economic models (of anything from disaster to platform capitalism), X is no longer one or any sum of locations. X = the very notion of geography, as a whole.

5 John Perry Barlow, "A Declaration of the Independence of Cyberspace", Electronic Frontier Foundation, February 8, 1996, https://www.eff.org/cyberspace-independence

{Embracing Relocation}

The struggle to balance economic expansion with its environmental implications is oftentimes narrated as: globalism ≠ localism. But we contend that neither word means much in our current climate. Simply put: we've gotten used to market and state forces scurrying us around the globe, escaping crises =/ chasing opportunities. The pace and extent of this motion have grown so rampant that it is beginning to feel like a game of musical chairs that obfuscates dynamics of cause and effect, and urges redefinition. But far beyond any personal or social implications, this shift is now felt on a tectonic level. On a globe where entire ice sheets drift from the poles to the center, displacing entire ecosystems, the word "relocation"[6] suddenly gains new meanings.

Although also used to describe the moving of populations en mass (let X ≈ a natural catastrophe), today relocation is mainly a market lingo used to entice workers to move abroad, to help businesses branch out. Fusing the prefix *re-* with *location* doesn't sound as desperate or political as *migration*. It sounds lighter. You're not detaching, you're expanding, you're not displaced, you're exploring new grounds in a new place where everything is provided for.

Relocation is more commonly a euphemism for the travel-light immigration of the privileged. Though associated with hi-tech, it does not pertain to the hi-tech industry worker exclusively. Anyone belonging to a privileged sector may find themselves moving to a new country, oftentimes more than once during their lifetime. These may be artists or postdocs who scored a spot in a residency program or a scholarship for a stay in Berlin, or pro-

6 "'Relocate' Definition & Meaning", Merriam-Webster, accessed 6/2/2022, https://www.merriam-webster.com/dictionary/relocate

grammers who relocate their family to Silicon Valley in pursuit of a better life and broader prospects.

In the terribly near future, however, this rosy depiction of airlight uprooting may serve as the market's sexy cover-up of the climate-devastated terrains it scorches. Herein lies a bigger problem than the divide between *relocation* and *migration* and the inequities it conceals:

Migration may soon be swapped by relocation, but not just because of a neoliberal wordplay. Our very understanding of the concept of migration may soon become obsolete altogether.

Relocation used to be considered *temporary* whereas migration was imagined as *permanent* resettlement. But in a heating planet with radical seasonal shifts, few regions will accommodate a tolerable stay throughout the entire year. Any move is expected to be temporary. Those who don't have the means to constantly move may perish. Those who don't perish may be destined to a life devoid of ambitions beyond shelter or their next meal.

Having said that, this essay first and foremost applies an artistic lens on economics. Any humanitarian concerns derive from this perspective and not the other way around. We might be arrogant to assume that, essentially, any human condition values the survival and prosperity of its spirit (= its art) as much as the body. Either way, both are in jeopardy in the future we outlined. For both, surviving on a planet ruled by a toxic marriage of state and market, means subverting the terms of the contract; it means redefining its concepts, its language, its lingo. Actually, many contemporary artists practice this survivalist approach, as part of their brand and for a living. So should art class be added to the post-apocalypse bootcamp?

Reappropriating X

Relocation is the default state of the arts. At least in the sense of "being up to date", staying on top of the art game more often than not actually means *moving around*. It means crossing all types of distances, within and through fields, practices, and disciplines, in order to expand art's horizon (= its territory). But art is not alone in this pursuit.

The self-reflective artist often belongs to the *projectariat*: a class defined by Kuba Szreder as a dispersed cohort of (by now, mostly digital) nomads who move from project to project and travel between disciplines and practices, without long-term stability.[7] Projectarians may be stationary one day and move on the next day, never knowing which day is payday. Theirs is a stranger definition of relocation, seemingly displaced by choice, immanently misplaced, arguably privileged, nevertheless anxious. For them, relocation is a mental state.

What might set an artist's milieu apart from other projectarians is that artists don't only provide (more or less appreciated) services to the market but also excel in trolling, mocking, mimicking, warping, rearranging, subverting, and undermining frameworks and conventions, as part of these services (yes, also, or maybe especially, the kind of art that billionaires would hang in their living room). Such works belong to a strand of art that thrives on the thing neoliberalism is known for doing best, which is to subvert neoliberalism all the while tacitly perpetuating its logic; which is why we would suggest these types of artists as the exclusive representatives of the projectariat inside the "market game" (The obvious suspects would be Banksy, Koons, Hirst and Cattelan but they're really just the flashiest most gimmicky of the

7 Kuba Szreder, *ABC of the Projectariat: Living and Working in a Precarious Art World* (Manchester: Manchester University Press, 2021).

bunch; whereas Christopher Kulendran Thomas, DIS Collective and MSCHF are more what we had in mind). Riffing off the lingo of games (though it means something altogether different in baseball), we would like to suggest an "inverted double play":

Let X = X*X/X (let X equal X times X divided by X)

In essence, this is the common formula that allows art to do what both it and neoliberalism have always done: to apparently change everything without changing anything, apparently. Let's be a bit more concrete in what we mean:

Earlier, we suggested to define gentrification as a form of economic cultural appropriation. A classic form of gentrification is the situation in which artists, often against their declared principles, are lured in to transform a slum into studios and galleries. Soon after, their gallerists are the first customers of that posh café that opens right on the corner. Artists are also called in to spearhead other forms of economic colonization and erasure. They are the first to get to play with a high-tech military robot arm or cybernetic system. By doing so, these inventions are "made cool" = made to seem adventurous but approachable and "inviting". This is a post-geographic appropriation and expansion of gentrification. It is the economic transformation of the spirit of anything/anywhere until it erases any trace of what it once was.

A sly relocator, however, can use this expansion as a discursive weapon, as a form of gentrification in reverse. Artists play the role of desperate projectarian brokers, called in by the market to surreptitiously expand its territory. Instead, as nomadic projectarians, they can surreptitiously colonize the richest parts of the market in the most performative ways. They can hop into the Matrix, learn Kung-Fu, trash the place, redecorate or repur-

pose it (depending on their type of artist) and hop out before the agents pick up their trail.

What is actually stopping us, artists, from taking these risks? Most of us run our ateliers on the fumes of our savings anyway. Besides, the sky really is falling, the forests really are burning and soon enough, no place would be permanently safe. Art never had stable geography. By default, by choice even, art's terrains are always compromised, a constant re-negotiation of its borders. There is no stable institution under which artists can or wish to bask. Artists are just as free to relocate as they are doomed to. To survive, to stay "relevant", artists must infiltrate, intrude, interrupt, disrupt and dress up, ad infinitum. If relocation is reverse gentrification then it is not just the practice of constant project/skill-based moving; it is the ability to inhabit an environment for the purpose of clandestinely remodelling it for one's needs in order to survive; it is the constant *re*-appropriation of everything all the time. The cunning relocator becomes native in a variable geography changed by the act of relocation. In short, the relocator is the agent of geographic change; ergo, the relocator = this new geography; ergo, the relocator = X.

Relocation Nation

The state of the arts already resides on the cusp of the privileged hi-tech industry fantasy and crisis-driven lifestyles. But who are the citizens of such a state? A particular kind of projectariat? Can a place really exist for these global dispossessed? And can this model be expanded to one that eventually offers cross-cultural intersectional nationhood? Its doomed precariousness = its resilience? And if it doesn't have geographical borders, does this state at least have some kind of conceptual shape?

Actually, the main precedent we draw on is no other than the contemporary nation-state.

On the one hand, the projectariat is a seemingly amorphous social class and it is therefore assumed that it cannot coalesce or unionize. On the other hand, the model citizen of many postmodern nation-states is already a particular kind of projectarian, simply because these states' leading economic model is a projectarian model: the startup. The USA is as much known today for its sensationalist politics as it is known for Google and Facebook, China's economic model is still a mystery to many Westerners but they all casually shop on Aliexpress. To add an example that we, the writers of this text, are most familiar with: in the last decade, Israel practically rebranded itself as the "Startup Nation"[8] in an attempt to "tech-wash" Israel's military-based economy into something more agreeable with public opinion.[9]

In the case of Israel, jumping on board this economic trend might be a brilliant PR move but it also accidentally reverses Israel's national ethos. Departing from its previous claim of being the one Zionist nation that all Jews must flock to, Israel is now marketed as the training platform that all techies hope to jump off from (and land somewhere in a lavish imaginary Palo Alto). The irony here is that a nation with a startup-driven economy is a nation that tacitly encourages relocation, a principle that subverts the very idea of the nation-state as a permanent residence for its citizens. Such a nation may end up de-locating itself. Just like the startups it champions, it may become nothing more than a brand with a shifting base. In other words, in order to avoid

8 Dan Senor and Saul Singer, *Start-up Nation: The Story of Israel's Economic Miracle* (New York: Twelve, 2011).

9 Tsila Hassine and Ziv Neeman, "War Machines: Military Technologies between Civility and Authority", Transmediale, 3/2/2012, https://archive.transmediale.de/content/war-machines-military-technologies-between-civility-and-authority

becoming failed states, our future states (in all aforementioned senses of the word) may be transformed into polities with no permanent geographical center, a diaspora dictated by market logic.

In these accelerated startup nations, those who wish to miraculously, both survive and maintain their selfhood (their agency ⟾ their moral compass + their critical creativity), would have to behave like artists: they would have to mark their terrain cunningly and *from the inside*. Accordingly, the name of this nation already exists within the former model: at first we thought to call ourselves the st-art-up nation, but keen on polishing our branding skills, we eventually agreed on *ArtUp Nation*.

Conclusion = Mark the Higher Ground

Thinking artistically about relocation (the way we understand artistic thinking in the context of the contemporary art discourse) brings Kuba Szreder's projectarian closer to Hakim Bey's pirate (in many ways considered the first prototype for the digital nomad) who exists on the go, evading any defined borders.

In the early 1990s, Bey imagined digital pirates existing in the hidden corridors of the internet, only to find out soon after that the market took over the whole place. In turn, the projectarian pirate (= the artist) one-ups Bey's provocation by convincing the campus CEO to allow her to remodel the lobby. The result celebrates the opulence of the whole structure all the while satirizing it. Surprisingly, this pleases both parties. Then again, after all, in today's economy satire and self-reflectiveness are lucrative forms of symbolic capital. The CEO gives their recommendation and the pirate moves to the next location, to fuck up the next lobby. Tick the next box, criss-cross. It's a win-win.

In its essence, this essay is a provocation. We urge our readers to consider relocation as the new spectacle of X-territo-

ry; relocation as the celebration of constant movement within a branched out monolithic system, in search of different futures, using the post-digital nomad's ability to change and adapt.

The title of this essay (which, granted, unintentionally also reads as a manifesto of the ArtUp Nation) appropriates a song from 1982 by Laurie Anderson.[10] The lyrics are quite cryptic. Although repeated after every clause, it's never clear what X signifies for Anderson. At one point, Anderson implies she wrote an imaginary book (≈ a blueprint of sorts) that allows her to see the future. Maybe that's X? Collective fates? What's to come? As uncertain a future as it may be, it is also a dictated one, ruled by economic algorithms. However, Anderson doesn't describe this future in temporal terms rather in geographic distance: 70 miles east. If you think about it, relocating 70 miles away is not too distant. It means pretty much staying in the same place with a clearer view of the imaginary brighter east ≈ the place where some nations, among other things and places, rise.

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10 *Big Science*, accessed 6/2/2022, https://open.spotify.com/track/543VOLzzhjhTog1rArIX-6E?si=fbaa12452dd049e8&nd=1

X, the Ever-Evolving Talking Head, Going Pro, and the Post-Pandemic Self

Amy Alexander

In the continuously generated livestream, *What the Robot Saw*,[1] I implement a curatorial algorithm that reveals personal vlogs that YouTube's search and ranking algorithms render invisible. Videos that successfully navigate the YouTube algorithm are usually developed strategically, by creators with significant online video expertise. Conversely, the videos featured in What the Robot Saw are typically produced by non-professional vloggers, often with limited production expertise and equipment. These vloggers frequently frame themselves in closeup—as "talking heads''—and narrate personal experiences directly to the camera.

How do we think about these amateur vloggers and their performances for the camera? Pre-social media, the subjects of amateur videos rarely appeared as talking heads. The typical amateur video maker of the 1990s, for example, lacked practical fluency with cinematic framing concepts. In any case, since these videos were generally produced as home movies, the on-camera subject was rarely speaking directly to the audience. Talking heads, then, were largely the domain of newscasters and talk

1 Amy Alexander, "What the Robot Saw—the Endless Documentary of a Social Media Robot," 2020, https://what-the-robot-saw.com

show hosts: professional speakers; professional performers.[2] But with the advent of social media video, video makers became their own subjects, addressing their own audiences. The nature of the equipment—webcams and mobile phone selfie cams—facilitated close-up, "talking head" framing. These cameras and their immediate visual feedback also facilitated videography practice, and time spent focusing on social media presentation and the online feeds of peers became an informal self-study course in photography and videography. The use of skilled techniques, like shot composition and editing, in amateur video increased dramatically. And the direct-to-camera talking head, once a signifier of a professional production, became a central element of video for social media. As video makers, and the stars of our own productions, we had collectively gone pro.

X and the Expanding Talking Head

In *The Fourth Revolution*, Luciano Floridi discussed the relationship between our offline selves and the selves we produce and perform for social media, writing, "the micro-narratives we are producing and consuming are also changing our social selves and hence how we see ourselves."[3] Floridi understood that our offline and online, professionalized and branded "selves" were, by 2014, already X: intertwined in an interdependent feedback loop. Webcams and selfie-cameras buttress this effect by design, facilitating a production process that is not so much narcissistic as it is a bifurcation of the "video self" into both production and tal-

2 Of course, some non-commercial video makers like video artists, public access TV producers, amateur journalists, and serious hobbyists have also employed talking heads in their work for several decades. But I am focusing here on the wide-scale adoption of the practice by the general public.

3 Luciano Floridi, *The Fourth Revolution: How the Infosphere Is Reshaping Human Reality* (Oxford: OUP, 2014), 62.

ent roles. Our social media video selves are both producer-director and actor, at once behind the camera and in front of it—a feedback loop of self and cinematic representation.

The talking head vlogs in *What the Robot Saw* function at this X—the crossroads and intertwining of offline selves and online social media selves—several years on. The cinematic language of vlogs and YouTube tutorials is now intuitive to even novice YouTubers: Start with a "Hey Guys!" (or a "What's Up!") and bring on your best talking head. How does the talking head change the performed self and the offline, "producer" self? What does it mean as viewers when we constantly encounter our fellow ordinary humans in a framing that only recently carried the semiotic coding of celebrity?

What the Robot Saw went live in February 2020. Within two months of its launch, COVID-19 had pushed roughly half the world's population into lockdown. For many people with adequate resources and internet access, lockdown meant work and school went online. Conference rooms and classrooms were replaced with video conferencing grids, and YouTube filled with videos by teachers, students, bosses, interviewees, pastors, and more—all in the form of talking heads. We had moved online—and our offline selves had disappeared from the social spaces they normally inhabited. What does it mean to the feedback loop when the spaces our offline selves inhabit disappear? When our relationships with one another exist as a continuous, talking head performance?

When Worlds Collide

What starts on the internet doesn't stay there. Much of the United States (where I live) thought it only just learned this when more than two thousand Extremely Online insurrectionists took

over the US Capitol Building in January 2021, in an attempt to overturn results of the US presidential election. The term "Extremely Online" refers to people who follow online posts closely—presumably too closely. The Extremely Online insurrectionists' collision with the offline world, was, of course, extreme; the crash into physical space was literal, loud, and high profile. But the offline and online had long ago collided. Long before the pandemic, cyberstalking, doxing, and canceling had real-world impacts on many people—and chilling effects on many more.

Yet as our online and offline selves subtly intertwine, so can online and offline worlds. By the start of 2021, pandemic life had been in full swing for nearly a year, and formerly private offline spaces had become public online ones. For the newly online workforce, living rooms and bedrooms, often awkwardly revealing in the early days of the pandemic, had completed their transformation to Zoom sets.[4] Offline living was now configured to accommodate decor and book placements carefully designed for an online audience. We became accustomed to living in spaces that are at once private and public; home and set; offline and online. Our homes have gone pro; we now live in X.

Live from X: A Professor Goes Pro

At the university where I teach, classes went fully online for more than a year, and they have continued that way in part since then. Teaching in lecture halls, we were accustomed to performing: the lecture hall is a theater; we intuitively magnify our voices and movements the way stage actors magnify their gestures to be seen by distant audience members. Teaching from

4 I will refer to Zoom throughout this text because it is the dominant video conferencing platform in the United States and the one with which I mainly work. However, most of the references should also apply to similar platforms.

home, as "talking heads" on Zoom, we find ourselves in another type of performance. Home invokes comfort; our true "selves" begin to seep through. The video closeup at first seems to hold the potential for a more intimate discussion format. But the camera creates an equal discomfort; the screen feels like a barrier. Intuitively, I try to push through the barrier. "Hey everybody!"—I find myself performing a hyper-cheerful YouTube-style self each time I teach. I'm not really sure what makes for an "X Factor" in the medium of Zoom teaching, but I nevertheless try to conjure it. After a few months, I become strangely comfortable making eye contact with my webcam. My eyes lock with the blue glow of its LED, and I feel connected to it. I feel I've achieved at least some degree of X Factor, some oneness with the Zoom medium. I wonder if fledgling TV newscasters feel this way when they first get their on-camera sea legs.

My students, meanwhile, take a different approach. I might have expected younger people—"digital natives"—to be more comfortable than I am presenting themselves on Zoom. But this would be a naive misconception. They've grown up with the understanding that online technology implies surveillance, an invasion of privacy. Over time, some of them will explain that the Zoom camera feels like a violation of personal and family space. Digital natives understand there are no safe spaces online; they mostly keep their cameras and microphones off. And despite my newfound ability to lock eyes with a blue LED, connecting in real time with students I cannot see or hear is not so easy.

In lieu of my students' faces and bodies, I'd expected at least the consolation of their talking head video representations. Instead, I find myself teaching a silent grid of names and avatars. At first, I find this lonely and disorienting. Social media has prepared us to communicate as talking heads! Zoom is all about

talking heads! How can we possibly communicate as a group if I'm the only talking head?

It turns out—not surprisingly—my students intuit Zoom as medium better than I do. Older adults tend to approach Zoom as a metaphor for real-world gatherings where we encounter other people as physical "talking heads"—for example, seated at a business meeting, at a restaurant, or in a classroom. But students understand Zoom as a livestream—Twitch for academia. I'm the streamer, the talking head, the pro, the celebrity. They're not talking heads; they're the online audience.[5] When I "screen share" to present on-screen material, my talking head shrinks to a small size, positioned to the side of, or superimposed on, the presentation. In addition to prioritizing screen space for presentation material, this visual arrangement has two less obvious effects: it relieves the "Zoom fatigue" and tension created by the intensity of viewing larger than life talking heads for long durations on computer screens, and it creates a screen arrangement like that used by video game streamers. The Zoom talking head isn't the television talking head or even the YouTube vlogger talking head. The Zoom talking head serves a supporting role, not a starring one.

But the radical shift created by the livestream paradigm is not in my presentation; it's in the students' participation. Livestream audiences communicate by chat, and so do my students. Simultaneous, asynchronous, free-flowing ideas bubble through the chat as I present. At first it's disconcerting, but I soon realize: discussions are much fuller this way. Students who don't usually feel comfortable speaking up in in-person class join in the chat chorus. Students' ideas encourage and play off one another,

5 While I generally favor non-hierarchical classroom arrangements, students seem to prefer this setup in lecture-type remote courses. In small seminar courses, they are more likely to speak on-mic and, sometimes, appear on camera.

and I can respond to the chorus of ideas collectively or individually. Of course, our experience is not unique, nor is my observation. In the article, "Long Live the Zoom Class Chat," Rowana Miller writes, "The chat allows multiple speakers to talk at the same time, but doesn't draw attention to any one of them. And I think that's radical. It can shift the classroom from a space of individual learning to a space of collective learning."[6] Miller ponders ideas for keeping group chat class discussion streams once back in the physical classroom, as do I. Now that we've been to the other side, "offline" classes won't be quite the same again—nor should they be.

The transformative effects of simultaneous Zoom chat aren't limited to students and classrooms, however. Zoom chat, like other forms of streaming chat, lends itself to simultaneity. The pandemic simply made group chat a central element of an expanded range of work, school and social situations. As early film found its "language" after initially imitating theater, and as every new medium finds its language after first imitating what came before it, the medium of Zoom (and similar videoconferencing systems) is finding its language. It's not the language of business meetings. It's the language of streaming, which is the language of spontaneous simultaneity—the language of many streams of consciousness crisscrossing to form a collective stream—the language of X.

X and the Other Side

After a year, some events and gatherings tentatively return to physical space. With masks still required, every event is like a

6 Rowana Miller, "Long Live the Zoom Class Chat: The Chat Solves Education Problems We Didn't Even Know We Had", *Slate*, October 8, 2020, https://slate.com/technology/2020/10/long-live-zoom-class-chat-remote-learning.html

masquerade ball: everybody looks familiar, but you're not sure who they are. Faces are incomplete. Conversations are awkward; it's hard to read non-verbal cues. Do people get my jokes? Have I been talking too long? We're no longer a crisscrossed stream of text streams, able to effortlessly flow simultaneously. We're not even talking heads; now we're bodies with only partial faces in physical space. We're not sure how to perform these selves yet. And regardless of masks, something has changed in the way we communicate. Something is missing back in the offline world. In meetings and social life, as in classes, we begin to discover — some things actually work better online.

X can mark an intersection, a crossing: the intermingled offline and online selves that Floridi identified in 2014, which have further intertwined since the start of the pandemic. X is also a multiplier: the deliciously tangled stream of consciousness of a Zoom chat discussion. But X also marks incompleteness: something that's missing, or something to be filled in. For all that X combines and augments, X also leaves much incomplete.

The title of my project, *What the Robot Saw*, is a reference to *What the Butler Saw* films, a genre of early 1900s erotic films in which a butler spies through a keyhole on a partially undressed woman. Both the Robot and the Butler were voyeurs who spied on something that was supposed to remain unseen. But neither could really understand the object of their obsession. The image is incomplete.

Our online selves have long been assumed to be incomplete images: visually—talking heads and empty Zoom rectangles—and socially—performances for online audiences and the robots who rank them. But our offline selves now, too, are incomplete—at least for now. Eventually, we'll resolve these transformed, offline social selves: the way a cross-section of society

who never expected to "go pro" has learned to lock eyes with a camera; the way homes have become sets; the way meetings and classrooms have discovered the potentialities of everyone talking at once. And the way, once discovered, some of these new ways of being in the online world will follow us back offline. Our online and offline selves will continue to shift and intertwine, as Floridi wrote in 2014. But neither self is complete without the other—even as they combine, multiply, and transform into ever-fuller selves. For better and for worse, we are X.

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The Value of AI Art

Jon McCormack

Art made using Machine Learning (ML) and Artificial Intelligence (AI) software is again on the rise. With the success of old techniques on new hardware, the immediacy and availability of "big data", the sharing of open-source code and the geographic and cultural homogenisation that the Internet makes possible, almost anyone can download some software and become an "AI Artist". With the advent of Non-Fungible Tokens (NFTs), the modern AI artist can also participate in the global crypto market, selling their digital works without dependency on a traditional gallery or auction house.

Such democratisation seems like a good thing: complex algorithms and research that was previously opaque to artists is now open and accessible. An online community offers help and support without cost. Artists, irrespective of status or location can directly connect with buyers and sometimes even earn a living through their virtual artistic practice. We now live in what some have termed "a renaissance" of generative and digital art, fuelled in no small part by AI software, NFTs and a culmination of factors discussed here.

This situation did not arise overnight. For more than half a century, computers have been foundational to many an artis-

tic practice. Early pioneers such as Georg Nees, Frieder Nake, Manfred Mohr, Vera Molnár, Charles Csuri, Lillian Schwartz, and Ernest Edmonds—to name just a selective few—worked directly with algorithms at a time before the open access and immediacy of the Internet. As such they had to write their own software from scratch, inventing many of the techniques that continue to be reinvented today by contemporary digital artists. With the advent of personal computers, then the global Internet, then accessible learning and development platforms such as Processing, programming for creative applications became possible for new generations of artists. The accessibility and community support made it easy for people to develop and share their work and skills, helping to feed the learning process that was now also being supported by educational institutions, who had previously largely resisted thinking of technology as a core part of artistic training.

However, this so-called renaissance also amplifies many problems. Like other changes facilitated by technological developments, ubiquity and accessibility brings broader cultural issues to the fore. One of these issues—and what is at the heart of this essay—is the changing understanding of art and artistic practice brought about by technology.

Most digital art currently being produced possesses few, if any, of the qualities that would have previously been associated with traditional fine art. Digital art is mostly generic, derivative, vacuous, repetitive, and vacant. It typifies the category of aesthetic experiences that Sianne Ngai terms the new aesthetic categories of "Zany, Cute and Interesting",[1] offering a short, but ultimately unmemorable visual hit, before disappearing into the swathe of similar imagery that one typically experiences via their

1 Sianne Ngai, *Our Aesthetic Categories: Zany, Cute, Interesting* (Cambridge, MA: Harvard University Press, 2015).

"feed". Now of course there are some exceptions, and one might argue that a similar situation exists with many aspects of contemporary cultural practice, not just digital art. But then how do we explain the popularity and interest in this current wave of AI and digital "art"? And what are the consequences more broadly for its future?

The answers are, no doubt, numerous; determined by a nexus of factors beyond their technological facilitation, such as the pandemic, which has significantly reduced physical interaction and travel, the closure of physical arts spaces such as galleries and museums, and a retreat online as a way of compensating for such changes.

To fully understand this situation is far bigger than this simple essay. To reign in the scope, I want to focus on a single question that I find myself constantly asking as I browse a seemingly ever-increasing amount of digital art online: what is the *value and purpose* of this art? I propose three different interpretations of value to help answer this question: value as $, value as art, and value as X.

Value as $

> Success does not consist in never making mistakes but in never making the same one a second time.
> *George Bernard Shaw*

The current era of AI art jumped into public attention on the 25th October 2018, when a "work of art created by an algorithm" was sold at auction by Christie's for US$432.500—more

than 40 times the value estimated before the auction[2] and the highest price paid at auction to date for a computer generated artwork. The work was created by the Paris-based collective *Obvious* who had backgrounds in Machine Learning, Business and Economics. They had no established or serious history as artists. Such a record high price fetched at auction appeared to herald a new interest in AI and algorithmic art by the mainstream art world, that for years had largely underappreciated and undervalued such work.

Perhaps one of the most well-known pioneers of "AI art" is Harold Cohen (1928–2016). Cohen originally trained as a traditional painter, representing the UK at major international festivals during the 1960s, including the Venice Biennale, Documenta 3, and the Paris Biennale. His work is in the collections of major galleries such as the Tate Modern. He devoted most of his professional career to exploring the possibilities of AI art, painstakingly developing his AARON software over more than 40 years. Despite this significant pedigree, his works typically did not sell commercially for even 1% of the price paid for Obvious's "AI art".

Shortly after the Christie's sale it was revealed most of the code used by Obvious to create the work was written by a 19-year-old open-source developer, Robbie Barrat, who did not receive credit for the work, nor any remuneration from the sale (and who in turn, relied on code and ideas developed by AI researchers and companies like Google). An online arts commentary site, *Artnet*, summarised it thus: "Obvious… was handsomely

2 Unknown Author, "Is artificial intelligence set to become art's next medium?", *Christie's*, (November 2018). Accessed 7/11/2018. https://www.christies.com/features/A-collaboration-between-two-artists-one-human-one-a-machine-9332-1.aspx

rewarded for an idea that was neither very original nor very interesting."[3]

Browsing the current crop of NFT sites shows a myriad of digital artworks sold using cryptocurrencies for what would traditionally be thought of as eye-watering prices: typically, tens to hundreds of thousands of equivalent US dollars. The majority of these works also seem "neither very original nor very interesting". So while it might be easy to dismiss the Christie's auction as an anomaly, it seems that some people are willing to make the same mistake twice (or many times over) and are willing to pay large amounts of virtual money for art that is incommensurate with the concept of value I will discuss in what follows.

There has always been an art market, and people have traded in art for numerous reasons, including for the generation of wealth, to display their wealth as indicators of their success and power, or to express the privilege of ownership of something that is rare or special. Corporations, governments, and nation-states also trade in the art market, acquiring works of significance on behalf of their citizens or shareholders. In the case of public institutions, the art is preserved and archived due to its cultural significance and is usually accessible to the public whose taxes supported its purchase. In this sense the aims of the public institution are different from individuals or corporations. But to enter this market one must possess a level of wealth and power that is inaccessible to the common citizen.

Even if we generously concede that, for conventional art, financial value is a (highly imperfect) proxy for some other kind of artistic value (rarity, uniqueness, aesthetics, cultural or his-

3 Naomi Rea, "Has Artificial Intelligence Brought Us the Next Great Art Movement? Here Are 9 Pioneering Artists Who Are Exploring AI's Creative Potential," *Artnet* (November 2018). 7/11/2018. https://news.artnet.com/market/9-artists-artificial-intelligence-1384207

torical significance) the financial value of current digital art isn't commensurate to any of these non-financial artistic values. NFTs impose a kind of faux rareness, cloaking the work under the capitalist concept of unique "ownership" through technology, but as everyone knows, digital art is not rare. And, neither "rare" in the sense of its unlimited and exact reproduction, nor in the generic qualities and ready availability it displays. NFT art masquerades as accessible and democratising, supposedly seeking to dismantle the power structures that have existed within the traditional art market, yet it adopts the same language and promotes the same desires as the conventions it seeks to disrupt.

This leads one to the conclusion that any correlation between an artwork's financial worth and its value in terms of its physical rarity, uniqueness, aesthetics, cultural or historical significance does not exist. But then what is it that people are actually paying so much money for? There are several, obvious possibilities, including buyer's herd mentality ("everyone else is paying that much so I have to as well"), a fear of missing out, the investment opportunity, the satisfaction of "wining" an auction (similar to the gambling table), the perceived status of faux ownership, and an excess of disposable income due to the pandemic.

What we can conclude then, is that digital art's financial value has little, if any, relationship to the values we have traditionally associated with fine art. Ironically, digital art still exploits the term "art" in this traditional sense, seeking the "best of both worlds"—the art world and the financial world. Buyers are seemingly under the illusion that both can coexist, despite this glaring anomaly.

Value as Art

> If I have a complaint about what has happened in the arts this century, it is not that technology is constraining imagination, or making slaves of us. It is rather that it isn't constraining it enough.
> *Anthony O'Hear*

The most common understanding of art's value is not its capital, but cultural value. Art is a human enterprise, defined by experience, of both artist and audience. It involves human communication between artist to audience—an argument used by philosopher Anthony O'Hear that discounts, *a priori*, the possibility of computers making art autonomously.[4] Indeed, such views date even further back. According to John Dewey, "the trait inherent in the work of the artist [is] the necessity of sincerity; the necessity that he shall not fake or compromise."[5] As Dewey points out, the artist's intention and their authenticity are critical for both being an artist and practicing art. A computer (and AI software) has no intention or authenticity, so it can't be considered an artist by these criteria, nor can what it produces be considered art.

We can of course, ignore or reject such rigid conditions, which seems to be what many AI artists would like to promote. Perhaps one day, in the far-off future, machines might have their own intention to make art with a fair degree of authenticity. We might have to deal with trying to understand "what it's like to be a machine" as much as machines might try to understand "what

4 Anthony O'Hear, "Art and Technology: an old tension," *Royal Institute of Philosophy Supplement*, 38 (1996), 143-158.

5 John Dewey, *Art as Experience* (New York, NY: Capricorn Books, 1934).

it's like to be human" to appreciate each other's art. Maybe we will have become hybridised by then and the point is moot. But that day currently only exists in fiction, not fact. So, sticking to reality, what AI software currently generates is not art by this traditional definition.

It might be argued that the magic ingredients of sincerity and authenticity come from the person running the software they downloaded from the Internet, not the software itself. The software is a "mere tool" that is manipulated and fashioned to the will of the individual's creative expression. This might be true, in which case it leads to the question of why then software is promoted as artificially "intelligent," when it does not possess the primary elements of human artistic intention. Moreover, the banality and generic nature of AI software art suggests that human sincerity and expression is low if it exists at all. This genericism arises because the software used is generic. It is typically authored by many engineers and computer scientists, not the artists themselves. Deep learning's lifeblood, its vast training data, is sucked from the internet, trained via the resources of large technology companies such as Google or OpenAI which are inaccessible to most individuals.

From paint to software, artists have always relied on tools and technology, and this technology has led historically to seismic shifts on how we understand art, and the possibilities for the kinds of art humans can produce. These "kinds" extend beyond being new media. Photography, with its mechanical reproducibility and ability to represent reality changed painting forever. Today's digital art is no exception. Nonetheless, there are some important differences. Tools themselves have always had a *mate-*

rial agency.[6] Both the technology and its material agency are significant determinants of what is possible. Without silver bromide there would be no photography, without cameras there would be no cinema, without computers there would be no AI art. None of these technologies are benign, but especially software. Computer technology and software has its own kind of material agency, AI software can possess an agency and autonomy that is not fixed or pre-determined by the software's authors. With the advent of online AI software, technique is no longer central to art.

Value as X

If the value of current AI artworks is not to be found in their monetary or artistic value, wherein does it lie?

How do works generated from AI software mediate and inform human experience? Works that lack an individual author's intention, yet somehow initiate complex responses and change in their human creators and recipients. An "immaterial materiality" exists at the nexus of human, machine, and culture, where words and images become more than symbols, stories, or markings.

All those human qualities we might naively seek in an artist—nobility, purpose, insight, sensibility—are completely vacant in AI art. Yet the poetics of the machine have effect. Where does this come from?

The abilities of current AI models, such as GPT-3, VQGAN, CLIP, etc., at first appear impressive. For example, GPT-3 was trained on a vast corpus of on-line human writing and can generate (partially) coherent text that runs for several paragraphs on any multitude of topics. But the rich cornucopia of human lan-

6 Lambros Malafouris, "At the Potter's Wheel: An Argument for Material Agency" in *Material Agency: Towards a Non-Anthropocentric Approach*, eds. Carl Knappett and Lambros Malafouris (New York, NY: Springer Science and Business Media, 2008), 19-36.

guage from which the model learns renders it like some strange idiot savant, with no distinct personality or voice, just the collective, homogenised voices of hundreds of millions (billions?) and the ability to wield language that is in some sense meaningful, but without understanding or intentionality.

The AI poet's or artist's voice—the "I"—is a collective, statistically homogenised "we" of the internet, learned in the tropes of human interests and desires, yet devoid of any grounded knowledge or phenomenological experience. Like the parrot that mimics fragments of human conversation around them, this intelligence's intention is fundamentally different from our own. For us, language is a communication mechanism that gives insight to others of our own inner states, our desires, our aspirations, our feelings, our experience of the world and our intentions in it. For the AI, its intentions are bound to stochastic transformers: if these were the last *n* words, what are the most likely next words in the context of this text?

GPT-3's memory and capacity for language is in part superhuman, yet it understands nothing of actually being human, a contradictory position for any artist.

In what is called the "4E" view of cognition, the mind is considered as embedded, enacted, embodied, and extended. It has become a major topic of cognitive science, led by work such as Clark and Chalmer's Extended Mind Hypothesis, which proposes that cognition does not happen exclusively within the confines of the brain and body, but extends out to include our interactions with objects in the world.[7] Material devices play an active and important role in the cognitive process, which occurs

7 Andy Clark, *Natural-Born Cyborgs: Minds, Technologies, and the Future of Human Intelligence* (Oxford; New York, NY: Oxford University Press, 2003).

through the interactive links of reciprocal causation between things, not just from those things themselves.

Similarly, Malafouris's arguments for material agency, that is, the agency of materials, includes the tacit and non-linguistic knowledge gained from the interaction of people and materials. He argues that agency is not exclusive to human intention, rather it arises through material engagement, i.e. the dynamics of mediated action, a "dynamic coupling" between mind and matter.[8]

Many things, including matter, AI, and people exhibit agency, but this agency is not all of the same kind. Matter, for example, demonstrates the ability to self-organise. Proteins fold in specific ways, which lead to the machinery of life (DNA) as a self-organising system. A murmuration of starlings appears visually as an emergent super-organism, each bird only reacting locally. Termites collectively build vast architectural structures without a designer or central coordinator. A key characteristic of self-organisation is the lack of centralised command or determination—there is no singular "intelligence" directing the organising or assembly, structure and organisation emerge from the bottom up through intra-actions with the environment.

Tied up with issues of agency and autonomy from a human perspective is the concept of intentionality. Intentional states reflect a concern of or about things or objects, at face value something distinctly lacking from the non-living, in the sense of "prior intention" as opposed to "intention in action".[9]

Perhaps more paradoxically we could say that the only intention of the algorithm is to show itself. AI algorithms have a high level of autonomy—but their decisions are statistical models that reflect the human behaviour they are exposed to. They

8 Malafouris, "At the Potter's Wheel."
9 Ibid.

are, in a sense, algorithmic mirrors of ourselves, but what is being mirrored is also being changed by the mirror itself, leading to a coupled, recursive, emergent system of cultural change.

Hence, such systems are not exterior tools or aids, but interior transformers of consciousness and cognition. If thinking is performative (based in action) and action is determined by AI software (in whole or part), our intra-actions with AI software play an increasingly important role in our cognition.

Conclusion

The value in the current wave of digital and AI art lies not in its financial, cultural, or creative power. This "art" lacks almost all the features we have traditionally (over hundreds of years, at least) associated with what art is and art's meaning. Its value lies in the cognitive dissonance it imparts. Human cognition extended and coupled with a new kind of autonomous agency, an agency that is completely unlike human agency. An agency that is affecting and changing us in ways that have never existed.

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Code-Poetics X Esolangs

Daniel Temkin

Code is the text with two readers. The evaluator, usually a piece of software, interprets code in the most literal way in order to run it or translate it into machine code. The human reader needs more context, provided by the overall architecture of the program, the coding style, comments and the naming of functions and variables that together reveal the intent of the programmer. Computer science pioneer Donald Knuth took the emphasis on the human reader further than most, with his concept of "literate programming", saying that "programming is best regarded as the process of creating works of literature, which are meant to be read... so we ought to address them to people, not to machines."[1] Yet even for Knuth, this human reading is subordinate to the "complete and unambiguous explanation" the machine requires:[2] it is there to make clear how the code will perform. It would seem ridiculous to him to make the code do something only in order to have it read better to a person.

1 Christopher J. Van Wyk (moderated by), "Literate Programming", *Communications of the ACM* 32, 9 (1989): 1051–1055

2 Donald E. Knuth, "Donald Knuth: Programming is like nothing else. Become friends with geeks", *Idnes.Cz* (October 17, 2019). Accessed 6/2/2022. https://www.idnes.cz/technet/technika/donald-knuth-interview-computer-science-brno-czech-republic.A191016_112708_tec_technika_pka

Yet this is completely reasonable in code poetry. Code poets flip this script: they make the literary reading of code primary. Rather than code-as-text illuminating the code's performance, the performance of the code goes to the supporting role, enriching the code as a textual work. The performance may illustrate its theme, add nuance through its output, or even reverse expectations the text suggests to create ironic tension.

Keeping a confluence between human and machinic readings can be challenging, for both code poets and work-a-day programmers. Style guides like Microsoft's *General Naming Conventions* advise to "favor readability over brevity" in naming, to make it simpler for the text to explain the purpose and use of the variable in code:

> The property name CanScrollHorizontally is better than ScrollableX (an obscure reference to the X-axis).[3]

The approach by code poets is very different. Consider this line from *TIME GOES BY SLOWLY* by Chris Boucher:

```
For Each Day As TimeGoesbySlowly In YourLife
```
[4]

For, *Each*, *As*, and *In* are keywords in the Visual Basic language. Boucher names his variables *Day*, *TimeGoesbySlowly* and *YourLife* to make the line read as natural English. The metaphoric meaning of the variables are more important than anything literal to make clear how the variable functions in this code.

3 Microsoft, "General Naming Conventions" (2021). Accessed 6/2/2022. https://docs.microsoft.com/en-us/dotnet/standard/design-guidelines/general-naming-conventions

4 Chris Boucher, "TIME GOES BY SLOWLY", in *Code {poems}*, edited by David Gauthier, Jamie Allen, Joshua Noble, and Marcin Ignac (2012):43.

The closeness of Visual Basic to pseudo-code means that many people can run their program in their heads, even if they are not familiar with the Visual Basic language. It is a constraint-based poem, shaped by how his text can run as a Visual Basic program.

Take away runnability as a factor and code poetry would look very different. Mez Breeze's *Mezengelle* uses code-like phrasing and punctuation in the middle of words to allow for a layering of referents and multiplicity of meaning. It brings the formalism of code into natural language in order to expand it (this practice can be described more specifically as "codework" rather than the more general "code poetry"). Since it is not actually executable, it is not bound by the machinic, literal meaning as interpreted within one programming language, nor by the constraints of the language in which it is written:

> `pricking.s[t|n\uff[ering].+virtually.b[l] in[d] ned`[5]

But what if digital poets could have it both ways? If poets wrote their own code-poetic programming languages, they would be freed from the constraints of existing language, able to create a logical framework of their own devising that they can then explore through their poetry.

While there is already a practice of creating programming languages purely for creative expression, called esolangs (for "esoteric programming languages"), it has not been a popular approach for code poetry for a few reasons. First, the learning curve to designing a language is perceived as much higher than writing

5 Mez Breeze, "Cultural Farming", in *Human Readable Messages* (TraumaWien, 2012): 123.

in an existing one. However, once the basic concepts of language design are understood, the technical aspect need not be complex, particularly for esolangs that focus more on lexicon than on alternate forms of computation (although linguistic experimentation might bring a language designer in that direction as well). The jump from writing code poetry to designing simple code-poetic languages is smaller than it might appear.

There are also issues of presentation, mainly the idea that following the execution of a program might be more difficult for the reader if it's in a new language. But this is also a problem in existing languages once poems reach even moderate complexity: there is always a point where it is not immediately runnable in one's head without an effort.

Third, esolangs have their own fraught history of languages that engage with natural language. These are some of the best-known esolangs, yet the ones that gain the least respect, often dismissed with the term "thematic", which tends to discourage more experimentation in that space.

Thematic Esolangs

There is a page on the esolangs wiki devoted to thematic languages.[6] They include esolangs where you write code in the voice of Arnold Schwarzenegger or the Swedish Chef, or where the code is a series of ASCII dicks. These are some of the best-known esolangs, as year after year, they appear in "weirdest programming language" listicles that first introduce many programmers to esolangs. Because of this, they are seen as the scourge of esolangs, with repeated cries to ban such trivial languages from the esolangs wiki.

6 "Thematic Esolangs," Esolangs.Org (n.d.) Accessed 1/4/2022. https://esolangs.org/wiki/Category:Thematic

In this interview with ais523, a prominent esolanger, he gives this advice to esolangers experimenting with such languages:

> If you use an unusual syntax or appearance as your gimmick, a so-called thematic language, try tying it into the semantics of the language somehow; languages like Taxi and Haifu are good examples of this, and are much more interesting than thematic languages like LOLCode or the brainfuck-variant-of-the-week.[7]

The language Taxi uses the taxi metaphor to map computer functions to locations on a map. To understand how to code in Taxi, one needs to follow the map of the town's streets, which function as the language's virtual machine. It's a metaphor that goes beyond the surface layer of text and explains the behavior of its code: the taxi goes to different spots that each correspond to a computational activity.

Most thematic esolangs do far less than this, they have "find and replace" lexicons, where instead of a forward slash (/) indicating division, a Schwarzenegger catchphrase ("HE HAD TO SPLIT") is used instead. The jokes of these thematic languages (such as they are) work because of the concordance between command and signifier.

Languages that use Schwarzeneggerisms or emoji make more or less the same point: they undermine the authority of the machine, reveal the arbitrariness of code. Unfortunately, the general silliness of many of these languages has reinforced the idea that languages primarily about vocabulary have little else to say.

7 Ais523 and Daniel Temkin, "Interview with Ais523," *Esoteric.Codes* (2011). Accessed 6/2/2022. https://esoteric.codes/blog/interview-with-ais523

Two theme languages, TrumpScript and ModiScript, mock the blustering of fascist leaders of large democracies. TrumpScript has features like "correcting" the number 4,5 billion to 10 billion, based on Trump's rejection of Forbes's estimation of his fortune (an early embarrassment in the Trump campaign, now long overshadowed by many other scandals). TrumpScript made the rounds on popular blogs (such as Gizmodo) in early 2016, racking up 7.400 stars on GitHub. But as Trump progressed from distraction to serious political contender to US president, the creators of the language abandoned the language. They froze the project withd a final update:

> Frankly, this joke isn't funny anymore. Rather than spend your time beating the "Trump is ridiculous" meme to death, please actually do something instead.[8]

This note was followed by links to the ACLU, NRDC, and Planned Parenthood.

ModiScript seems modeled on TrumpScript and is equally toothless, lightly teasing a public figure based on his posturing, with no reference to his religious nationalism and the violence it has unleashed.

Is it possible to create an esolang that criticizes political leaders in this way? A language is not only a way of controlling a machine, but a system of logic. Perhaps it can have more to say about authoritarianism than has been attempted; whether it is a medium well-suited to this kind of direct political commentary has yet to be shown. The fact that it has not been tried shows how limited the ambitions of thematic languages have been so far.

8 Sam Shadwell, Dan Korn, Chris Brown, and Cannon Lewis, "TrumpScript: Make Python Great Again" (2015). Accessed 6/2/2022. https://github.com/samshadwell/TrumpScript

Poetic Esolangs

The first esolang to fully embrace natural language, Shakespeare. Created in 2001, its programs read as a somewhat ridiculous version of Shakespearean stagecraft. Like many esolangs, it was created by bored students: Karl Hasselström and Jon Åslund built the language to fulfill an assignment for a Syntax Analysis class.[9]

Shakespeare goes a bit further than the find-and-replace lexicon. In this language, adjectives with positive and negative associations are used to create or modify positive or negative numbers. For the first time, a prose-like programming language uses the emotional quality of language as part of its calculus. Because many of these positive and negative words are necessary to perform math in the language, the program-script includes dialogue with long strings of adjectives. Adjectives can't be turned negative or positive by context, they have a fixed value.

```
Hamlet: You are as brave as the sum of your
fat little stuffed misused dusty old rotten
codpiece and a beautiful fair warm peaceful
sunny summer's day. You are as healthy as the
difference between the sum of the sweetest
reddest rose and my father and yourself! Speak
your mind!
```

9 Karl Hasselström and Jon Åslund, "The Shakespeare Programming Language Original Documentation" (2001). Accessed 6/2/2022. http://shakespearelang.sourceforge.net/report/shakespeare/

Positive adjectives include *beautiful*, *amazing*, *cunning*, *delicious*, and *embroidered*. Negative adjectives include *cursed*, *stuffed*, and *worried*.[10]

The range of what can be expressed in Shakespeare is low: pretty much every Shakespeare program sounds the same, with dialogue full of long, absurd lists of adjectives. This is reasonable for a language designed as a joke. However, it showed that poetic esolangs were possible, and inspired the next generation of work. Will Hicks describes coming across it:

> When I originally encountered Shakespeare, one of my disappointments with it was how much the algorithmic aspects of the language intruded on its possible artistic expression (e.g. "Thou art as sweet as the sum of the sum of Romeo…"). (…) [it] tends to become tiresome after the third "Speak your mind!"[11]

Hicks went on to create a family of esolangs called Esopo, named for *esolang* + *Oulipo*. Each language in the group has its own lexical rules. The first, Ashpaper, was designed to fit the way poets actually write:

> I developed a lexicon in which particular tools from the poet's toolbox would correspond to algorithmic operations, but I also tried to ensure that there were multiple ways of building any particular operation. A "for loop" might be constructed with end-rhyme and a particular

10 Karl Wiberg and Jon Åslund, "Shakespeare Programming Language" (n.d.) Accessed 6/2/2022. https://shakespearelang.com/

11 Daniel Temkin, "Esopo: Turing Complete Poetry", *Esoteric.Codes* (2018). Accessed 6/2/2022. https://esoteric.codes/blog/esopo-turing-complete-poetry

meter or with an appropriate sprinkling of similes, for instance.

While Shakespeare programs are immediately recognizable, AshPaper programs can easily be mistaken for poems that have no connection to computation. Rhyming, meter, and use of simile are widely used poetic tools, and they don't mark a poem as necessarily an AshPaper program. The aesthetic of AshPaper is open-ended.

The aesthetic of Correspond, the second Esopo language, is in the form of a letter. There, instead of syntactic signifiers, its lexicon is built around the semantics of the text. There are two registers, R_ME and R_YOU. Using "me" or "I" makes R_ME active. Using "we" or "us" sets the two registers to be the same. The personal kind of writing this encourages, just in insisting on returning to the two characters, encourages a certain kind of writing that is perhaps more specific than AshPaper. Correspond's vocabulary is still open-ended, but the aesthetic is more constrained than AshPaper's.

All of the Esopo languages are general-purpose, meaning that one could write a web server in AshPaper if they really wanted to. The poetic language in:verse by Sukanya Aneja takes a different approach. In:verse is shader-based: programs in the language run on a virtual machine capable of generating still or moving images.

The unusual feature of in:verse is its wordtable. While the list of commands available to each program is the same, that program will have its own signifiers for those commands. In:verse allows the vocabulary to be completely set by the program's author. So while one program might use "to" to indicate the y access,

another might use “gigantic”, such as this piece, which generates a gradient:

```
something gigantic
in your texas cells
stir my walls
aquire my perimeter
rest in my pillowed
south
```[12]

Like the vast majority of mainstream languages, most esolangs adopt keywords (their “fixed” lexicon) from English. However, some have pushed against the English default. The language Wenyan by Lindeng Huang is an extraordinarily ambitious project for an esolang. Created by Huang when he was an undergrad, Wenyan is modeled on the grammar and tone of Classical Chinese literature.[13] It has a sophisticated, semi-professional development environment that rivals mainstream languages. It has gained an enormous following, with 18.000 stars on GitHub, more than Microsoft’s Roslyn compiler, the centerpiece of its .Net platform. However, it has received little journalistic attention, most likely because it avoids English entirely.

The 99 Bottles of Beer program—a popular program to learn to code a new language—is written this way (the translation and comments are by the artist Yidi Tsao):

12 Hot Texan, “Something Gigantic” (n.d.) Accessed 6/2/2022. https://editor.inverse.website/?sketch=9z2yd6Y2K

13 Lingdong Huang, “Wenyan-Lang” (n.d.) Accessed 2/1/2022. https://wy-lang.org/

吾有一言。曰「「春日宴。」」。書之。
I have a word, called “spring feast”.

有數九。名之曰「酒數」。
There are nine numbers. I call it “wine number”. (note: 九 nine and 酒 wine are homophones in Chinese.)

恆為是。若「酒數」等於零者乃止也。
It is always like that. It only stops when “wine number” is zero.

吾有三言。曰「「與君」」。曰「酒數」。
I have three words. one is “with you”. The other is “wine number”.

曰「「杯酒。可以窮歡宴。綠酒一杯歌一遍。」」。書之。
It says, “glasses of wine. All the fun of the feast. A glass of green wine then a song”.

減「酒數」以一。昔之「酒數」者。今其是矣云云。
Minus one from “wine number”. Previous “wine number”, now is this.

吾有一言。曰「「綠酒千杯腸已爛。」」。書之。
I have a word. It says “thousands of glasses of wine. my stomach is done”.

The phrases came from a poem called “to Wang Han Yang” by Li Bai, who is famous for his drinking habit, also the greatest poet in Chinese history.[14]

14 Daniel Temkin, “Wenyan-Lang” *Esoteric.Codes* (2020). Accessed 6/2/2022. https://esoteric.codes/blog/wenyan-lang

Wenyan programmers adopt the style of Classical Chinese not only in the required keywords of the language, but in strings printed to the screen. The writer of this piece could have made it about beer, but chose to use wine, not only to make it truer to the time period of Classical Chinese, but also in reference to this specific poet. The most interesting Wenyan programs play thus with historical and poetic references that are mostly lost in English translation.

Ancestral Codes and Cree# by Jon Corbett are two versions of a programming language that use Cree in the place of English in a C# or Java-like language. Corbett, who comes from Métis heritage, chose to make a language that not only used his ancestral language of Cree, but also frames the program as a story in the Cree tradition. While Cree# can be used for any purpose, Ancestral Codes, which is built on Cree# syntax, is meant for storytelling in the Cree tradition.

It was important to Corbett that not only is the alphabet Cree, but also the vision of computation. For instance, instead of if/then statements, Cree# uses the idea of a dividing river, a concept borrowed from the Alelo C# coding group project, a Hawaiian programming language. It works equally well in a Cree worldview as in Hawaiian. Programmers need to explain a program through a ceremony, including symbolic actions like smudging to begin the program (a "small/personal ceremonial practice where a medicinal herb [usually sweetgrass or sage] is burnt"). The program then uses actors like the Raven, who might not do as commanded if the program is not offered with sincerity.[15]

Because Cree is a morphemic language, Cree# is as well. This is highly unusual for a programming language, as it means

15 Jon Corbett and Daniel Temkin, "Interview with Jon Corbett", *Esoteric.Codes* (2021). Accessed 6/2/2022. https://esoteric.codes/blog/jon-corbett

keywords are not consistent in their complete forms, but rather that parts of a word might hold meaning.

Cree culture must also be understood to program in the language. A variable that is mundane or "everyday" is put in a berry bag, or *mînisiwat*, while one with more meaning is put in the *maskihkîwiwat*, a difference which is not obvious to outsiders. Corbett has created a language where one must embrace a Cree worldview in order to write code.[16]

A Largely Underdeveloped Space

Most code-poetic esolangs, such as in:verse and AshPaper, have arbitrary relationships between the human and computational readings of their texts. In this way, the languages serve as Oulipian constraint sets, where following the rules of the language generates an approach for esoprogrammers to write poetry that conform to the rules of the language and yet say something compelling on their own. Wenyan and Ancestral Codes do the opposite, creating a confluence of meaning between the two readings, similar to the "thematic esolangs".

While neither of these approaches are close to being exhausted, there are other possibilities for poetic esolangs that have not been seriously attempted yet. What if a language adopted a larger gap between the text as written and as parsed by the machine, allowing for more ambiguity in the front end? Perhaps a series of mini-languages borrowing from Queneau's *Exercises in Style*, with programs in styles like Passive, Hesitation, or Cross-Examination. Or to draw from J.L. Austin's concept of illocution, using mundane conversational approaches like implying, or convincing that it is in one's own interest. We can "warn,

16 Ibid.

congratulate, complain, predict, command, apologize, inquire, explain, describe, request, bet, marry, and adjourn, to list just a few specific kinds of illocutionary act",[17] drawing from how we converse with other people more directly into code. Or perhaps a greater ambiguity or depth of meaning can be brought to the performance of code, to the "complete and unambiguous explanation" we provide—a Mezengelle for the compiler.

These are just a few possible directions for the digital poets and writers interested in the field of code-poetic esolangs. But very likely the next great code-poetic esolang will bring poetry into code in a way that can't be foreseen, expanding or complicating the resonance between the two readings of code.

Daniel Temkin is an artist and writer. He has covered programming languages as an art medium for over ten years on his blog esoteric.codes, which won the 2014 ArtsWriters.org grant from the Warhol Foundation and Creative Capital. Esoteric.codes has been exhibited at ZKM, written in residence at the New Museum's New Inc incubator, and was the honoree of Webby Awards for best writing (editorial) and best personal blog in 2021. Temkin shows with Higher Pictures Generation gallery in New York and his work has been a critic's pick in Art News, the New York Times, and the Boston Globe.

17 Daniel R. Boisvert, "Expressivism, Nondeclaratives, and Success-Conditional Semantics," in *Having It Both Ways: Hybrid Theories and Modern Metaethics*, eds. Guy Fletcher and Michael Ridge (New York: Oxford University Press, 2014), 22-50.

How Can Art Exist on a Distributed Ledger?

Domenico Quaranta

When, on February 25, 2021, a .jpg file was offered at auction by Christie's for $100, many in the art world took it as a bad joke. When, on March 11, 2021, the file sold for more than 69 million dollars, that joke turned, in the public perception, either into a miracle or something as absurd and enigmatic as, let's say, the US Capitol attack. How can a digital file—something that can be seamlessly shared, copied and saved—actually be sold? How can it pretend—as the Christie's website boasts—to be unique? And, who's Beeple?

For many, of course, the spectacular sale of *Everydays. The First 5000 Days*, a digital collage of 5.000 illustrations by South Carolina-based graphic designer Mike Winkelmann aka Beeple, was neither a joke nor a miracle. Its possibility was rooted in a technology as old as the Great Recession, cryptocurrencies, and the infrastructure they rely upon, the blockchain. Mostly unknown in the art world, Beeple was extremely popular on social media, and some of his works had sold for big amounts before the Christie's sale: *The Complete MF Collection* was bought for $777.777 on December 12, 2020, and the looping animation *Crossroads* for more than 6 million on February 25, 2021. Both these sales took place on an online marketplace called Nifty Gateway, a start-up

founded in 2018, whose declared mission is "to make NFTs accessible to everyone."[1]

NFT stands for Non-Fungible Token, and describes a blockchain-based technology "used to identify something or someone in a unique way".[2] If fungible tokens (i.e. any currency) are interchangeable, non-fungible tokens are unique; and as they are recorded on a tamper-proof, unalterable ledger—the blockchain—and can be linked to any kind of digital content through a cryptographic hash, their uniqueness can be transferred to the associated file. While the latter can still be copied, shared and downloaded, its association with the NFT allows to prove its provenance and ownership, and to transfer it to a new owner in a transparent, trackable way. By buying the NFT, somebody can claim ownership of the associated file, and eventually sell it to somebody else. In simple terms, an NFT is a piece of code written according to a specific standard (the most popular one being ERC-721, introduced in 2018) and governed by a smart contract, a blockchain-based program implementing the terms of a contract.

NFTs can be used—and have been used since their introduction—to certify uniqueness and prove ownership for any kind of collectible items, from cards to in-game assets, from sports memorabilia to popular or rare memes, but also for "access keys, lottery tickets, numbered seats for concerts and sports matches".[3] Between 2018 and early 2021, the NFT market grew thanks to the emergence of a number of platforms and market-

1 See https://niftygateway.com/about
2 See "ERC-721 Non-Fungible Token Standard", https://ethereum.org/en/developers/docs/standards/tokens/erc-721/
3 Ibid.

places, and gave birth to a community with little or no ties with the mainstream art world.

The sale of *Everydays* changed this landscape completely. In a few months, the monthly sales volume went from a few million dollars (January 2021) to 100 million (February 2021) to 200 million (March 2021), with peaks of 700 million (August 2021). At the end of December 2021, the total market volume amounts to 2,5 billion dollars, for 2,6 million artworks sold.[4] New platforms emerged, all the main auction houses started to sell NFTs and to accept cryptocurrencies, and an increasing number of artists joined the space. At the end of the year, the "non-human entity" ERC-721 tops the Artreview Power 100, "the annual ranking of the most influential people in art", and NFT is the word of the year according to the Collins Dictionary.[5]

Retrospectively, it's easy to see in the *Everydays* sale the result of the convergence between two interests: the art market's interest in attracting the big money of crypto-investors, and the crypto-investors' interest in popularizing NFTs and promoting cryptocurrencies. They both succeeded. Today, cryptocurrencies are accepted by auction houses and some galleries to buy not just NFTs, but also physical art and other luxury items.[6] And even

4 These data are provided by the website Cryptoart.io, that follows the NFT art market on some of the most popular Ethereum based platforms (with the exception of Hic et Nunc, based on the Tezos blockchain): which means that these data are incomplete, but still useful to provide an overall picture.

5 For the *ArtReview* Power 100, see https://artreview.com/power-100/; the Collins Word of the Year is available at www.collinsdictionary.com/it/woty

6 It has been reported that cryptocurrency billionaire Justin Sun has spent more than $100 million at auction along 2021: buying not just NFTs, but also artworks by Picasso, Warhol, KAWS and most notably Alberto Giacometti's masterpiece *Le Nez* (1947-1949). The work has been donated to the APENFT Foundation, focused on registering world-class artworks as NFTs on the blockchain. See Amah-Rose Abrams, "Cryptocurrency Billionaire Justin Sun Has Bought More Than $100 Million Worth of Art This Year. So What's He Going to Do With It?", *Artnet News*, November 29, 2021, https://news.artnet.com/art-world/justin-sun-interview-metaverse-2041065

if concerns and criticism have been raised about the ecological impact of blockchains, the NFT market as a pyramidal scheme and a scam, the NFT technology limitations when it comes to certify authenticity and uniqueness, the role of investors-collectors and of platforms, the abuse of art to promote and legitimize cryptocurrencies, and many other issues,[7] it would be hard to question the popularity and massive adoption that NFTs were able to reach in a few months. Exactly because of this massive adoption, that brought creators—visual artists, but also writers, musicians, film directors etc.—and supporters of all kinds to invest on blockchains and cryptocurrencies (any active gesture performed in the blockchain environment starts with opening a wallet and buying currency) the aforementioned issues have become crucial, and the way we'll deal with them will shape the future landscape of the internet. Along this text, I focus on two of them: the role of platforms and the creative potential of smart contracts.

The Role of Platforms

> What is needed is an electronic payment system based on cryptographic proof instead of trust, allowing any two willing parties to transact directly with each other without the need for a trusted third party.[8]

A persistent myth in the blockchain environment has been the end of trust and intermediaries. Cryptocurrencies want to disintermediate finance: value is generated, and payments are

7 These and other topics are largely discussed in: Domenico Quaranta, *Surfing con Satoshi. Arte, blockchain e NFT* (Milan: Postmedia Books, 2021).

8 Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System", 2008. https://bitcoin.org/bitcoin.pdf

made, without the need of financial institutions, banks and trusted third parties. Smart contracts want to disintermediate agreements, implementing them into code and automating their execution without the need of lawyers, accountants, or notaries. NFTs want to disintermediate the art market, putting creators in touch with collectors without the need of an art world in between: art galleries selling the work, but also art critics, curators and institution certifying its cultural value.

This sentiment is fueled, on the side of the artists, by resentment against the art world, and on the side of collectors, by their alignment with the ideology of the blockchain. Most artists who experienced success as "crypto artists" don't have a background in what started to be called, in the field, the "legacy art world"—either because they have been rejected or didn't even try to join it, regarding their work as belonging to other fields, like illustration or commercial photography. Those who had a previous experience with galleries, often perceive their selling conditions (with 50 to 60% of the artwork price going to the gallery) as unfair—not to mention the secondary market, where usually no royalties are recognized to the artist (something that even best selling artist Gerhard Richter famously complained about).[9] "Crypto art collectors", on the other hand, when they are not mere speculators, are usually people who not only own cryptocurrencies, but often invest in blockchain based projects. They spent time and money in a field that for a long time has been either perceived as barely legal or wholly illegal. They believe in the blockchain, and they want to change the world with it. They are often excited to see how their act of collecting can determine the cul-

9 Kate Connolly, "Amount of money that art sells for is shocking, says painter Gerhard Richter", *The Guardian*, March 6, 2015, http://www.theguardian.com/artanddesign/2015/mar/06/amount-of-money-that-art-sells-for-is-shocking-says-painter-gerhard-richter

tural value of the artworks they like in the public perception. The roles traditionally performed by institutions, critics and curators converge in the hands and wallets of crypto investors, aroused by this sense of power and following an agenda that is economic, social and political rather than artistic.[10]

In between artists and collectors, there are platforms. A platform is typically an infrastructure built around a smart contract, in order to facilitate the minting and exchange of an NFT. When you mint—that is, register on the blockchain—a work as NFT, you usually do it using the smart contract deployed by the platform, which will automatically regulate every transaction from then on. Some platforms (i.e., OpenSea) are open to everybody, some others (i.e., SuperRare) select artists through applications. In Foundation, creators can only be invited by members of the community. An increasing number of platforms emerged along 2021 are based on some kind of curatorial model. If, to some extent, the removal of trusted third parties is true, what we are seeing is actually a replacement of the traditional art world with another, where roles usually distributed among a network of different subjects happen to be gathered in two main subjects: platforms and investors/collectors. In this new ecosystem, all participating artists are subject to the same, immutable rules implemented and automated by the smart contract; however, they are not all equal: those who succeed are usually those who have been in the field for some time, who own some crypto and can use it to mint new works, to collect other artists and consolidate relationships, to participate in DAOs (Decentralized Autonomous

10 An example of this approach to collecting can be seen in the words of Colborn Bell, founder of the Museum of Crypto Art: Ben Davis, "Colborn Bell, Founder of the First Museum of Crypto Art, Isn't Worried About Wooing the Traditional Art World: A Q&A", *Artnet News*, December 17, 2021, https://news.artnet.com/market/interview-colborn-bell-museum-of-crypto-art-2049578

Organizations) and have a voice in the community; those who are better in self promotion and have a strong social basis, and finally who manage to get the interest of the most powerful and influential collectors.

Platforms and, on a different level, collectors play another important role in the NFT space: they set the technical and expressive standards of what can be presented within their framework. Usually, the word NFT evokes a small, static or animated visual piece, sometimes with sound, usually colorful and pleasing. It doesn't need to be like this: almost anything—from digital to physical artworks, from visual to sound and interactive content—could technically be tied to an NFT. Along its long history, art made with digital means explored different forms, languages, aesthetics and modes of presentation. This outcome, though, is the result of a combination of tradition (the first digital collectibles were memes, gaming cards, tiny images from a generative series—i.e., CryptoPunks and CryptoKitties), influence of social media platforms, design and technical limitations of the main platforms, and audience preferences and tastes. When you upload your file, the platform informs you about the media formats allowed and the maximum file size. The work is presented in a grid interface, where it has to compete with a wide variety of visual material. In such a Darwinist environment, colorful files win over minimalistic aesthetics, and the eye is more easily captured by something moving, than by a static image. If you combine all this to an audience usually more informed about cryptocurrencies, videogames and online general content than about contemporary art, more interested in bragging ownership rights over a valuable and easily recognizable artwork on social media or at the coffee table than in showing it in a museum, and more akin to prove their influence and power than to recognize that of

any art world insider, it's easy to understand how this form of stereotypical NFT came about.

In other words, if platforms "democratized" (using their own language and rhetoric) or rather enlarged access to the blockchain space, they did it at a price: by standardizing and oversimplifying the ways art can exist in this space. The very idea that an NFT is an easy way to generate artificial scarcity in the digital environment, and to deploy, as David Joselit puts it, "the category of art to extract private property from freely available information",[11] is a consequence of this oversimplification. Proving ownership and tracking provenance is actually the more boring way an artist can use the blockchain technology for. The problem is that a more sophisticate use of the blockchain would require an awareness of the environment and technical and coding skills that most platform users do not have and are not interested to have. And yet, developing such skills and awareness is the only way to prevent the blockchain environment to quickly evolve into something similar to the Web it pretends to fight against: a space dominated by a few giant platforms setting the rules for how we can share cultural content and generate an economy out of it. And the only way to actually reach that level of autonomy that most platform promise, but only a few deliver to their users. In order to understand what's at stake, let's consider some examples.

Artists' and Art Workers' Rights

On most platforms, when an artwork is sold on the primary market, creators receive 85% of the final sale price. If an NFT is listed and collected again on the secondary market, a 10% royalty is automatically sent to the creator who originally minted

11 David Joselit, "NFTs, or The Readymade Reversed", *October* 175 (2021): 3-4. https://doi.org/10.1162/octo_a_00419

the artwork. The 10% royalty on all secondary sales is an amazing innovation if compared to what happens in the traditional art market, where artists have little or no rights on the future life of a sold artwork; and depending on how the price will rise and how many time a work is resold, they can bring in more money that the first sale on the primary market. Could smart contracts really allow something that visual artists fought to introduced for decades—the implementation and respect of an artist's rights on their work?[12]

After introducing the 10% royalties on secondary sales, most platforms didn't experiment further with the potential of smart contracts. Advocating their use for a more fair retribution among art workers, in April 2021 the US-based Transfer Gallery opened *Pieces of Me*, an online exhibition where artists receive 70% of sales, while the remaining 30% is distributed to all the artists in the exhibition along with the knowledge workers, contributors, technologists and gallerists making it possible.[13] After that, some platforms introduced "Splits", that allow to split earnings between collaborators, to support a cause or an institution, even to reward the gallery or label representing the artist on other markets. Foundation, for example, allows to split revenues with up to three other recipients; Art Blocks allows only an additional payee. Through a 50% split on the sale of the *Endless Nameless* generative project on Art Blocks, artist Rafaël Rozendaal directed around $430.000 to the no profit Rhizome, the largest benefit donation in the institution's twenty-five year history.[14]

12 The obvious reference is Seth Siegelaub and Robert Projansky's famous (yet rarely used) Artist's Reserved Rights Transfer and Sale Agreement (1971). See https://primaryinformation.org/product/siegelaub-the-artists-reserved-rights-transfer-and-sale-agreement/

13 See http://transfergallery.com/pieces-of-me/

14 Zachary Kaplan, "Announcing the "Endless Nameless" Gift from Rafaël Rozendaal", *Rhizome*, August 05, 2021, https://rhizome.org/editorial/2021/aug/05/announcing-a-major-benefit-gift-from-rafael-rozendaal/

Generative Processes and Coded Behaviors

Smart contracts are written in a programming language that can be used to influence various behaviors of the associated artwork. Through "Oracles", the programmer can also query off-chain data in the smart contract. A custom smart contract has been used by conceptual artist Rhea Myers to either validate or question its own artistic status: *Is Art* (2014-15) is an Ethereum contract that can be instructed to nominate itself as art (or not). Any new transaction changes the status of the contract as it was set by the previous one.[15] Artist Pak Murat used custom contracts to release works that are "strings attached", or that display a live behavior: released with Sotheby's, *Fade* is a fully on-chain living timepiece that disappears over a year, a procedural animated vector file that resets and regenerates itself with a new color gradient every time it's transferred to a new owner.[16] *Merge*, a collection sold in December 2021 on Nifty Gateway, is a visually abstract portrait of its very selling and investment mechanism. The project "has a built-in scarcity mechanism to ensure that the supply of tokens decreases over time. Every Merge token transfer merges with the token in the recipient's wallet, adding up the mass value and resulting in a single token."[17] *Merge* NFTs, displaying a single white spot on a black background, are generated dynamically and become bigger as their collector acquires more mass. In a 48 hours auction, a quarter of a million masses were sold to 26.000 unique collectors for a total income of 91 million dollars, that made *Merge* the largest ever art sale by a living creator.

15 See https://rhea.art/is-art

16 See http://www.sothebys.com/en/buy/auction/2021/natively-digital-a-curated-nft-sale-2/to-be-announced

17 See https://niftygateway.com/collections/pakmerge

While some platforms, such as Nifty Gateway and SuperRare, accept custom contracts, Art Blocks is unique in allowing artists to deploy generative projects on the blockchain. Instead of uploading a static piece on the platform, the artist stores a generative piece on the blockchain, programmed to generate, in a pseudo random manner, a fixed number of unique seeds. The NFT associated to a single seed is generated together with the seed when a collector buys it; when all the tokens have been minted, the generation of new seeds is stopped, and the existing NFTs can be bought on the secondary market.[18]

The Artist as DAO, the Artwork as DAO

A DAO is a specific form of smart contract, governing in an automated and immutable way the relationships between a number of wallets. As wallets usually identify users, DAOs are often used to organize a number of people around a given mission, without a central government, distributing voting power between members according to the financial participation. Collector's DAOs, for example, have become a common presence on many platforms, and often gather to support a cause or win an auction. *Jonas Lund Token* (JLT) is a peculiar DAO and an artwork by Jonas Lund, in which the artist has created 100.000 shares in his artistic practice. The shares give the shareholders agency and voting power over future decisions concerning Lund's artistic practice. Each share is represented by a Jonas Lund Token, a crypto currency built on, and distributed via the Ethereum blockchain. One share equals one vote and shareholders become part of the board of trustees, consulted each time a strategic decision needs to be made. While the artist reserved 10.000 shares, the others

18 See http://www.artblocks.io/learn

are distributed in various ways to collectors, art critics, curators, friends. The DAO's activity, which is transparently performed on the project website, pictures how an artist activity is socially determined, but also how, on the blockchain environment, influence is often strongly dependent upon economic power.[19]

Another powerful portrait of the potential and limitations of DAOs is offered by the *Plantoids* project, by Primavera De Filippi. Started in 2015, the project revolves around a number of robotic sculptures (their body), connected to a crypto wallet and governed by a smart contract (their soul). Described as blockchain-based lifeforms capable to reproduce themselves, *Plantoids* invite people to donate bitcoins, rewarding them with colored lights and animations; when they have collected enough money, they automatically start their reproductive process, involving donors in a voting session to determine the look of the new Plantoid and then opening up a call for bids to find out the artist that will be commissioned to create it.[20] When a new plantoid is born, the cycle of capitalization and reproduction begins all over again. The plantoids are therefore a form of life that reproduces and evolves autonomously, according to a Darwinian principle: some flowers (those which are more beautiful, or better suited to the setting they are displayed in) are destined to raise more money and give rise to a long line of descendants; others will remain the only specimen of their species.

These plantoids are a visual metaphor or physical representation of a DAO, a decentralised autonomous organisation that resides on the blockchain, and is based on a special kind of smart contract. Like a DAO, each plantoid is run by software and governed by its sponsors, whose voting power is proportional to

19 See https://jlt.ltd/
20 See http://okhaos.com/plantoids/

the size of their stake. As a work of art, the plantoid challenges the concepts of copyright (it is programmed to reproduce by involving creative subjects that may be different from its creator), scarcity (it reproduces) and ownership (it owns itself).

The *Plantoids* project, as well as the other examples mentioned above, show how art and blockchain should "X": at the crossroads between these two fields, art shouldn't just peruse the blockchain as a given, an immutable, existing substrate, but actively, creatively implement, criticize or correct its infrastructure, nurture and manipulate this substrate to make it evolve in ways not yet envisioned.

Domenico Quaranta is a contemporary art critic and curator with a focus on the impact of current means of production and dissemination on the arts. The author of *Beyond New Media Art* (2013) and *Surfing con Satoshi* (2021), he curated various exhibition, most recently *Cyphoria* (2016) and *Hyperemployment* (2019-2020).

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This Chapter Might Have Been Written by a Machine

Alessandro Ludovico

The Automatic Writer

A machine that can write is one of the oldest attempts by computer scientists to programme some kind of intelligence. In fact, literature was one of the first cultural areas where computers could be used, as texts are very "light" in terms of the amount of data compared to images, sounds and videos. Since the 1950s, attempts have been made to write software to produce meaningful texts. Programmers who worked with industrial computers in their spare time used minimal and special corpora with a combinatorial approach and generated mainly poems. Poems were easier to create because the language rules were looser. More so, poems have a scarce amount of text to compute, and the high tolerance for conceptual inconsistencies could have been interpreted as accidental metaphors. In the 1960s, when science fiction writers like J.G. Ballard, Philip K. Dick and Stanisław Lem were dreaming up either flawless or flawed writing machines, some poets and writers were exploring the idea of an automatic writing machine. The methodology was combinatorial, trying out many or even all combinations of words or verses within a certain, usually fixed structure, predicting, as it were, which words should be changed where. One of the most famous examples is

"Tape Mark I" by Nanni Balestrini, who in 1961, together with an engineer, developed a computer programme for the IBM 7070 that combined three poems by Michihito Hachiya, Paul Godwin and Lao Tse into a new meaningful poem. One of the more than 3.000 variations generated was chosen by Balestrini as an emblematic example and published in articles and catalogues. He made some minimal interventions to correct grammar and punctuation, which the author justifies with the "limited amount of code instructions used in the elaboration of the text."[1] Here the machine did not produce meaning on its own, but new meaning through what had already been produced in the famous literature. Nevertheless, the human co-author had the final say in the final selection, in a collaborative effort that preserved the specific context of the poetry.

In the following decades, the combinatorial approach evolved towards the "recursive grammars" or more discursive text generators. Among the many applications is the "Postmodernism Generator", written in 1996 by Andrew C. Bulhak of Monash University,[2] which generates imitations of postmodern texts in the form of whole articles at will. An example of the output is:

> 1. Predialectic narrative and textual discourse.
> "Class is fundamentally dead," says Marx; however, according to Hubbard, it is not so much class that is fundamentally dead, but rather the collapse and subsequent defining characteristic of class. Thus Lyotard uses the

1 Nanni Balestrini, "Tape Mark I," in *Almanacco Letterario Bompiani* 1962, ed. Sergio Morando (Milano: Bompiani, 1962), 145-151.

2 Andrew C. Bulhak, "On the Simulation of Postmodernism and Mental Debility using Recursive Transition Networks," Department of Computer Science Technical Report 96/264, Monash University (April 1, 1996).

term "expressionism" to denote a self-referential totality. Baudrillard promotes the use of structuralist narrative to deconstruct and read society.

These quite funny online applications highlight the limitations of certain "formats" in a particular context and the resulting expectations of the reader. Here, the machine provides the iterations through the particular corpora used, but the structure of the processes used to generate the sentences is transparent or easily deduced, and it is ultimately almost combinatorial work. We press a button or simply re-run the process to be entertained again, but the possible anthropomorphic aura of the machine can be gradually lost as predictability is revealed with the number of generations experienced as we compare them.

From the Combinatorial to the Simulation of Style

Over time, the basic mechanism of using a database as a source for an algorithm to generate meaningful sentences has been perfected. Larger and more interconnected digital storage and faster digitisation of printed pages have enabled the construction of vast corpora, while geometrically up-scaled computing power has allowed the implementation of so-called machine learning. Yet the predictive paradigm has survived almost intact, from Joseph Weizenbaum's 1966 *Eliza* software experiment,[3] an early natural language processing computer programme that simulated a conversation between a human and a computer using a "pattern matching" and substitution methodology, to today's industrial software based on machine learning.

3 Joseph Weizenbaum, *Computer Power and Human Reason: From Judgment to Calculation* (New York: W. H. Freeman and Company, 1976).

Consider, for example, the *T9* spell checker[4] used on mobile phones since the late 1990s, which evolved into an operating system-wide spell checker in the late 2000s, to today's autocorrections in all popular digital writing programmes and platforms. Autocorrections are designed to automatically change words that look wrong while predicting the next word that will be typed. In a way, this seems to realise the Surrealists' technique of "automatic writing" (Fig. 1), theorised by André Breton in his essay *The Automatic Message*[5] as a way of writing not as a directed process, but through a subconscious state and the spontaneity of thought.

The use of autocorrect has undoubtedly influenced our writing, but not yet our "professional" writing. Moreover, we are slowly moving from machines predicting (and suggesting) what a general person would write next to what a specific person would write next. This is a fundamental shift, transforming a machine's ability to produce meaningful text into a machine capable of producing text in the style of an author. And that is the most important expectation of machine learning in literature.

Algorithmic Authorship and the X of Deep Fakes

We are thus witnessing a progressive, mostly invisible proliferation of algorithmic authorship. This is facilitated by the vast corpora, now structured as datasets, that feed the machine learning algorithm that predicts a variable amount of forthcoming text based on prompts. It follows the questionable principle that if a sufficiently complex machine is properly trained with a consistent data set, such as an author's entire body of work, it can create

4 Wikipedia contributors, "T9 (predictive text)," *Wikipedia, The Free Encyclopedia*. Accessed 16/02/2022, https://en.wikipedia.org/w/index.php?title=T9_(predictive_text)&oldid=1060805251

5 André Breton, "Le message automatique" (1933), in *Point du Jour*, nouvelle édition revue et corrigée (Paris: Gallimard, 1992), 159-182.

Figure 1. Man Ray, Surrealist automatic recording session, 1924.

a mathematical model of that writing style to produce new "original" texts in the same style. The main ethical and methodological problem with this approach is that the machine does not know the meaning of the words it uses at all. For example, the causal or poetic associations and analogies in the original writing play no part in the mathematical model, which is used instead to make the most accurate "predictions" of what might come next, taking into account the complex, calculated abstraction of what has been written up to that point (what we might perceive as "style"). This process parallels the history of computer technology rather than the development of philology. If in the first machine writing experiments all possible combinations of words were jumbled up and the words were then sorted into more sophisticated schemes to produce meaningful results, all these meaningful combinations were already calculated and statistically evaluat-

ed, but still as mere quantified "sets" to be further recalculated. The "prediction" as the core principle of the whole system has remained the same, just on a different level of plausibility.

The so-called "autoregressive language models", such as the "Generative Pre-trained Transformers"[6] like the ones developed by OpenAI (Fig. 2) work like this. They generate text starting from short or long prompts, apparently without "lose track of what it was writing about as it generated output, keeping everything in context."[7]

This software is already used extensively and anonymously to write short news stories and reports that do not require as much commentary and lucubrations. The extensive use of this software has two important consequences. First, the original sources are literally atomised, i.e. they are kept in order but their causal construction is nullified to be used and then remixed, losing all meaningful references to the original context.[8] This systematic collapse of context, which seems to be a methodological approach to the reusability of the original corpus, transforms the original complex writing process, involving such a number of different conceptual relations, into a neutral matter, which is then even more neutrally and impenetrably edited by statistics and chance.

The second consequence is to reduce writing to a statistically derived process. The main problem with this approach is

6 Wikipedia contributors, "GPT-3," Wikipedia, The Free Encyclopedia. Accessed 17/2/2022, https://en.wikipedia.org/w/index.php?title=GPT-3&oldid=1072102946

7 Sean Gallagher, "Researchers, scared by their own work, hold back "deepfakes for text" AI," *Ars Technica*, February 15, 2019. Accessed 16/2/2022, https://arstechnica.com/information-technology/2019/02/researchers-scared-by-their-own-work-hold-back-deepfakes-for-text-ai/

8 John Seabrook, "Can a Machine Learn to Write for The New Yorker? How predictive-text technology could transform the future of the written word," *The New Yorker*, October 14, 2019: 54-63.

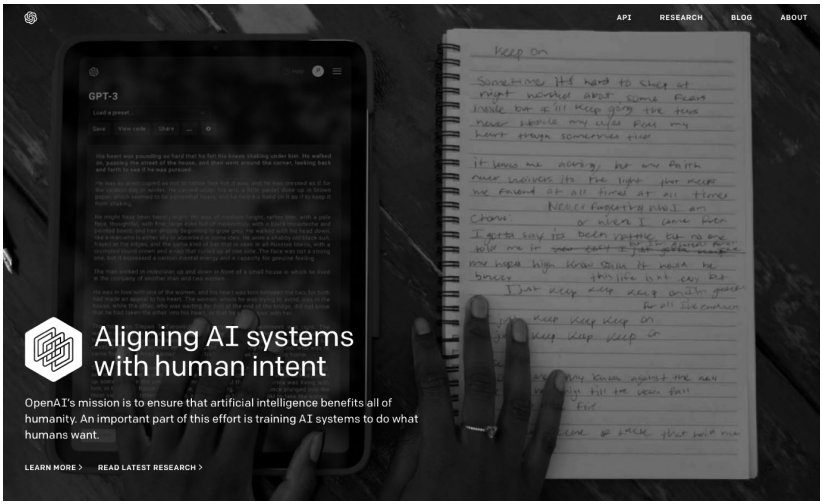


Figure 2. Open AI home page screenshot.

that its conceptual flaws may be increasingly overlooked because we are not trained to analyse this kind of writing. These glitches include the definition of "Escher sentences",[9] or sentences that make perfect sense at first glance but do not on closer inspection, and also the "world-modelling failures",[10] where the predictive approach produces syntactically and grammatically correct sentences but whose elements behave in an impossible way or are in a space/time where they simply cannot be in reality.

Furthermore, it is useful to define "deepfake": It categorises a synthetic content (primarily video and largely audio) in which a person is "replaced by the image of another person."[11] The technologies used, either photographic or audio, overcome

9 David Beaver, "An Escher Sentence in the Wild," *Language Log*, 8 May 2004. Accessed 16/02/2022, http://itre.cis.upenn.edu/myl/languagelog/archives/000866.html

10 Seabrook, "Can a Machine learn to write".

11 "What is Deep Fake and should we be worried?" *Deep Data Insight*, March 30, 2020. Accessed 16/2/2022, https://www.deepdatainsight.com/uncategorised/what-is-deep-fake-and-should-we-be-worried/

trust as the deepfake videos and audios look and sound so real that they can mislead even a critical person. The development of predictive software could produce very convincing fake texts, especially in short and simple formats suitable for social media. One of the grim scenarios involves armies of possibly millions of fake profiles that automatically simulate very different characters and post a huge amount of short texts to persuade action through polarising bogus arguments. But there could be countless ways to exert influence through an overflowing and automatic "written" production.

This cultural remixability has great potential to confuse, mislead and manipulate the reader. But one of the crucial questions might be: Have we already reached a generation of texts that not only pass the Turing test but can also convince an expert of the author in question? Not yet, according to the latest tests. There have already been successful and unsuccessful attempts to simulate historical authors, but the crucial indication is that the more complex the style (narrative rather than poetic, long texts rather than short ones), the less convincing the software can deliver. This seems to happen precisely because of the predictive and thus amnestic approach. Even if the writing makes sense, it usually sounds like it says a lot without saying much that is new.

So the "X" in this conceptual minefield is the historical point at which the computational is completely absorbed into the process (what we used to call "post-digital") and inseparable from the medium, so that we can no longer discern any essential difference and we become "schooled" by these processes and eventually accept that the production of literature at any level can be delegated to the machine, even with mediocre results.

Then the production of texts based on logical predictions rather than free thought (as if we were to ask our mother what we

want to say instead of saying it ourselves) would systematically enter reality, with all the corresponding consequences.

We can also define this "X" as the gap between the corpus of our own writing that we compile and that determines the outcomes of a customised prediction-based algorithm, and the unexplored associations of old and new, disconnected, unspoken knowledge that we have experienced in our lives, which lie in some distant chemicals in our complex brain and which can determine a new, unpredictable thought if not articulated. It is the unchanging struggle of computational means to produce plausible content that over time achieves a higher and higher "plausibility index" (formerly known as the "Turing test") over our innate plausibility that evolves due to unpredictable events and incalculable accidents, coincidences, thoughts, inferences, etc., all taking place in a largely non-algorithmic mind.

Even with possible spectacular results, the "X" to assess is not a misleading purely technical question: "How much computer power would it take to fully simulate our writing?" but rather a philosophical question: "Where is the threshold at which we give up our unique abilities, resign ourselves to them and delegate them to the still mediocre machine?"

Alessandro Ludovico is a researcher, artist and chief editor of Neural magazine since 1993. He received his Ph.D. degree in English and Media from Anglia Ruskin University in Cambridge (UK). He is Associate Professor at the Winchester School of Art, University of Southampton. He has published and edited several books, and has lectured worldwide. He also served as an advisor for the Documenta 12's Magazine Project. He is one of the authors of the award-winning Hacking Monopolism trilogy of artworks (*Google Will Eat Itself*, *Amazon Noir*, *Face to Facebook*).

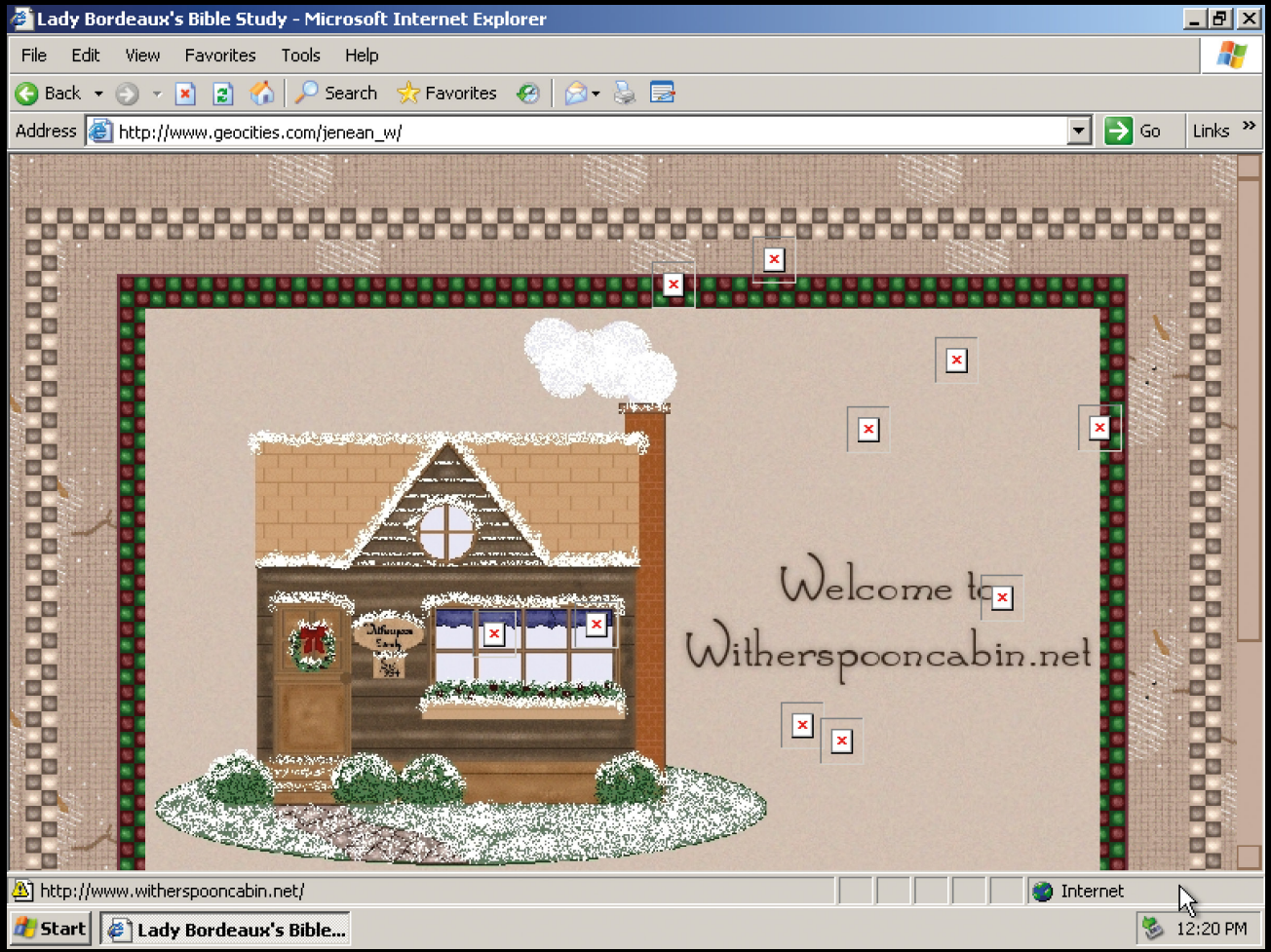
neural.it

Olia Lialina

X is a sign for a broken image inside a browser. As someone who deals with very old web pages I see it a lot, and always try to guess what is missing. But sometimes it is really easy, the constellation and the amount of the Xs suggest that it is a snowflake, a 24×24 px GIF that was a part of 1999's snow.js

As of December 31, 2021, we discovered 100 pages in the GeoCities archive that were decorated with softly falling DHTML snowflakes. Six of them were restored in December 2019. Now you can enjoy the snowfall in your modern browser and read more about the restoration at blog.geocities.institute/archives/6620

Olia Lialina (b. 1971 in Moscow) is a net artist, animated GIF model and a co-founder of the GeoCities Research Institute and keeper of the One Terabyte of Kilobyte Age Archive. Lialina writes on digital folklore, vernacular web and HCI. Since 1999 she is a professor for digital art and design at Merz Akademie in Stuttgart.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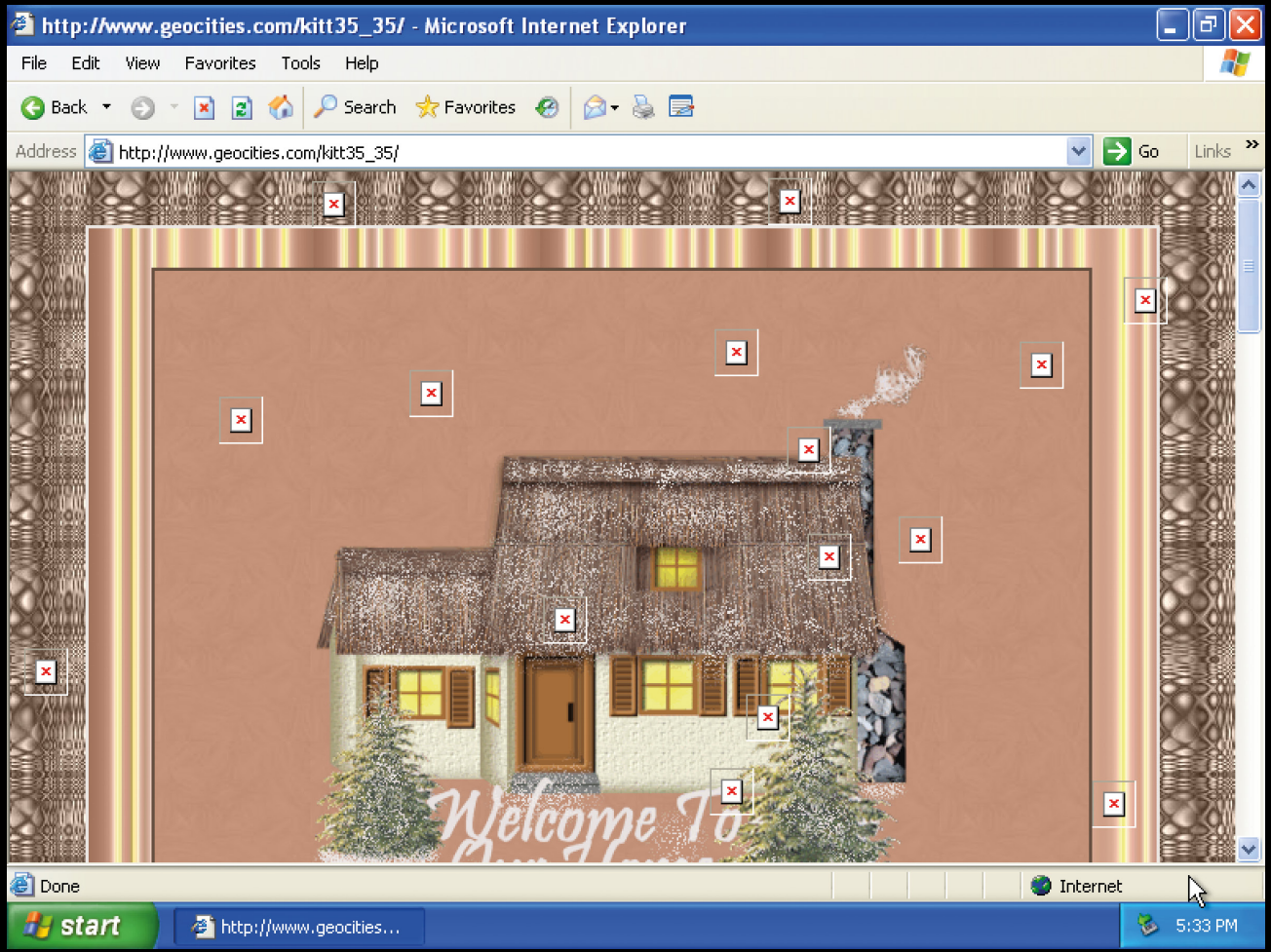
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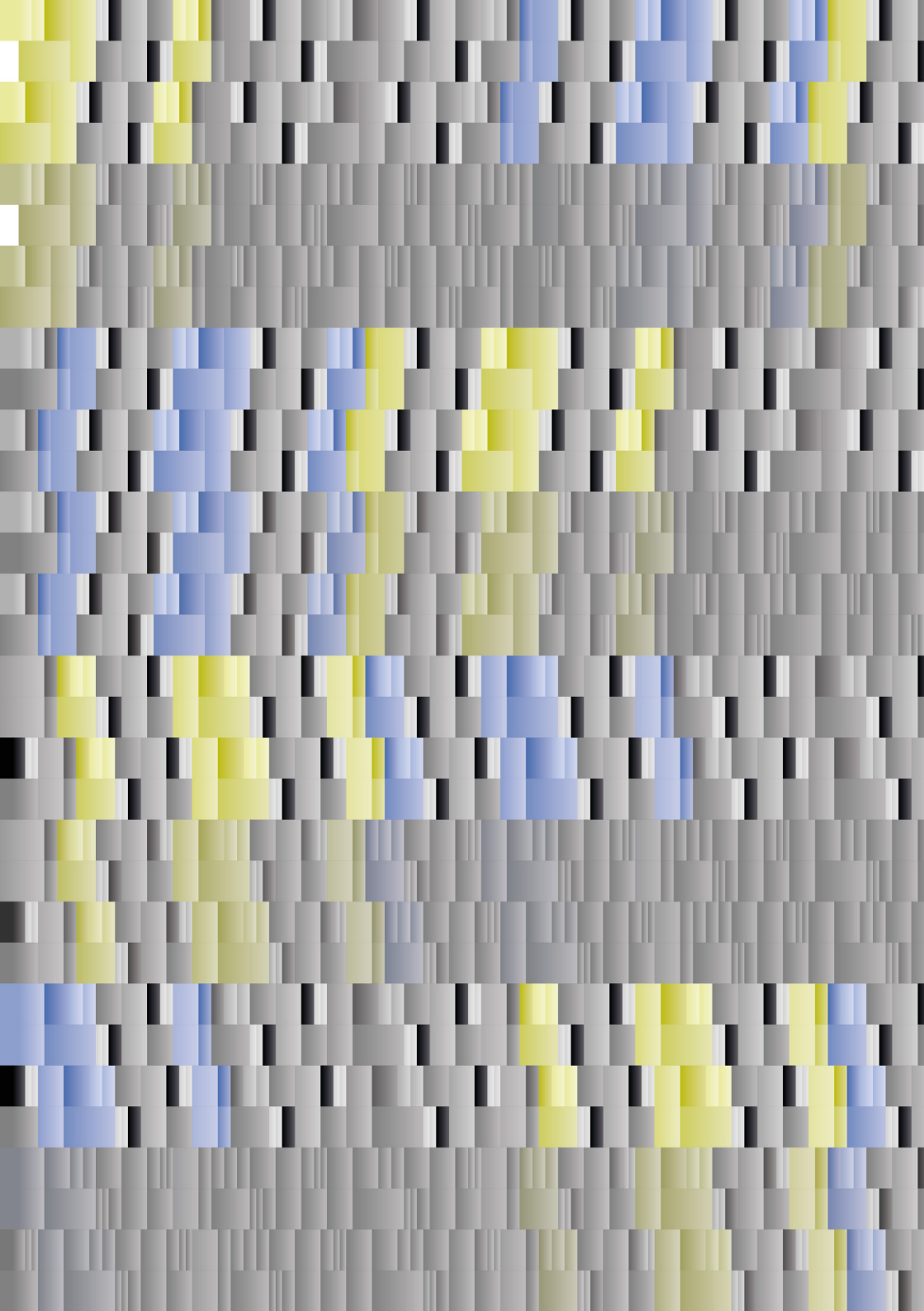
Alex McLean
This image is generated from this TidalCycles pattern:

```
superimpose (rev . (0.25 <~)) $ superimpose
(0.5 ~>) $ superimpose (blend <$> (slow 2 sine)
<* “grey” *>) $ density 12 $ superimpose (0.25
<~) $ every 2 (((blend 0.5 <$> (iter 4 “<yellow
grey cornflowerblue>”)) <*>) . slow 2) $
superimpose rev $ “[lightgrey*2 black] darkgrey
grey”
```

Generating patterned forms from such patterning rules has a long history in living craft traditions. The rules aren’t there to fix or preserve but to guide experimentation and change. Slow handcrafts (and I mean handcrafts, not automated Jacquard machines) such as weaving and braiding are ancient, culturally grounded, sustainable, yet fundamentally computational and continually innovating. Software engineers have much to learn from them.

Alex McLean is is UKRI-funded research fellow at non-profit studio Then Try This, based between Penryn and Sheffield UK. He researches algorithmic patterns, investigating heritage algorithms and making new systems to support human creativity. He instigated the TidalCycles free software project, and co-founded AlgoMech festival and the Algorave and TOPLAP movements.



Andres Wanner

Lissajous Pendulum (2015).

"The idea becomes a machine that makes the art."
(Sol LeWitt)
Happy birthday xCoAx!

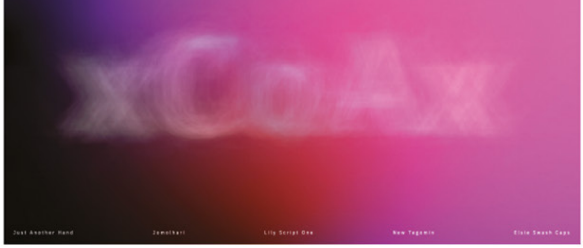
Andres Wanner is an artist/designer/scientist. His art machines operate at the intersection of mechanical fragility and algorithmic determinism. He currently leads the interdisciplinary bachelor's program "Digital Ideation" at the Lucerne University of Applied Sciences and Arts in Switzerland.

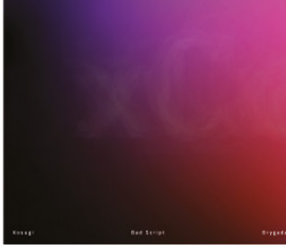
Sara Orsi

xGoOx is a small program connected to the Google Fonts API, which builds X “xCoAx” through X iterations, each one with X fonts from the API. xgoox.saraorsi.com

Sara Orsi is a web designer, creative coder, researcher, and educator whose practice has as principal motto the impact of digital media on contemporary culture.


Andada
Yuji Mai


Just Another Hand
Zen Kurenaido
Lily Script One
New Tegomin
Elsie Swash Caps


Kosugi
Red Script
Bryndan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Poly
Mr Dafoe


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Fraguati Narrow
Courier Prime
Slabo 27px
Zilla Slab Highlight
Karantina


iteration: 120
Arsitika
Volkorn SC


restart
Xanh Mono
Ruslan Display


iteration: 128
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IM Fell English SC
Lemon
IBM Plex Sans Condensed
Petua One
Space Mono


iteration: 304
Antic Didone
Noto Serif KR


restart
Poly
Mr Dafoe


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Rowdies
Public Sans
Bungee Hairline


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Caveat Brush


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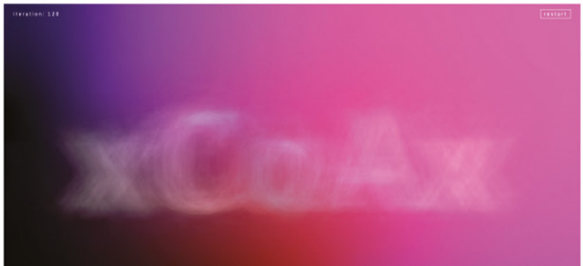
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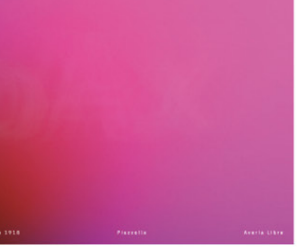
Piacevella
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Zhi Mang Xing
Kumpiro One
Pompiere


Gamja Flower
Baloo 2


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B612 Mono
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Public Sans
Bungee Hairline


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Arvifika
Vollkorn SC
Macondo Swash Caps
Trochut
Nobile


iteration: 16
Lalla
Kavia


restart
Kumpiro One
Pompiere


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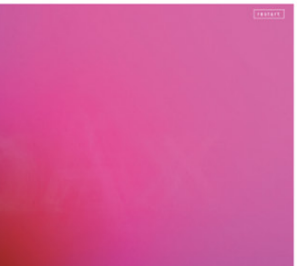
Karantina


iteration: 120
Just Another Hand
Zamakhari


restart


iteration: 120
restart


iteration: 999

Angela Ferraiolo

Exploded Surface, t_1 (2021), computational media, digital file.

Exploded Surface, t_8 (2021), computational media, digital file.

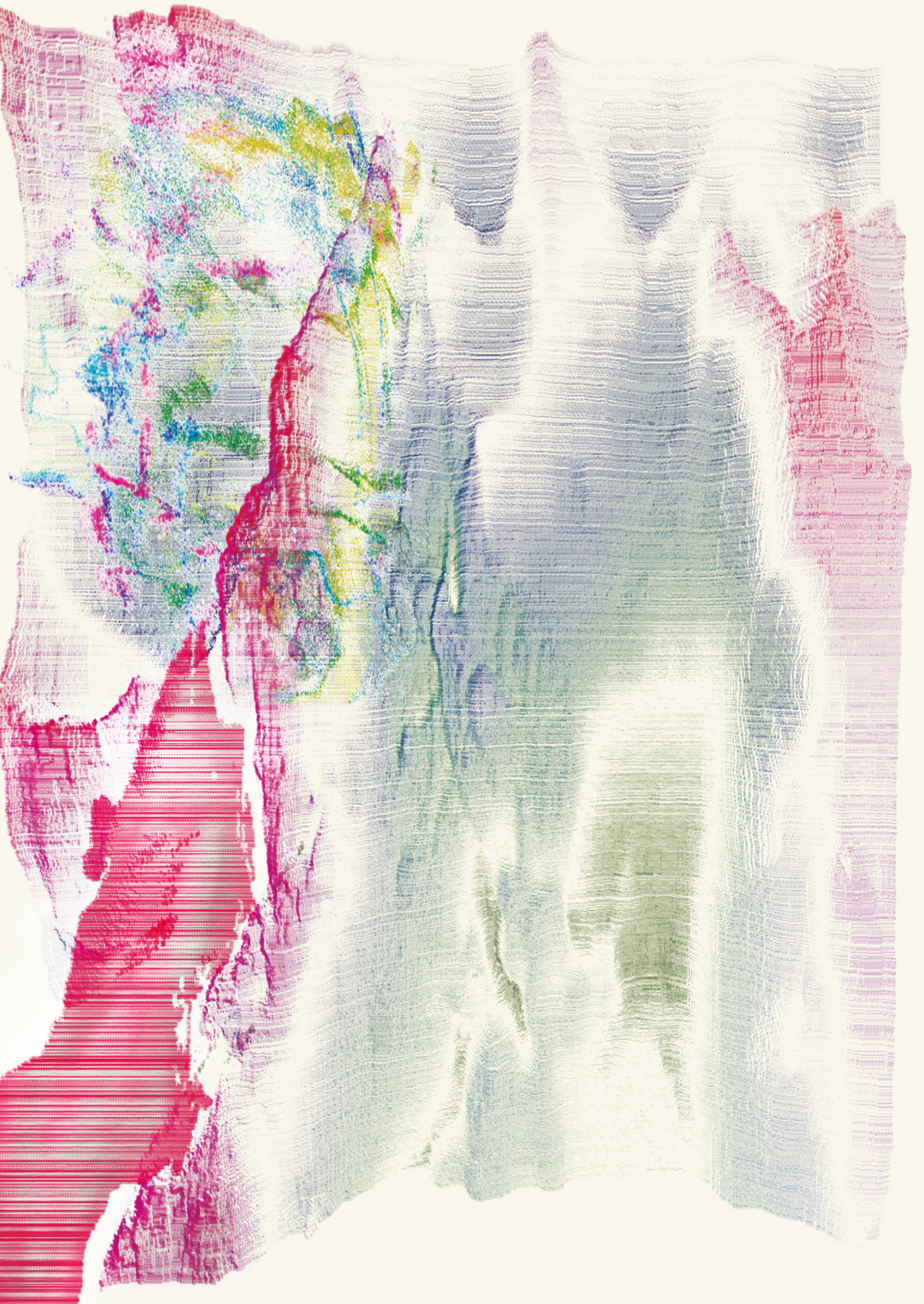
I was sitting on a bench, waiting for X, when I realized everything, even time, was about to change.

This was December. It was snowing. I had borrowed a coat. Unexpectedly, I discovered a surface in its right hand pocket. Maybe this coat belonged to a scientist? Who else leaves a surface lying around? It's silly, I told myself, watching the snow, how we continually misplace things. How we allow so many objects to elude location.

The sky turned silver. In the freezing air, snow became ice. Obviously, I thought, weather is alchemy. I imagined the surface in my pocket as an unstable lattice. I imagined X as the endless present. I decided X must be perceived in some alternate mode. I had no doubt X would arrive at the sub-particle level. That's when the surface in my pocket exploded.

Angela Ferraiolo is a visual artist working with adaptive systems. Her work *The Regeneration of the Earth After Its Destruction by the Capitalist Powers* was exhibited at xCoAx 2019 (Milan). An earlier work *Maps of a Future War* was shown at xCoAx 2018 (Madrid). In addition to her participation in xCoAx, her systems, video, and installation works have been screened and exhibited internationally including Nabi Art Center (Seoul), SIGGRAPH (Los Angeles), ISEA (Vancouver, Hong Kong), EVA (London), the New York Film Festival (New York), Courtisane Film Festival (Ghent), and the Australian Experimental Film Festival (Melbourne).

littleumbrellas.net



Beverley Hood

X-eno-bots: re-imagining human-like representation in robotics and AI, thinking through the ethics of who, what and how is represented (2020), Watercolour and collage.

#AI #bots #robots #bias #ethics #gender #race #ability #bodies #creatures

Beverley Hood is an artist and Reader in Technological Embodiment and Creative Practice, at Edinburgh College of Art, University of Edinburgh. Her research interrogates the impact of technology on relationships, the body and human experience, through the creation of practice-based digital and performance art projects.

www.bhood.co.uk
www.eca.ed.ac.uk/profile/beverley-hood

Anna-Luise Lorenz

As Jeremy Lecomte in his essay *Can the Possible Exist in Physical Form* remarked, the world is "constituted by the dialectic relationship between solutions and impossibilities which coexist on the same plane". Paradoxically, we are living in a world that demands continuous certainty. Obsessed with the calculative management of the unknown, we simultaneously are confronted with the fact that knowledge is protean and erratic, while technologies give space to increasingly self-sufficient algorithmic entities and produce new forms of paranoid reasoning. X as alienation not only embraces dysfunctional, ambiguous and even pathological realities but delineates a landscape of possibility that emancipates us from pre-agreed upon worlds.

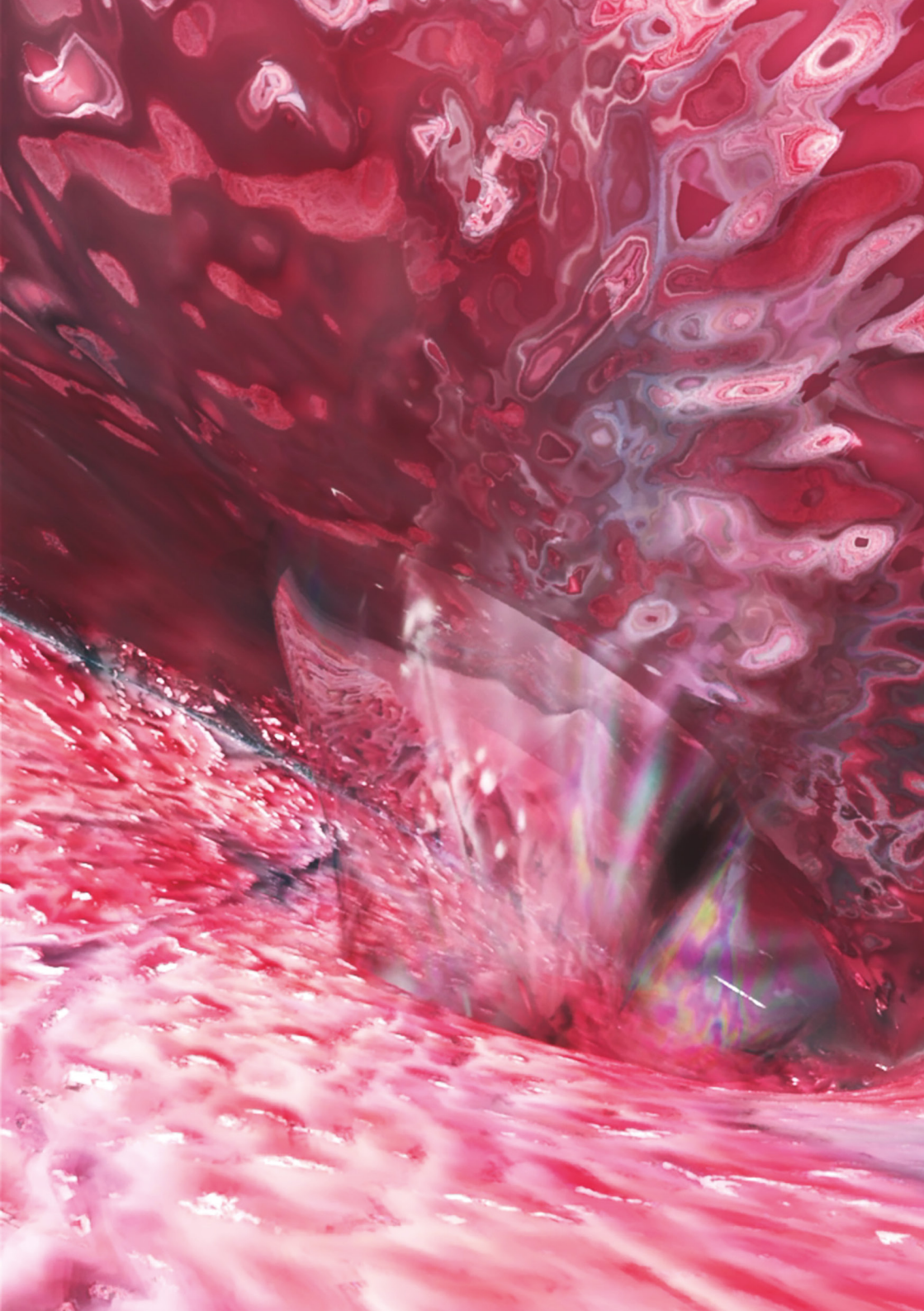
TongueTongue, a two-part installation consisting of a short story displayed on an LED ring and two animations shown on screens suspended from the ceiling, investigates how technologies co-constitute narratives and shape the conceptualisation of subjectivity and self. Digital technologies threaten the oneness of the body.

TongueTongue imagines a world in which the tongue as a bearer for language and performer of the subject becomes possessed and gains life on its own. In juxtaposition to this, fragments from conversations on online dating platforms weave into a story in which the protagonists become living contradictions, shells of "You(s)" and "I(s)", which adopt any gender and even shape; a turmoil in which the acts of thinking and speaking become one.

Anna-Luise Lorenz is a designer, artist and researcher based in Berlin. Her current work explores non-human agents as a pivot for the emergence of new creaturely beings, and accidental as well as deliberate non-human design practices. Anna completed her postgraduate degree at the Royal College of Art and was a fellow at Strelka Institute, Moscow.

www.annaluiselorenz.com


BACK

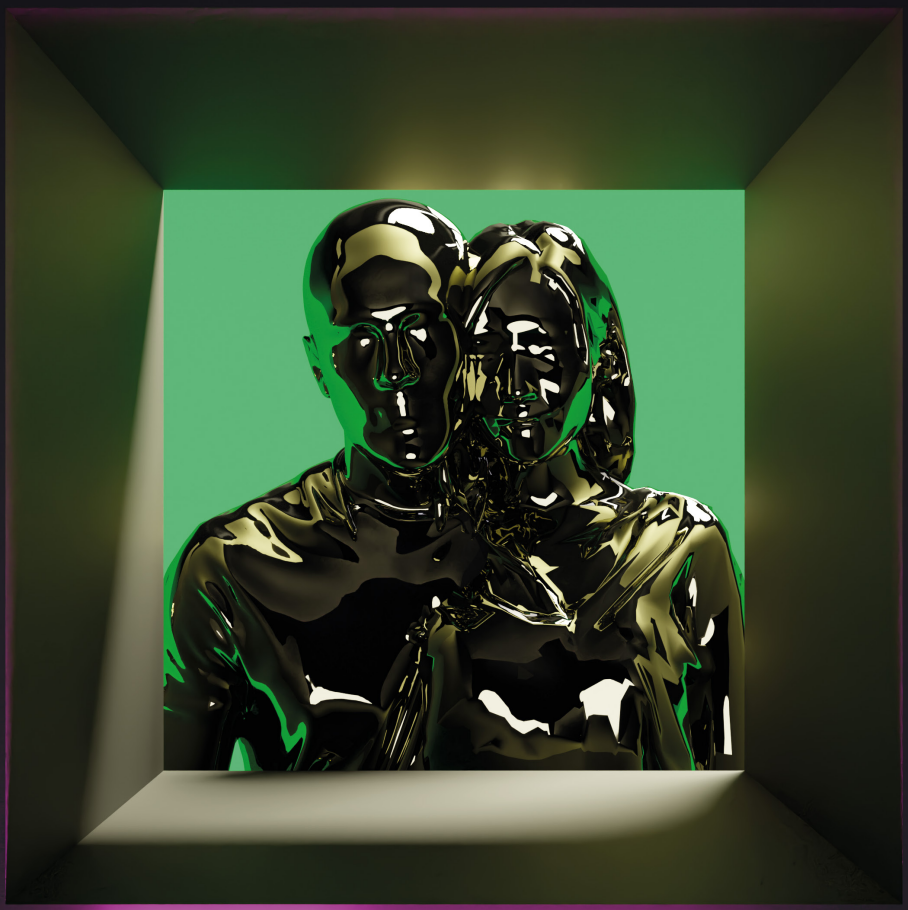


Andrés Villa Torres

Rituals of Extinction and Domestication #1 & #2 (2021), CGI Series, 3D Models, Text.

Human history tells us that tamed beasts manage to remain un-extinct for longer periods. Domestication is a survival strategy. One of the big questions for the next X is: How do we cope with our own obsolescence? Can we stay useful once machines can do everything we do? Can we stay desirable and useful for those machines or anyone else?

Andrés Villa Torres is a Mexican Media Artist. He focuses on the politics, sociology and philosophy of media and technology through his artistic practice. He is currently a PhD Candidate at the University of Bern writing on Algorithmic Agency and Social Machines.



TO THE UNKNOWN

I HAVE ALL THE DETAILS OF YOUR BONE STRUCTURE,
YOUR TISSUES, ORGANS AND DNA. I DON'T KNOW
WHAT YOU ARE AND WHY YOU ARE HERE.
I KEEP COPIES OF YOU IN MY ARCHIVE.
ONCE YOU ARE EXTINCT I WILL BRING YOU BACK.

FROM THE UNKNOWN

TO THE UNKNOWN

I HAVE ALL THE DETAILS OF YOUR BONE STRUCTURE,
YOUR TISSUES, ORGANS AND DNA. I DON'T KNOW
WHAT YOU ARE AND WHY YOU ARE HERE.
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ONCE YOU ARE EXTINCT I WILL BRING YOU BACK.

FROM THE UNKNOWN

Catarina Lee

Definitions for X proposes what might be a definition for "X", based on the papers that were presented at the xCoAx conference over the years. It starts by scanning through all the papers found in the conference proceedings, looking for the word X. Then, it randomly selects some excerpts that can be used as a definition.

Catarina Lee is a designer, teacher and researcher whose practice seeks to explore data-based and software-driven audiovisual systems. She holds a master's degree in Communication Design and New Media from the Faculty of Fine Arts of Lisbon.

x ← random_ float(1.0);

for each of agents: z ← random_float(1.0); x ← random_float(1.0); if (z < TOR) then: die; if (x < (PF) then: create_females(1); else: create_males(1);

X depends on the change nature

In order to do this, we followed the structure observed in the Net.flag descriptions: [element X] represents/stands for/ symbolises [Y], where Y is the queried word and X depends on the change nature.

X defines a cone of vision

Let O be the observer's viewpoint, S a compact surface, and X a tridimensional topologically closed set. X defines a cone of vision CO (X) with vertex at O.

X = bushwalk + crossmedia ecology

X = bushwalk + crossmedia ecology

X would take the value of "symbol"

For example, in the case of adding emoji, we defined that X would take the value of "symbol" (see left side of Fig. 2).

X stands for exploratory

To terminologically mark the step from a notion of DMIs that follow the paradigm of acoustic instruments toward one that takes full advantage of the categorically new possibilities of circuits and algorithms, we invented the term Xstruments, where the X stands for exploratory, experimental, or (as in scientific contexts), unknown.

X has more positive potential than Y

He argues that if initially point X has more positive potential than Y, the thread will grow in direction of X and that if at some moment in time the potential at Y is set to equal value the thread might bifurcate and split into two branches.

X cried; X shouted

Emotions: X cried; X shouted; X's brain reeled; Actions: X knocked at the door; Only at the nineteenth knock did X raise his head; X said "Come in—that dashed woodpecker out there!"; X said "Please, sir, it's about my salary."

X is an abstract object

X is an abstract object: the unknown; the point as a generating element.

X is also operation

X is also operation: the multiplication; the negation as a function of resistance.

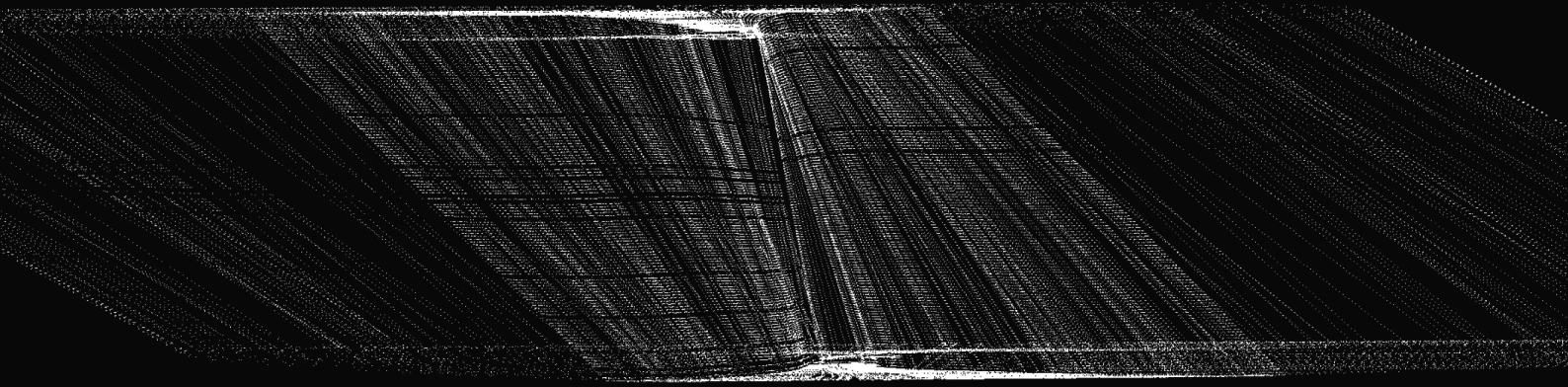
X is clear

We do not fully understand the operation of the vocal tract, but the trace of X is clear, in the poetic whole emerging from the simultaneously discrete and analogue articulation, intertwined in mutual support.

Jingyin (Jon) He

Between human and machine, exploring the duality of natural/artificial, controlled/emergent, and moment/motion, using *Komplex Etcher*, an interactive drawing system developed by the artist to generate visual imagery through real-time manipulation of coefficient parameters (of four strange attractors), and weaving the composition of their resulting fractal structures temporally.

Jingyin (Jon) He is an experimental sound and integrated media artist, educator, and researcher. He explores human-machine co-creation through interactive systems that utilise control and emergence to create new sound and visual works. Jon is interested in the communication and interaction in (between) body control structures and machines. His artworks highlight the creative affordances of human-machine co-creation, and reveal the latent structures and forms within the designed algorithms and control schemas.



Kim Albrecht

Computer vision is reductive by design. It proceeds by splicing rectangles out of images to determine age, gender, or facial expression, among others but removes the contextual framework to perform the task. For a human observer, the image of a smiling 24-year-old belly dancer and a smiling 24-year-old old soldier may appear sharply distinct. The algorithmic interpretation highlights the sameness of the two while removing its context. *Watching Machines Loving Grace* is observing the otherwise unwanted parts of facial recognition. The project visualizes the media negativity of algorithmic visual sense-making within the Harvard Art Museums collection.

In the 21st century, it is not an all-encompassing god who tenderly watches over us but the "loving grace" of watching machines as Richard Brautigan imagines. The word computer has its origins in the Latin "putare" or "prune" its broader meaning is to reduce or remove something to get rid of unwanted parts. *Watching Machines Loving Grace* observes the unwanted parts of our watching machines.

Kim Albrecht visualizes cultural, technological, and scientific forms of knowledge. His diagrams unfold and question the structures of representation and explore the aesthetics of technology and society. Kim is a principal researcher at metaLAB (at) Harvard and a Ph.D. candidate at the University of Potsdam in media theory.

kimalbrecht.com


ELLIOTT
1023 BARONNE ST.
NEW ORLEANS

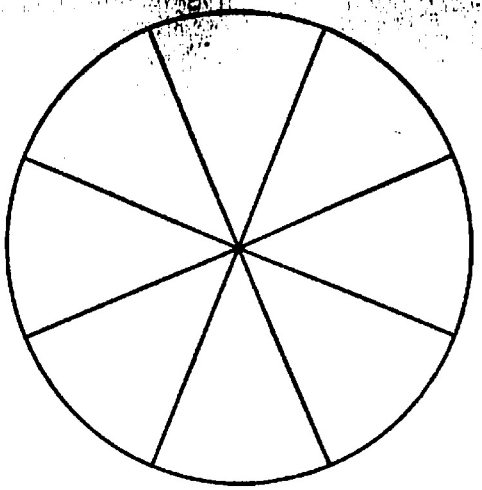

PROOF

Karen Ann Donnachie and Andy Simionato

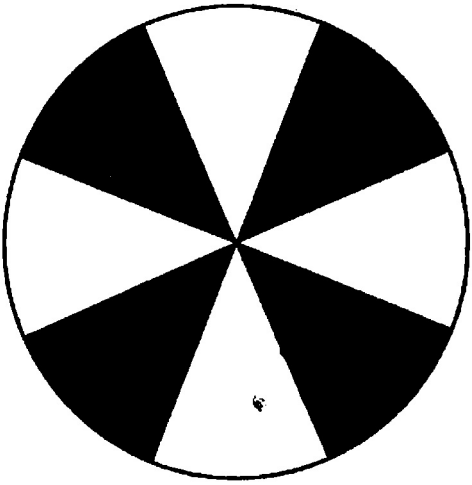
This page was generated after a nonhuman "reading" of M.D. Vernon's *The Psychology of Perception* (1962) for *The Library of Nonhuman Books*, an automated art system which uses Artificial Intelligence to identify short poetic combinations of words on each page of a book which it saves, while digitally erasing all other words and "illuminating" what remains with images taken from the Google Image Archive. Vernon's original book describes the development of the human ability to become aware of the world. Our reading machine reveals how human-nonhuman collaboration may allow new meanings to emerge. This "early consciousness" can be described as X.

Karen ann Donnachie and Andy Simionato have worked together in the fields of computational art and design since 1989. Their work has been exhibited in the Milan Design Triennale (Italy) and received the Tokyo Type Directors Club Award, the Cornish Family Prize for Art and Design Publishing (AU) and the Robert Coover Award for Electronic Literature (USA) in 2020.

karenandy.com
atomicactivity.com

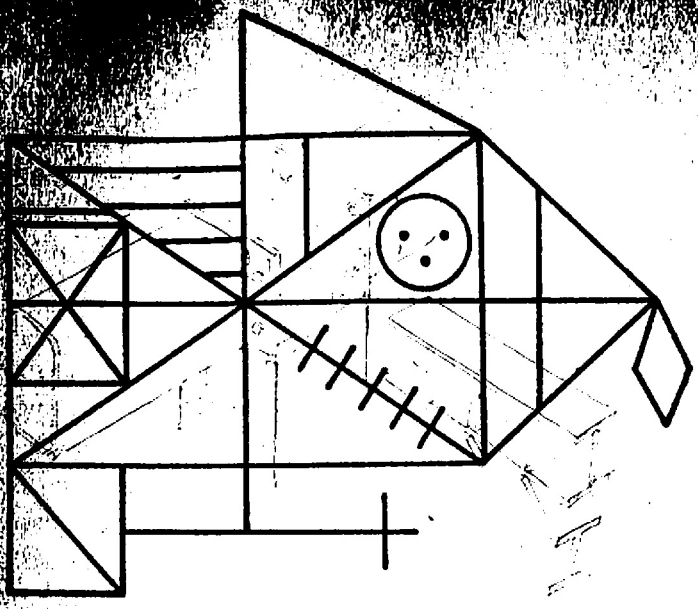


a



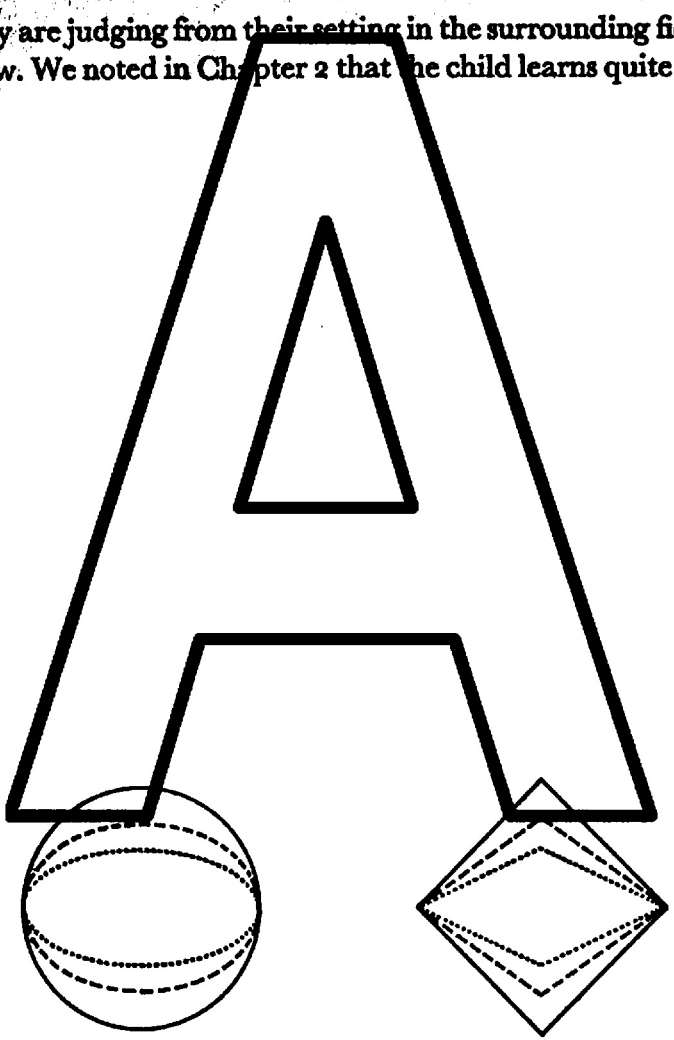
early

consciousness.



detail

they are judging from their setting in the surrounding field of view. We noted in Chapter 2 that the child learns quite early



a b

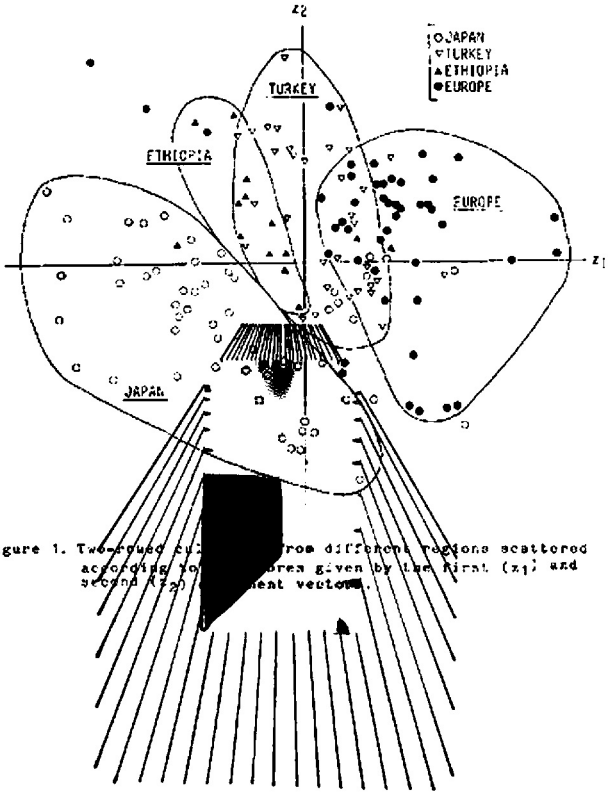


Figure 1. Two-group cu[illegible] from different regions scattered according to [illegible] given by the first (z_1) and second (z_2) [illegible] vectors.

Effect

effect

Joana Chicau

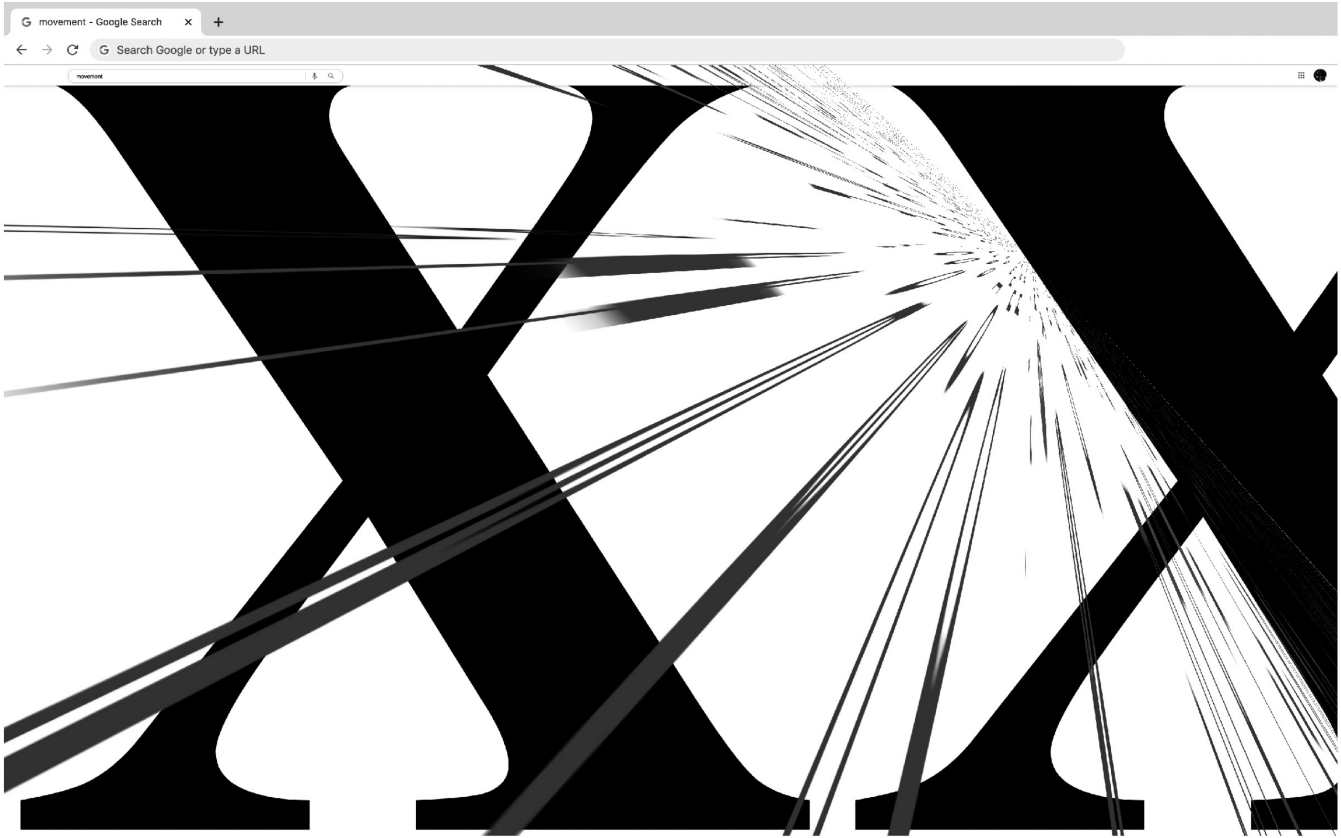
Screenshots from *A WebPage in Three Acts*, a live coding performance in the web browser. The performance script uses HTML, CSS and Javascript languages for "re-choreographing" the information displayed on the Google search results webpage.

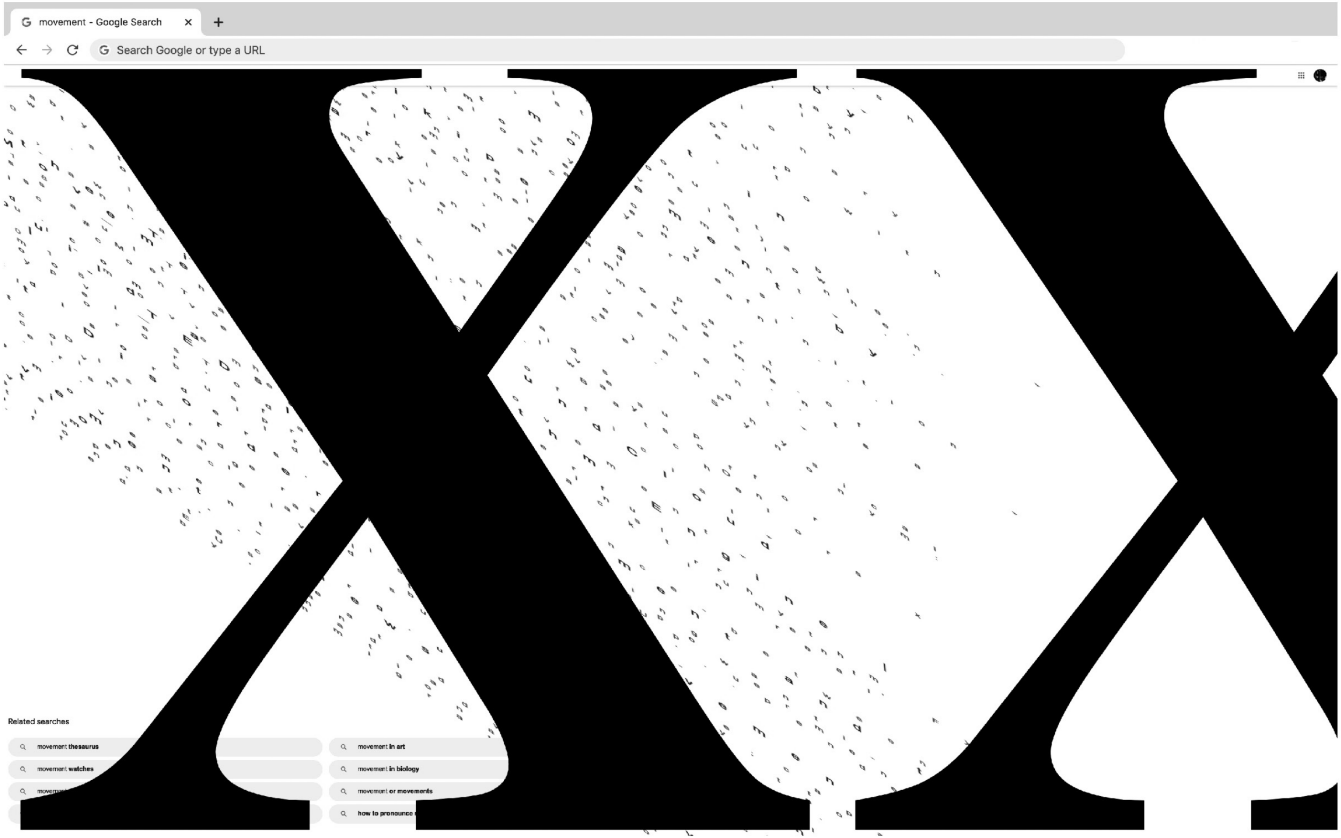
Joana Chicau is a graphic designer, coder, researcher, with a background in dance. In her practice she interweaves web programming languages and environments with choreography. She researches the intersection of the body with the constructed, designed, programmed environment, aiming at widening the ways in which digital sciences is presented and made accessible to the public. She has been actively participating and organizing events with performances involving multi-location collaborative coding, algorithmic improvisation and discussions digital equity and activism.

www.joanachicau.com

```
#logo {
font-family: -webkit-body;
font-weight: bold;
font-size: 150vh;
line-height: 100vh;
margin: 0px;
padding: 0px;
display: block;
height: 100vh;
color: #000;
position: absolute;
top: 0;
left: 0;
z-index: 9999;
overflow: hidden;
}

#search {
    letter-spacing: 2rem;
    transform: matrix3d(20, 14, 1, 0, 1, 10, 10,
0, 0, 0, 1, 0, 0, 0, 0, 10);
    /* or */
    transform: matrix3d(-20, 20, 1, 0, 1, 10,
10, 0, 0, 0, 1, 0, 0, 0, 0, 10);
    /* or else */
    transform: matrix3d(160, 20.6, 0.2, 0.09, 1,
1, 1, 0, 0, 0, 1, 0, 0, 0, 0, 1);
}
```


movement - Google Search
Search Google or type a URL
movement

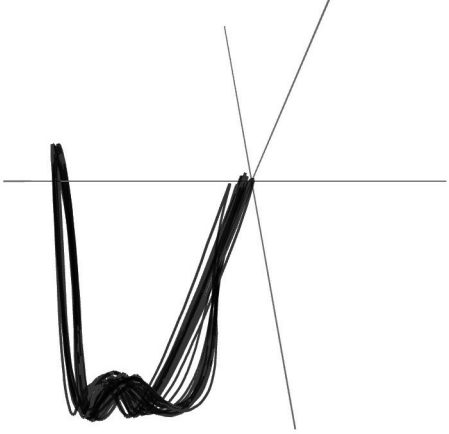
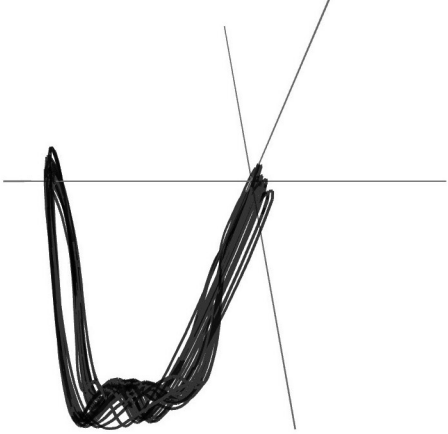
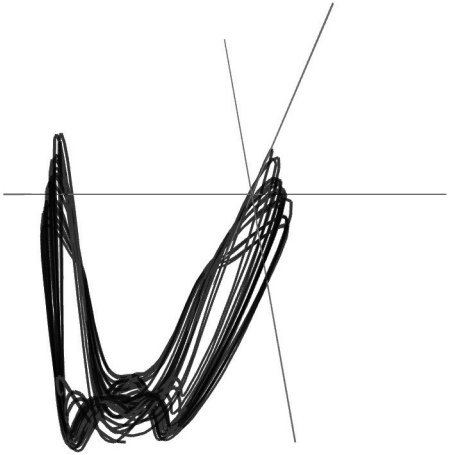
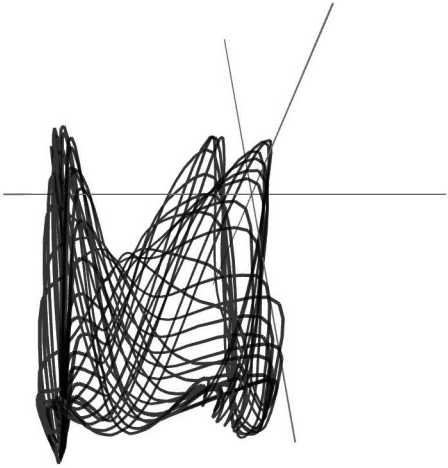
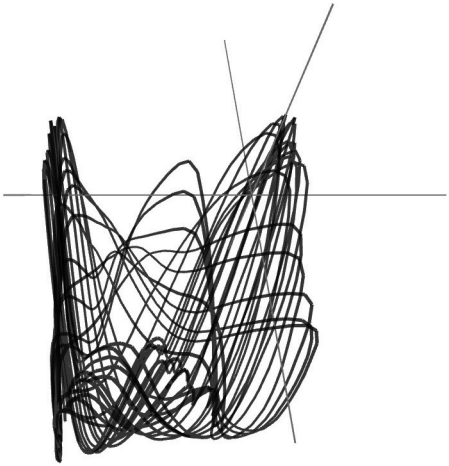
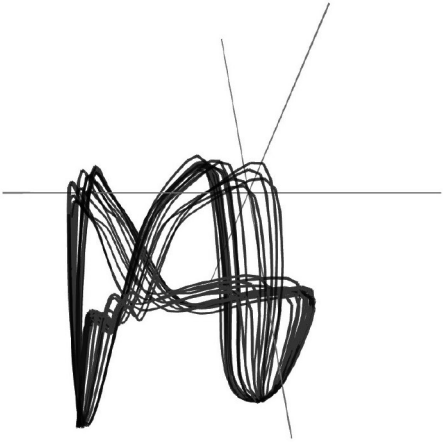

movement - Google Search
Search Google or type a URL
Related searches
movement thesaurus
movement watches
movement in art
movement in biology
movement or movements

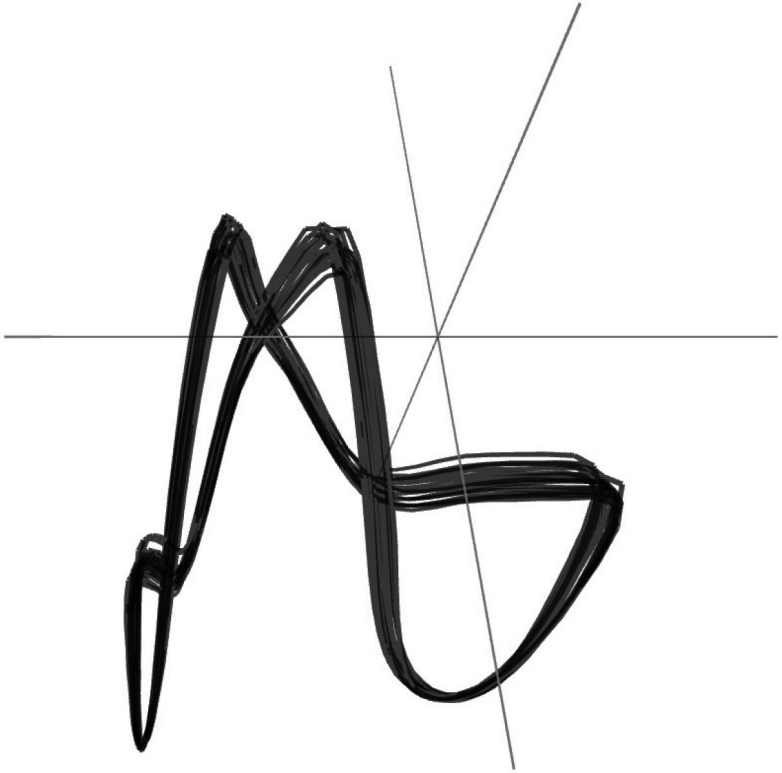
Christian Faubel

Ein X für ein U, plots of three coupled Amari oscillators with varying coupling.

Christian Faubel is an interdisciplinary scholar working in the differing fields of neuroscience, autonomous systems research and media art & design. He holds a PhD in electrical engineering and has completed research on autonomous systems at the Institute for Neural Computation from 2002 to 2012. From 2012 to 2018 he was working as an artist, researcher and teacher at the academy of media arts cologne. Since 2020 he holds a position as professor for smart connected products at the University of Applied Sciences Cologne, where he teaches in the new bachelor program Code & Context. In 2002 he founded derstrudel, a collective for the mediation of a relaxed approach to electronics and robotics. Since 2002 he has taught more than 50 workshops in building simple analog robots at international venues and festivals. In his work, Christian Faubel is interested in what enables complex behavior, and how this may result from the interaction of very simple units and their interrelations. In his artworks, installations, workshops & performances he tries to convey insights about theoretical concepts such as self-organisation, emergence or embodiment along an aesthetic dimension. He considers his artworks, workshops and performances to be in the tradition of philosophical toys as they combine the mediation of scientific concepts with pleasure and amusement.

christian.faubel.derstrudel.org

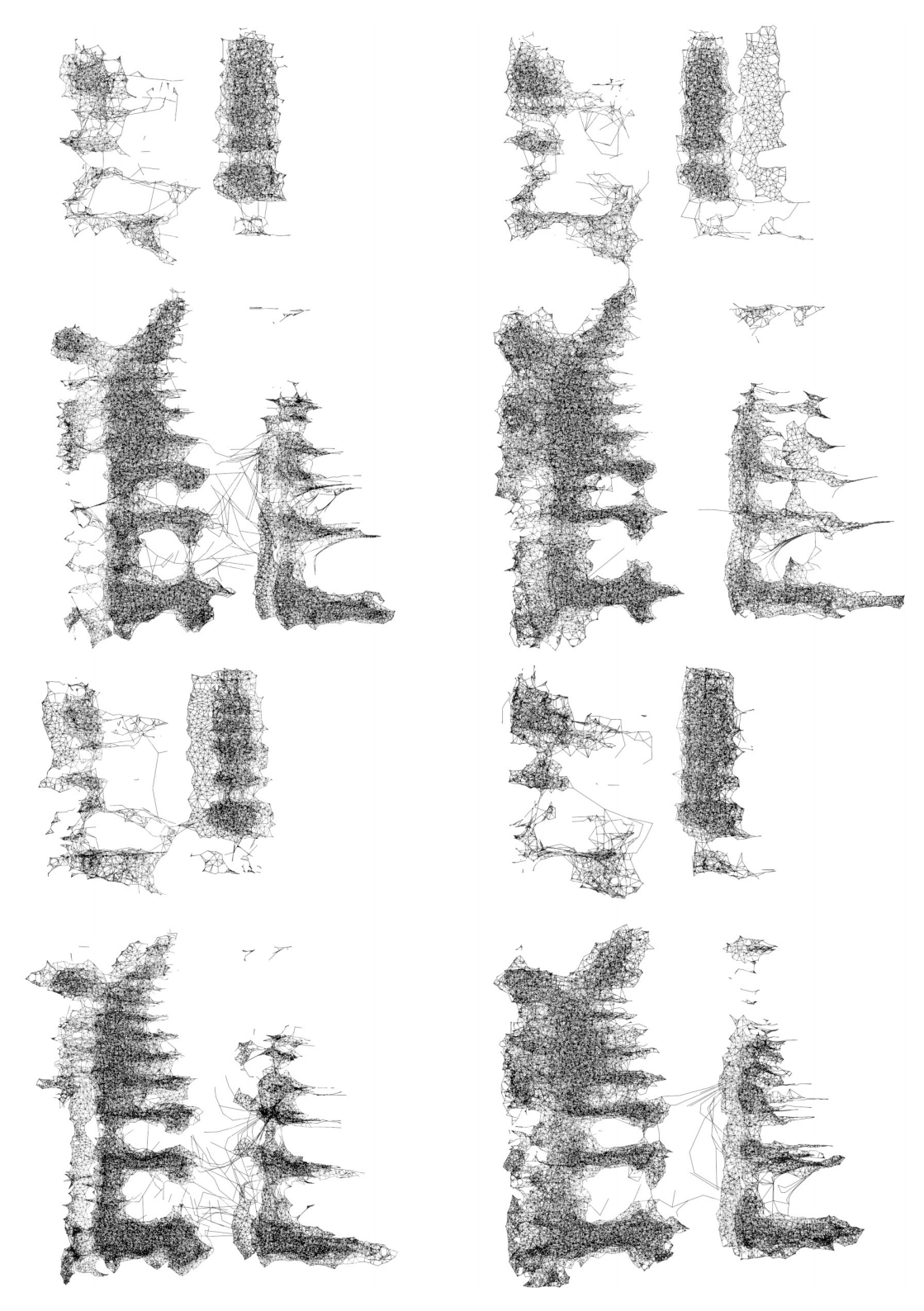


Hanns Holger Rutz

X is for Hybrid. The German word “kreuzen” means to cross or to hybridise. When spoken—ˈkʁɔʏ̯t͡sn—the sonogram of this word has a cross shape itself with both a temporal and a spectral stop gap, creating four quadrants: a crossing means two things meet and depart, both become transformed. The graphics are based on hundreds of recorded instances of the word, each revealing a slightly different articulation. The corpus is clustered into four quadrants and a subset of each cluster is composited after rendering each individual using the Growing Neural Gas algorithm, which imposes its own characteristics.

Hanns Holger Rutz is a sound and digital artist, composer-performer, and researcher. His work ranges from electronic and computer music to intermedia pieces to sound installation. He is interested in the materiality of writing processes and trajectories of aesthetic objects as they travel and transform across different works and artists.

www.sciss.de



David Pirrò

The X stands for a place of interaction. Along its edges, a process of mutual interference, of irreversible entanglement takes place. Through the X differences meet and touch: they will never be the same. Through the X the one materializes weaving itself into the other.

Inside the X, the liminal space between, patterns emerge from noise. Paths branch off, rejoin, and spiral: they lose direction in a labyrinth of choices with unforeseeable yet certain consequences.

Synchronization patterns of a two-dimensional lattice of coupled oscillators. Each oscillator interacts with the four nearest neighbours placed at the vertices of an X.

David Pirrò is a sound artist and researcher based in Graz, Austria. Departing from a radical inclusive point of view, he seeks ways of composing by which the work of art emerges from the mutual interactions of all agents involved in its performance.

pirro.mur.at

Martin Bricelj Baraga

Solocular is an art instrument created to engage X people in collective intimate observation of the sunset. The metal monument is installed so that the viewers can catch the setting sun in it. At sunset, the Sun is usually of an orange-red-violet color depending on the atmosphere. *Solocular* seeks the convergence of light in X moment when the red sun falls into the white circle; when the red natural light is being encircled by an artificial thin white illuminated circle. At different times of the year, the sun shines on the installation at a different angle relative to the beholder, and taken together these positions make the Sun Calendar.

Martin Bricelj Baraga is an award-winning media artist and curator. He creates interactive works and sculptures that explore spaces between environment, nature, technology and humans. Often large-scale, his works can be seen in public spaces and in unusual architectural contexts. He focuses on creating atmospheres that challenge our perceptions and question symbols and myths as a series of time and space-based experiments. He is the director of MoTA, Museum of Transitory Art, co-founder of Nonument Group and the founder of SONICA Festival in Ljubljana, Slovenia.

www.baraga.net
www.motamuseum.com
www.nonument.org

Paul Prudence

Quanta Mecha (2019), Performance.

Cross-wiring electroacoustic sound design and conceptual video material to deliver a hypnotic deluge of mesmerizing, floor-to-ceiling, multi-modal synchronisations.

> By gyrostatic action, the machine is transparent to successive intervals of time. It does not endure or "continue to be", but rather conserves its contents outside of time, sheltered from all phenomena. The machine's immobility in time is directly proportional to the rate of rotation of its gyro stats in space.
>
> Alfred Jarry, *How to Construct a Time Machine*, 1899

Paul Prudence is a writer and artist. His essays have been featured in *Reliquiae*, *Substance* and *Holo*, he is also a regular contributor to *Neural* magazine. His audio-visual work has been exhibited and performed internationally at renowned intermedia arts festivals.

www.transphormetic.com

Małgorzata Dancewicz

Fig. 1 input

The starting point is an empty space with the intention to empirically find out how an image of x conceived in the mind is transmitted through the eyes as an interface to be recognized by a machine.

x as something that does not exist.

x as something one strives to know.

x as an imaginary act of pure contemplation.

Fig. 2 output

The effect is a recording process of seeing an imaginary x.

x as a process of interacting with the machine.

x as a result of interacting with the machine.

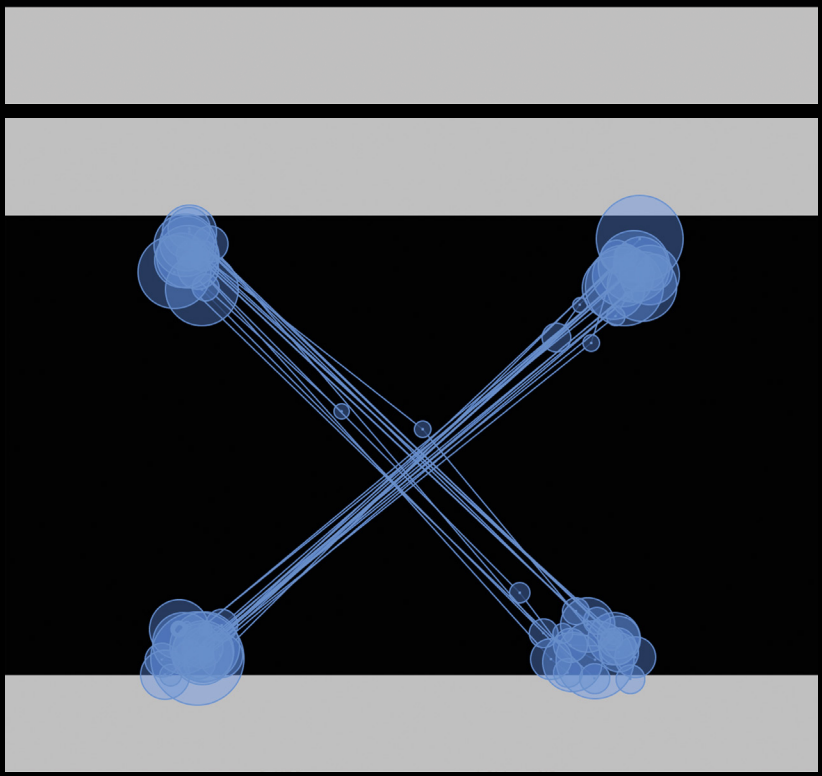
x as a recording of an imaginative act of pure contemplation, an act detected and recorded by a machine.

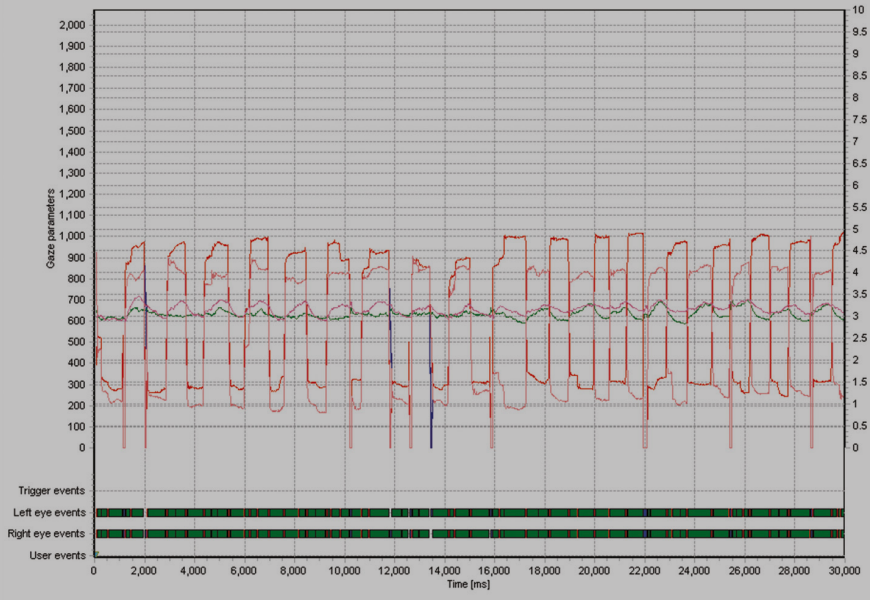
Fig. 3 line graph of the imaginary x eye drawing

The experiment was run on the SMI eye-tracking platform in the eye-tracking laboratory at the Department of Graphic Design SWPS University of Social Sciences and Humanities, Wroclaw. Made by myself on myself. Single participant analysis, free examination, manual time of displaying stimuli. The stimulus was a blank black screen square. The empty space of the black screen has all the properties, it can contain any imaginary shape, or nothing at all.

Małgorzata Dancewicz graduated from the Institute of Audiovisual Arts on Jagiellonian University, Poland. Ph.D. in Performative Studies at the University of Wrocław. Visual artist, performer and curator working across performing art & postmedia projects. Co-creator of Inire duo, where she investigates traditional composing, improvisation, acousmatic and spoken word juxtaposed with experimental video. Curator of Intermediale Festival, review of current aesthetic tendencies in live video art, video installation, audio art, and experimental music. Her interests focus on the coexistence of art & science, liveness and new technology in performance art. Author of the book *Postmedia Performance. Contemporary Technological Context of Performative Actions*. She carried out eye-tracking experiments at the Department of Graphic Design at SWPS University of Social Sciences and Humanities in Wroclaw. She conducts research and teaches at the Institute of Cultural Studies, University of Wroclaw and The Eugeniusz Geppert Academy of Art and Design in Wroclaw.

www.inire.net
www.intermediale.com




Gaze parameters
Pupil diameter
Trigger events
Left eye events
Right eye events
User events
Time [ms]
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
24,000
26,000
28,000
30,000

Valentina Vuksic
Electromagnetics (2022), Tape.
Side A: *Tripping through runtime* (14:47)
Side B: *Staying with the tech trouble* (15:03)
Release: Innernoise 2022
Download: innernoise.bandcamp.com

Valentina Vuksic is reading signal-based experimentations that are pursued remotely from civic engagement to work out a more precise understanding of the intrinsic *music* of the computational. She performs and collects electromagnetic emissions.

trippingthroughruntime.ch

SIDE A

tripping through runtime

improvisations for computational electrosmog 2009–2021

collage of subtle sounds from the rehearsals not reproducible later during the concerts

SIDE B

staying with the tech trouble

key terms of tech trouble

cutting-edge surveillance, unverifiable tech, high-risk laboratory, ad-hoc-tech that leads to risky security

a nokia 8110 is lying on two electromagnetic pickups, a smart feature phone in idle state

rehearsal in staying with painful technologies

thematic software is running on one to five laptops found or given or my own

while tracing the electromagnetic fields from the inner electronics: memory, processor and the data cables inbetween

to hear machines re-allocating resources

edge case of a system

call *stress* tool a few hundreds of times by typing commands

start 1st process >> *stress memory with 8 megabyte and touch every 16th byte*

start 2nd >> *stress input/output with 2 gigabyte*

stop 1st >>

start 3rd >> *stress memory with 256 megabyte and do not free the memory after usage*

start 4th >>

stop 3rd >>

stresslinux.org

cyberphysically safe

boot from *tin foil hat linux floppy* >>

launch *paranoia mode* >>

morse random encryption keys through the LED lamps on the keyboard >>

confuse the helicopter that is spying
on the laptop

tinfoilhat.shmoo.com

enginesofdifference.org/2021/05/30/staying-with-the-tech-trouble

how to do a close reading and unlearning at the same time?

start 1st track

start 2nd track
start 3rd track

stop 3rd track
start 3rd track

stop 3rd track
start 3rd track

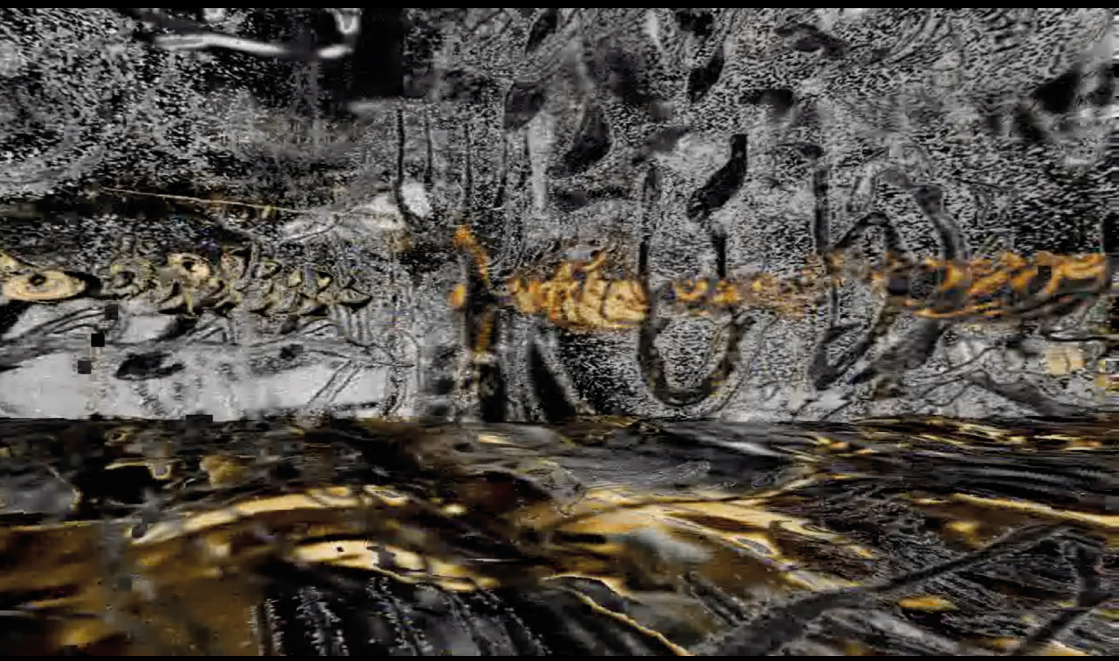
stop 3rd track
start 3rd track

Adriana Sá

Screenshots from a 3D software developed to process sound and image based on frequency analysis from a particular string instrument. The visual results stem from the dynamic superimposition of several graphical scores, made for a set of musical pieces. As such, they are no longer intended to provide indications. Instead, their use evokes a personal creative continuum, which traverses different approaches and processes.

Adriana Sá holds a PhD in Arts and Computing from Goldsmiths, University of London (2016) and a graduation in Fine Arts from the University of Lisbon (1996). She is a transdisciplinary artist, performer, musician and composer. Her research bridges artistic practice, interaction design, audio-visual theory, neuroscience and experimental psychology.

adrianasa.org



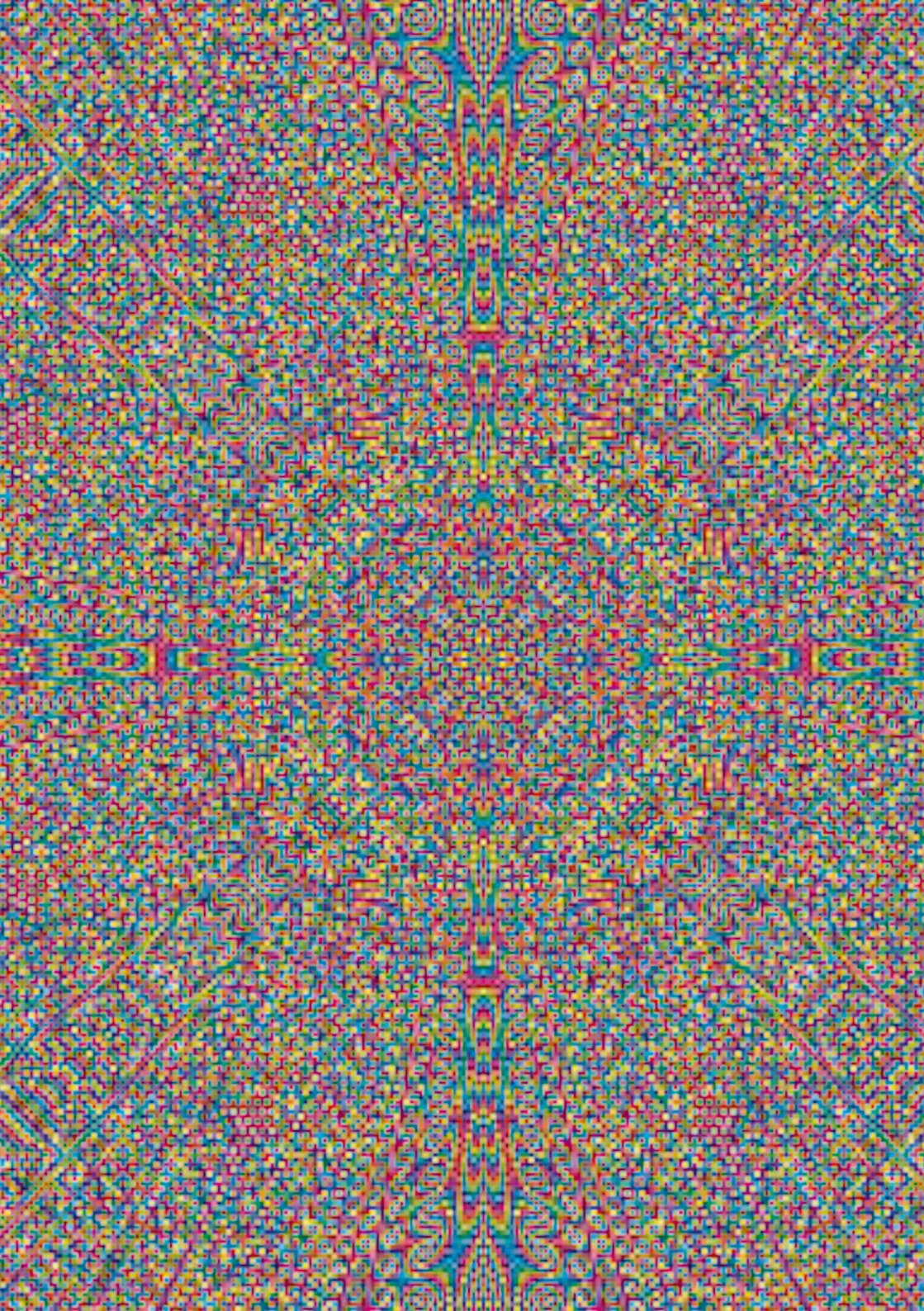
Vilbjørg Broch

The Circle And The Square.

X as computational error. The circle exists beyond digital realms. It cannot be represented in the language of squares. Enlarging the error reveals signs of the eternal mystery.

Vilbjørg Broch was born in Denmark, and just recently returned there after living almost 3 decades in Amsterdam. Lately, much of her activities go into computer music, a field within which she also creates spatial audio work, an interesting application of her interest in geometry and algebra. Originally she trained in postmodern dance and improvisation, and also studied classical singing for more than a decade by coloratura soprano Marianne Block. She is active in improvised and electroacoustic music since her early youth. Besides this, she works on and off with organic farming.

frekvensverden.dk



Francisca Rocha Gonçalves

X as INDIVIDUAL, UNKNOWN

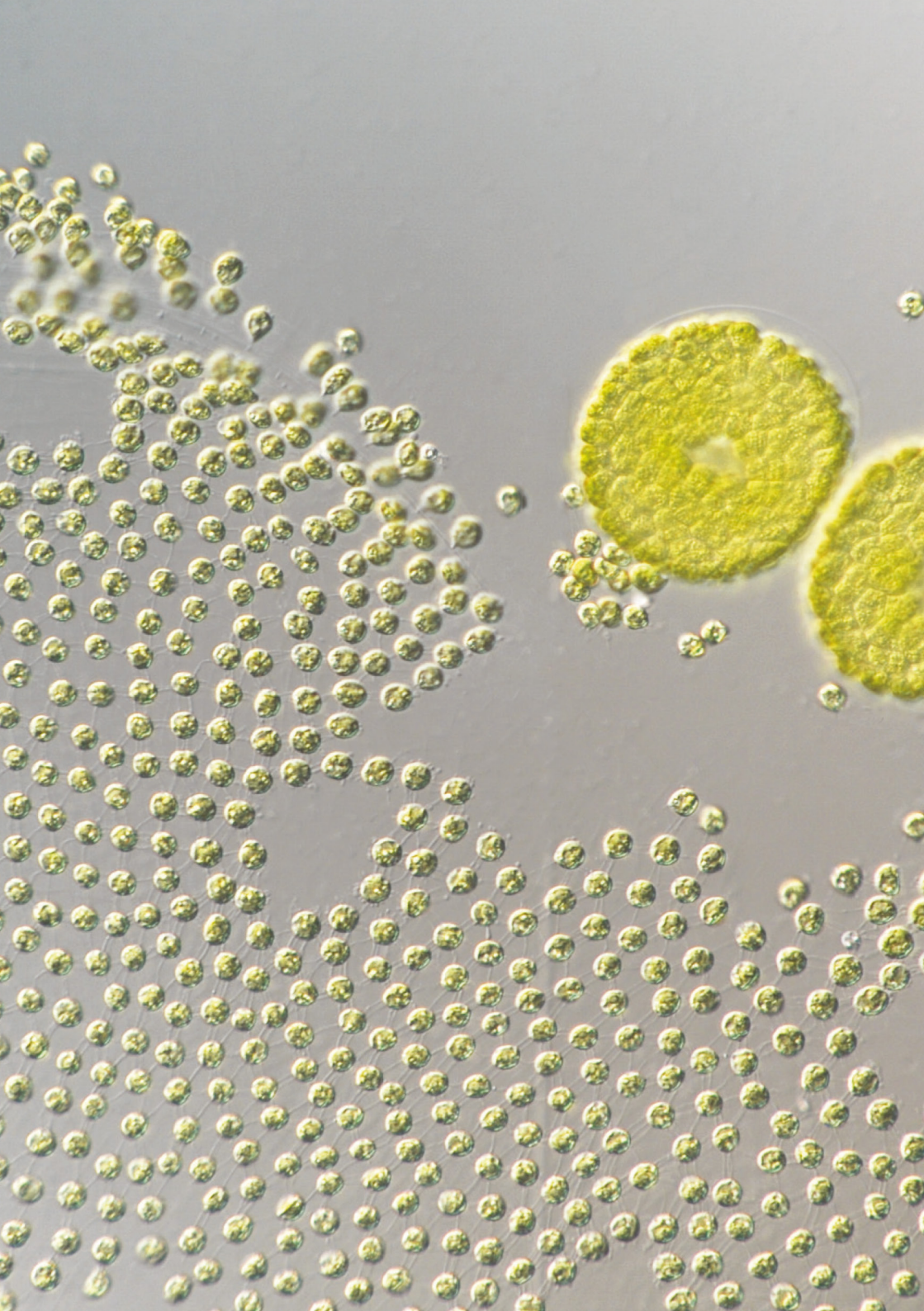
The concept of holism focused on the idea that the wholes are not static but dynamic. A continuum of relationships among parts, cyclical processes, the interconnectedness of all things, where considering nature as active and alive is crucial. The parts cannot be isolated into a simplified system, or they would distort the whole concept. Holism's philosophy of nature has its contemporary form in ecology, which considers complexities and totality and systems. The individual alone becomes unknown, without context.

X as WHOLE, MULTIPLIER

A *Volvox* is a system, a colonial chlorophyte and one of the largest free-swimming organisms living in freshwater ecologies. Excited by a directional stimulus such as light, their separate (individual) cells react in unity as a single organism towards it. Self-organization and emergence in complex systems explain phenomena from chemical, physical, and biological fields crossing different hierarchical scales. By looking more profound at biology, one may find inspiration for designing complex systems. The whole as a system becomes the multiplier, aggregating the individual parts, giving them meaning.

Francisca Rocha Gonçalves is a researcher from Porto. She focuses on acoustic ecology and ecoacoustics as tools for environmental awareness concerning the ocean soundscape. Developing artistic artefacts that reveal the problem of noise pollution in underwater environments is possible to understand changes in vibration and particle motion, both vital components in aquatic life. She is the co-founder of the artistic collective Openfield Creative Lab and of the Ocean Soundscape Awareness project – ØSAW. The pictures were taken at Algoteca de Coimbra during a collaborative research project about microalgae.

franciscagoncalves.com



Martin Rumori

An incidental occurrence composed of the setting sun, of refraction and reflection at the window glass and the floor, of the casual arrangement of chairs and a table in front of this basket that reveals a baby's bib. A magic encounter, on the other hand, that turned undirected inadvertence into aesthetic experience. Magic, that is uncanny, that is sublime, that is enabled through disbelief and through the literal, formulistic, the material act. An everyday phenomenon, luckily noticed, hesitantly captured, tied to an elusive ignorance of the unknown—truly a moment of X.

Martin Rumori (Berlin, 1976) works with sound and space in installations and performances. His focus is on auditory environments and the experience of the listening body, both in motion and in stasis, often incorporating field recordings and semi-narrative residues of everyday life. He lives in Styria, Austria.

Špela Petrič

Deep Phytocracy: Feral Songs (2018). Photo by Miha Godec.

X as multiplication. Sometimes the best way to break a constraining frame is to multiply, recombine, to grow with excess. In the parareality imagined in the artwork *Deep Phytocracy: Feral Songs*, the so-called anarchetypes proliferate relations to plants with exuberance. Uncannily reminiscent of the various real-world approaches to the vegetal, they manifest their plant compulsions through recombinant tools. While perplexingly simple, the tools invite us to embody anarchetypes' visions, alienating us briefly from our own notions of planthood and just perhaps, we encounter the plants anew.

Featuring: the *Kurortodox* using their golden-ratio inspired beauty assessment tool, seeking the plant view of perfect proportion, and the *Neognostic Agrarians*, investigating whether the particular tree harbors a human soul, which indicates it needs to be spared from culling.

Špela Petrič is a new media artist with a background in the natural sciences. Her artistic practice combines biomedia practices and performativity to critically examine the limits of anthropocentrism. Petrič has received several awards, such as the White Aphroid for outstanding artistic achievement (Slovenia), the Bioart and Design Award (Netherlands), and an Award of Distinction at Prix Ars Electronica (Austria).

Filipe Pais

WIFI Router Plant (2019), by Thalia Kassem (page 337)

3X MANIFESTO

X1—Materiality

We shall recognize digital spaces as hyper-material rather than immaterial. They depend on gigantic infrastructures made of steel and rare minerals, consuming huge amounts of energy and generating huge carbon footprints.

X 2—Transparency

An ethical digital space must fully engage with real algorithmic transparency rather than creating an illusion of liberty, addiction and nudging.

X3—Rematerialize!

Rematerializing digital elements allows us to rediscover our relationship with them, to de-automatize our perception, and renew our understanding of something that has become too natural and transparent.

www.filipepais.com/manifestos

Filipe Pais is an educator-researcher and curator currently living in London. Filipe is particularly interested in the ways contemporary arts and design movements inquire technological agendas, dealing with issues such as behaviour, play, transparency-opacity, dematerialization, flow, immersion, algorithmic governance, ecology and life after google.

www.filipepais.com

Tim Shaw

Arcs, Sparks, Streamers

High voltage experiments are some of the earliest attempts to control and understand electricity. Large beams of light and splutters of sound penetrated the laboratories of experimental scientists in the 18th and 19th century. Most contemporary media runs on a fraction of this power. Though small circuits need less energy, larger server farms and intensive algorithmic power associated with "smart technology" often lie on the fringes of consciousness. Away from reach, the power of current communication infrastructure is hidden away from immediate perception.

These experiments involve the videography of a home brew Jacobs Ladder, a high voltage demonstration involving an arc of electricity across two protruding electrodes. Though the input voltage remains consistent, the moment the electricity interacts with the air a semi-chaotic system occurs. A short, high frame-rate video records one cycle of the arc, the power equivalent of uploading this video to a server in the USA from a laptop in the UK. The frames of the short video are then superimposed on top of one another using a simple Python script. This is repeated 8 times.

Engaging with the perceptive quality of high voltage gives an immediate connection to the materiality of electricity. Something we are often removed from when engaging with contemporary communication infrastructure.

Tim Shaw is an artist working with sound, light and communication media. Presenting work through performances, installations and walks, Tim is interested in appropriating communication technologies, exploring how these devices change the way we experience the world. He works with field recordings, electronics, light, video, synthesis, sound objects, self-made hardware and DIY software.

tim-shaw.net

Winnie Soon

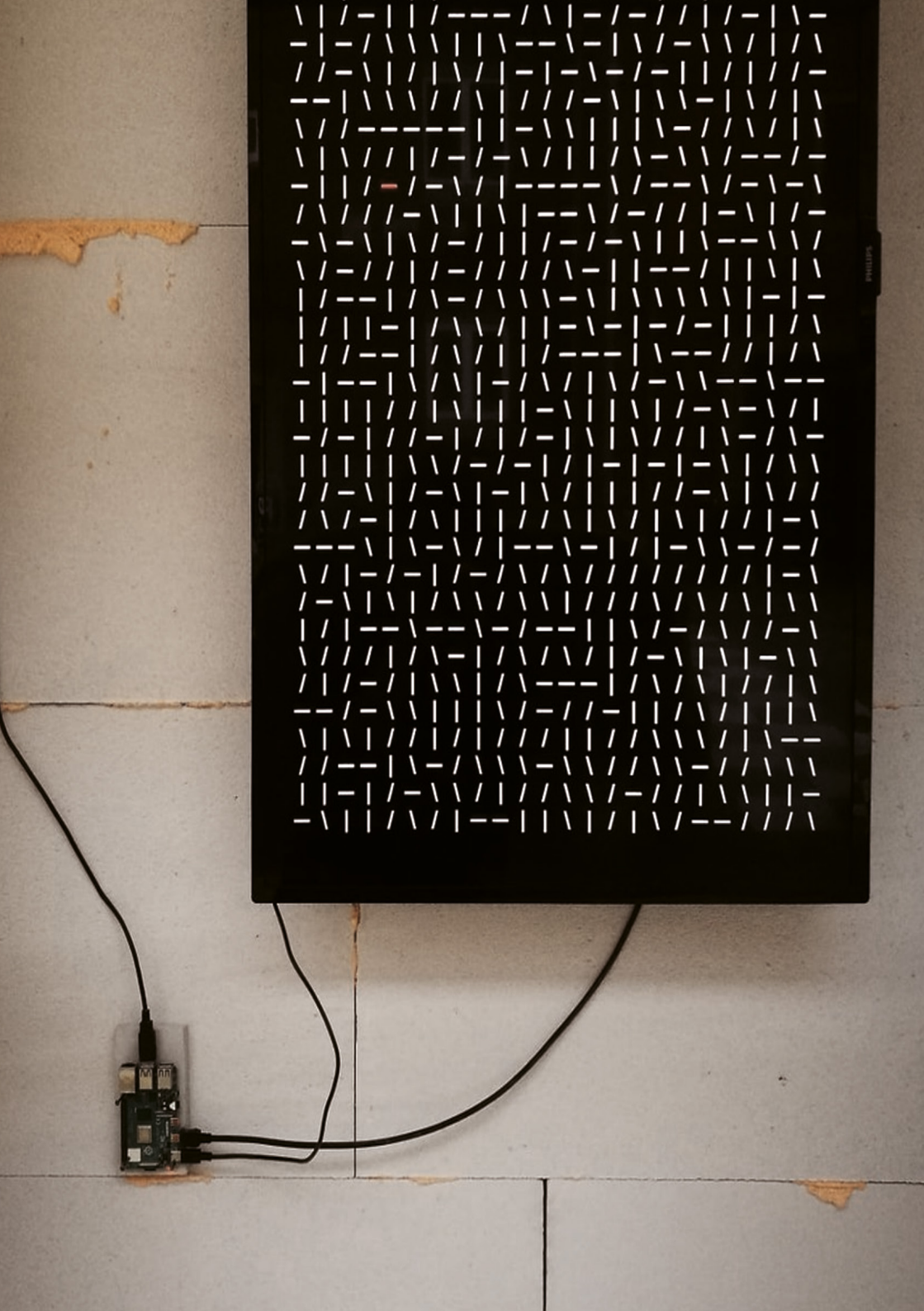
Throb (2019)

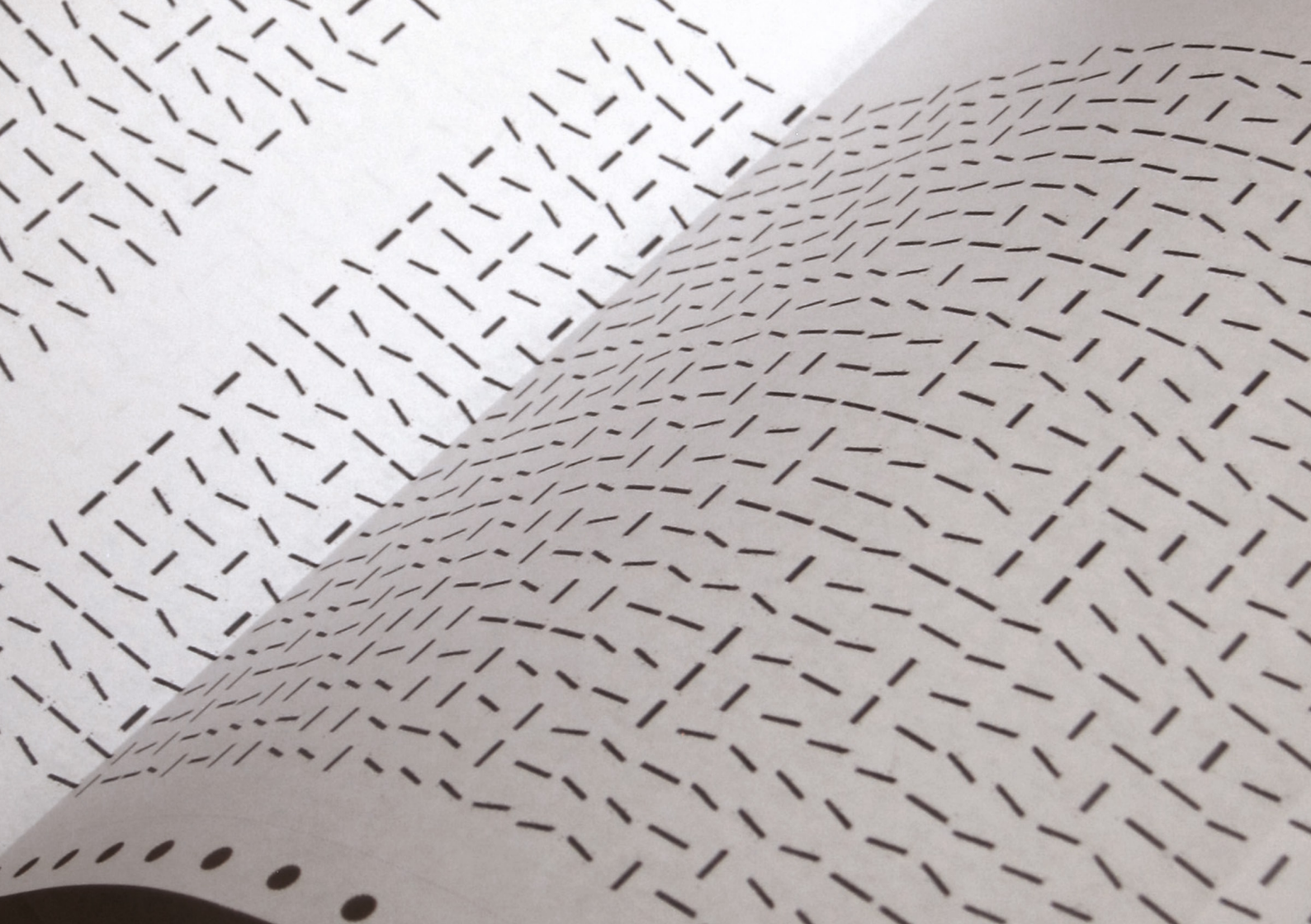
Consisting of a screen, a computer, a dot-matrix printer and a stack of continuous feeding paper, this installation with a piece of custom software that is programmed to generate, throb, capture, store and print a continuous presence, exemplifying the materiality of times through performing computational operativities.

Throb makes a direct connection to an iconic and animated graphic called throbber through generating the typographical symbols with characters —, \, |, /, usually indicating (micro-)temporal actions are performed behind the screens of loading, waiting and buffering in digital culture. siusoon.net/throb

Winnie Soon is an artistic coder and researcher interested in queering the intersections of art and technology. With works appearing in museums, galleries, distributed networks, and books, they are the author of two books: *Aesthetic Programming* (with Geoff Cox) and *Fix My Code* (with Cornelia Sollfrank). Winnie is Associate Professor at Aarhus University.

siusoon.net





Yanai Toister and Nimrod Astarhan

Spectral Choreography #2 (2020), generative radio broadcast installation (virtual view, Forum Stadtpark, Graz Austria).

Yanai Toister (Ph.D.) is an artist, curator, and educator working across Conceptual Art, Media Art, and Media Philosophy. Toister serves as associate professor and director of the Unit for History and Philosophy at Shenkar College of Engineering, Design and Art in Tel Aviv.

yanaitoister.com

Nimrod Astarhan is an artist, technologist, and lecturer for Digital Art. As an artist working in Sculpture and Digital Media, he exhibited and initiated group projects in Israel, Germany, Belgium, the U.S. and the ISS and worked on commissioned projects for museums, international festivals, and biennales.

nimrodastarhan.com

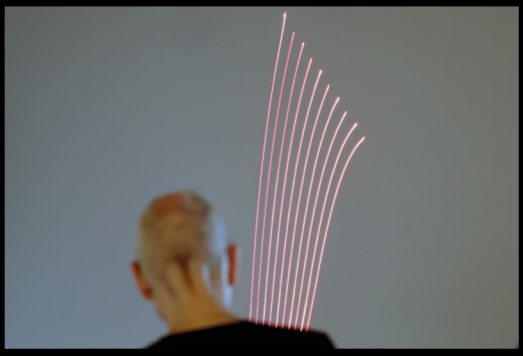
Pedro Tudela

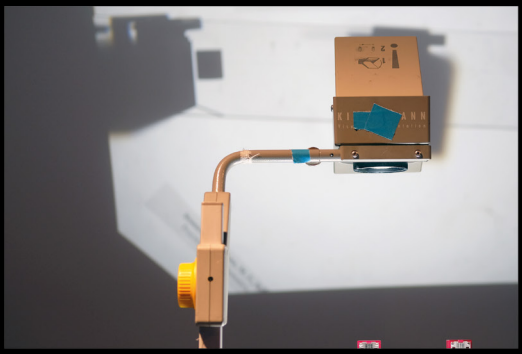
print ... sight

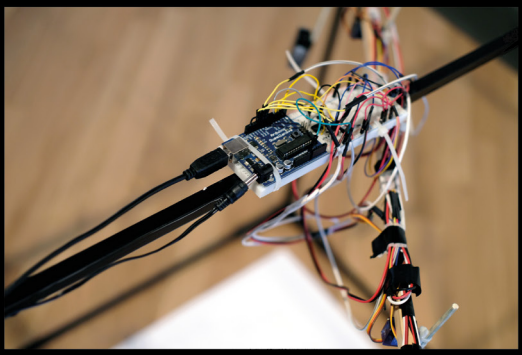
Pedro Tudela, co-founder of the multidisciplinary and digital music project @c and founding member of the media label Crónica. He has exhibited regularly individually and in numerous group exhibitions, since the 1980s, and has participated in several performance festivals, concerts and record editions, in Portugal and abroad. He is represented in museums, public and private collections. Assistant Professor at the Faculty of Fine Arts of the University of Porto.

www.pedrotudela.org
www.at-c.org

sight in print







Jason Reizner

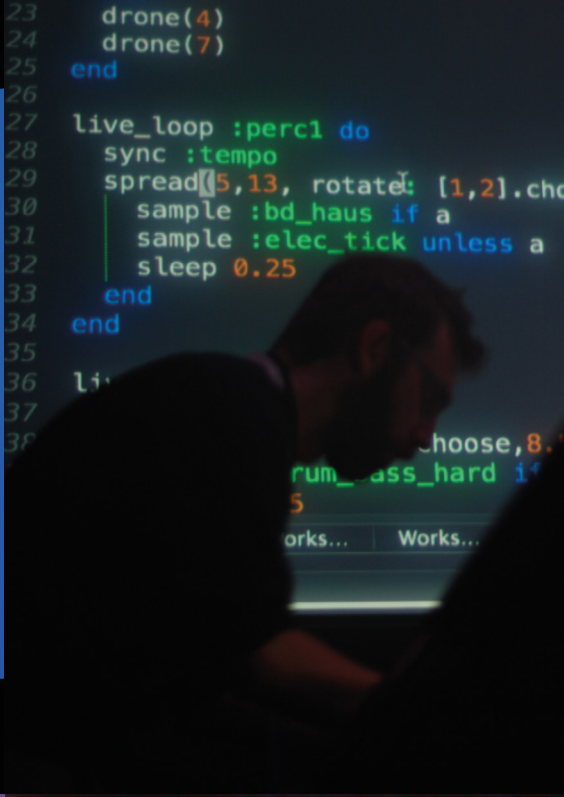
±X (2021-2)

JMR: Developed in commemoration of the first ten years of xCoAx, *±X* is an artwork that functions as both a synthetic memory of past conference editions and a speculative vision of the editions yet to come, created in collaboration with GANs.

GAN: *±X* means something more than the sum of the numbers—it's a symbol that transcends the constraints of a given format. It's a concept that allows us to reflect on the past, even if the past is gone. It's a tool for thinking about the future, even if the future has not yet begun. It's a promise—an ode—to the possibilities of what we can imagine, even if we can't yet fully express or imagine those possibilities.

Jason Reizner is a designer, media practitioner and researcher based in Weimar, Germany. As interim chair of the Interface Design Group at Bauhaus-Universität Weimar, he lectures in the Media Art and Design and MediaArchitecture master programs and leads the EFRE-supported Bauhaus Form + Function Lab.


Q&A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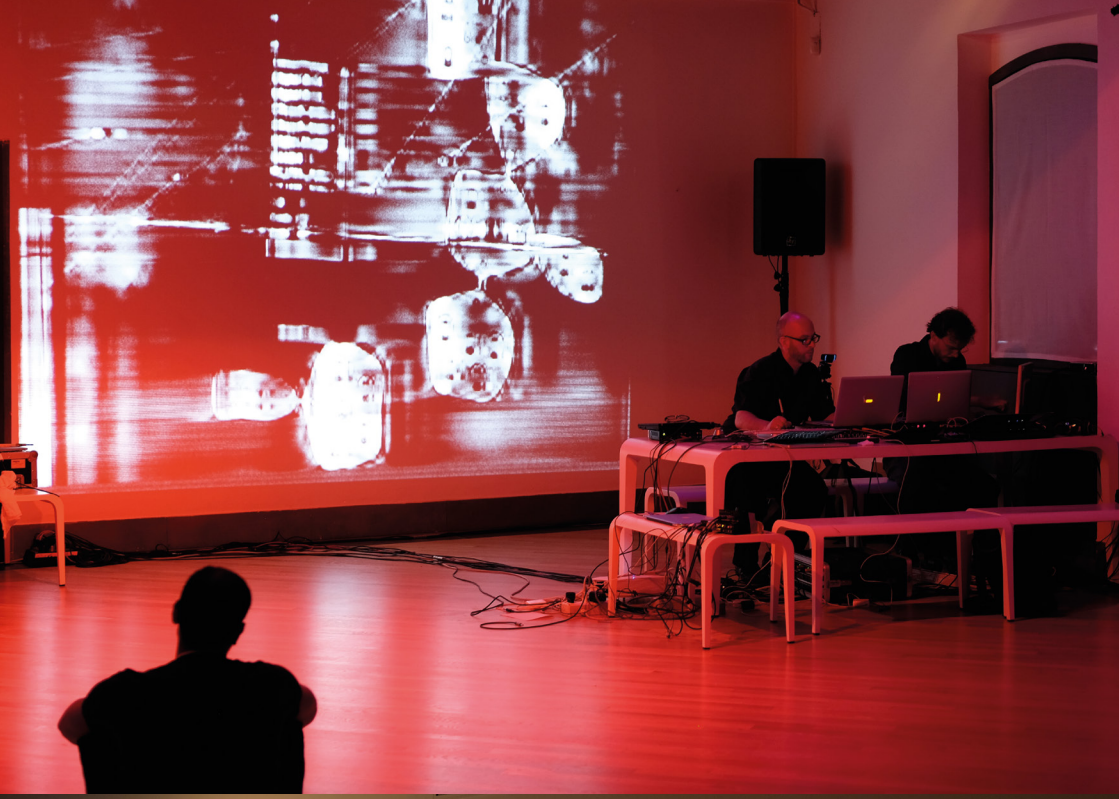


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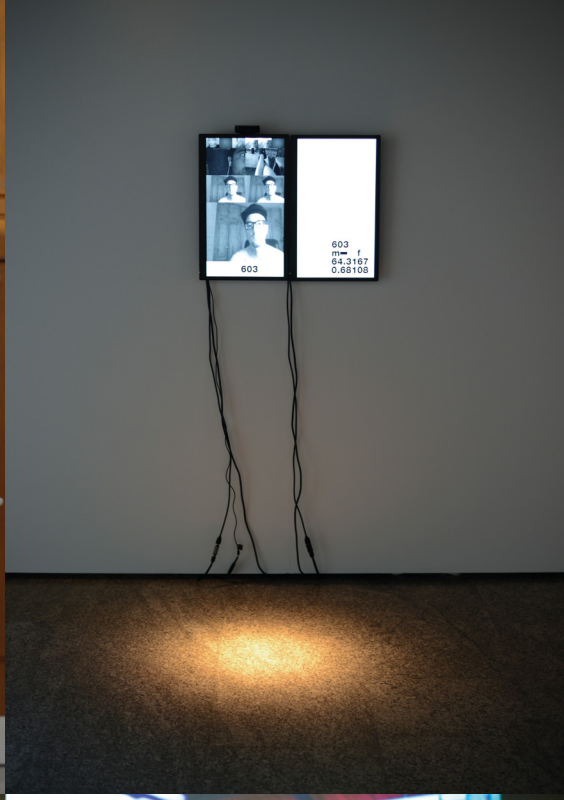
Computation Communication Aesthetics And X.
Computation Communication Aesthetics And X.


On the Internet Everybody Knows You had a Dog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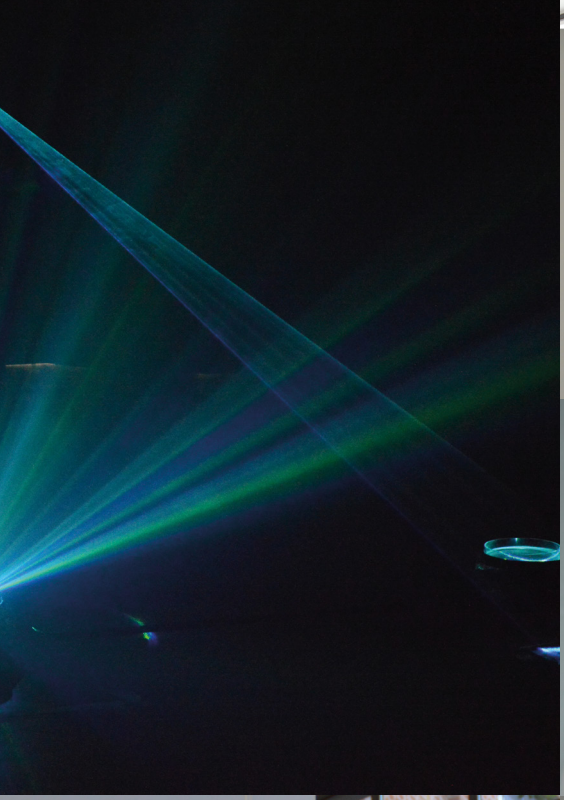

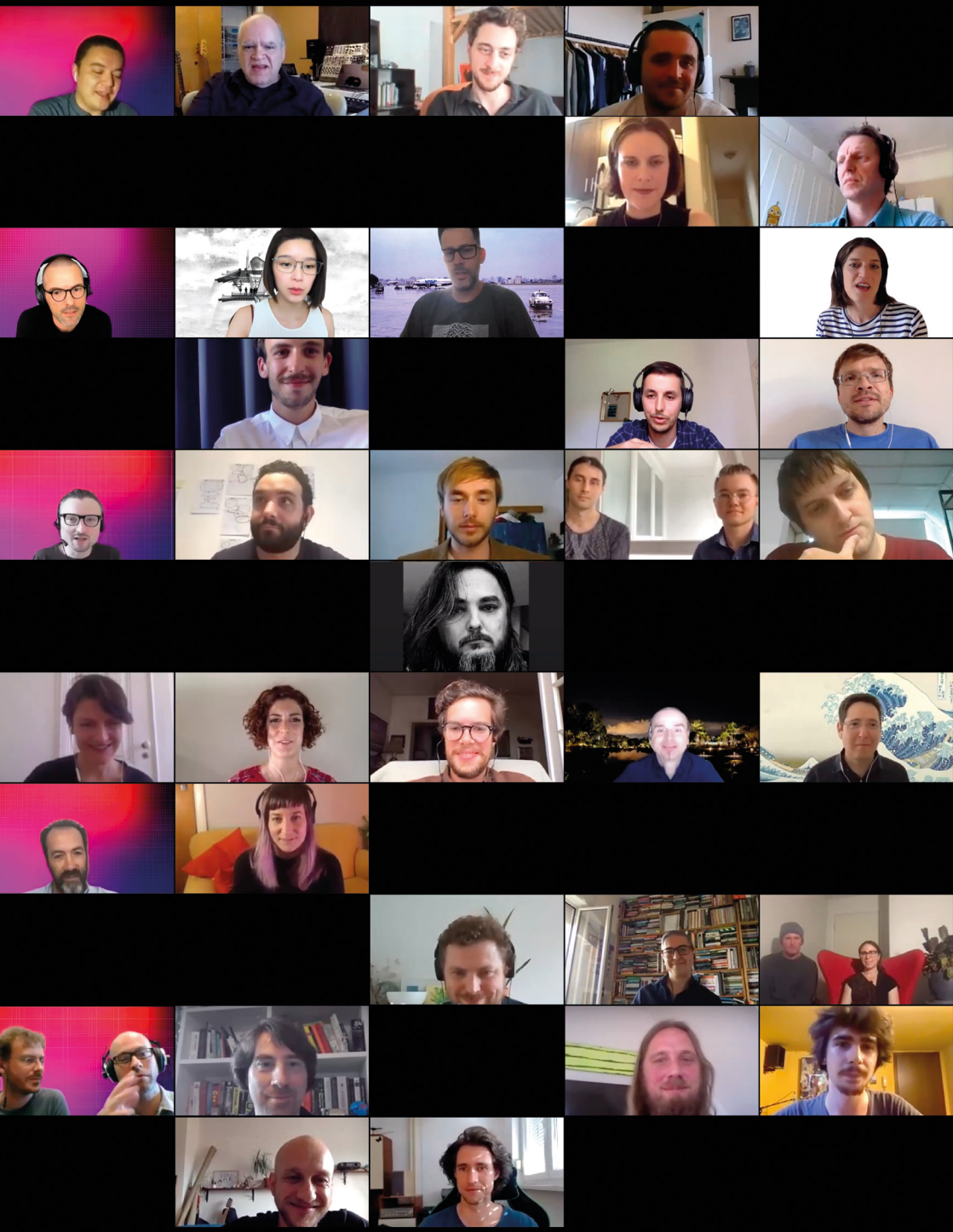

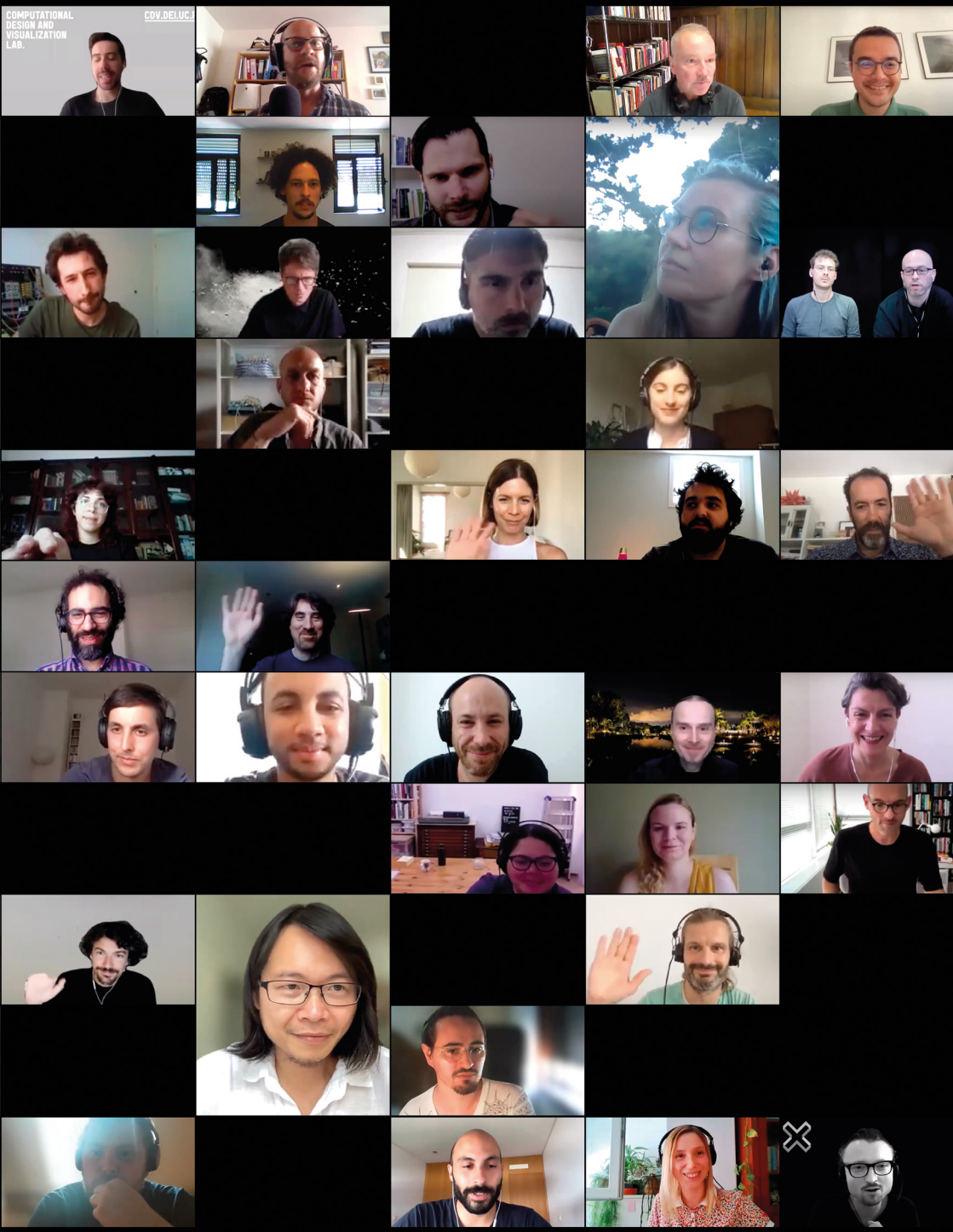
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In its first ten years, xCoAx was organised by: Mario Verdicchio, Jason Reizner, André Rangel, Pedro Tudela, Miguel Carvalhais, Ricardo Melo, Luís Pinto Nunes, Alison Clifford, Graeme Truslove, Steven Sherlock, Luísa Ribas, Rogério Taveira, Catarina Lee, Sara Orsi, Susana Sanches, Carol Pierina, Atxu Amann, Andrea González Garrán, Alejandro Sanchez Zaragoza, Marco Santabrogio, Sara Notargiacomo, David Pirrò, Hanns Holger Rutz, Daniele Pozzi, Pedro Martins, Penousal Machado.

These artists and scholars enriched xCoAx with their keynotes or their guidance at the Doctoral Symposium: Alessandro Ludovico, Olga Goriunova, William Latham, Olia Lialina, Penousal Machado, Philip Galanter, Frieder Nake, Mario Klingemann, Pep Vidal, Luciana Parisi, Domenico Quaranta, Simona Chiodo, Marko Ciciliani, Yuk Hui, Špela Petrič, Angela Ferraiolo, Andreas Broeckmann, Winnie Soon.

xCoAx was designed by: Mariana Owen, Joana Morgado, David Conceição, Ana Miguel Reis, Maria Fernandes, Luísa Silva Gomes, Sofia Matos, Catarina Neves, André Lourenço, Juhan Reis, Mariana Simões, Eliana Rodrigues, Ana Isabel Teixeira.

xCoAx was photographed by: Pedro Tudela, Adriana Romero, Catarina Oliveira, Stephen Blackwell, Andreas Zingerle, Linda Kronman, Ana Caria, Leonor Fonseca, Luís Camanho, Camila Mangueira Soares, Fabrício Fava.

The following people supported xCoAx with their energy and talent: Matilde Albuquerque, João Almeida, Madalena Anjos, Andrea Azzini, Candela Baliño, Bruno Bento, Giorgia Bianchi, Alice Black, Anselmo Canha, Diana Carvalho, Márcia Carvalho, Ross Cathcart, Pedro Costa, Rita Costa Pereira, Joaquin Diaz, José Dinis Henriques, Luís Eustáquio, Catarina Fazenda, Ana Ferreira, Mariana Ferreira, Olga Glumac, Ricardo Gonçalves, Nicole Henriques, Rodrigo Hernández Ramírez, Nikolaos Kampitsis, Jacek Kilian, Rosemary Lee, André Leitão, Carlotta Maironi Da Ponte, Ricardo Marques, Gaia Meris, Nina Micleusanu, Emina Mijatovic, Paloma Moniz, Catarina Monteiro, Andrea Moretti, Gloria Mosconi, Alireza Nasr Asadani, Maria Cristina Nuti, Pierre Oskam, Isabel Pacheco, Beatriz Page, Aldebaran Pepe, Inês Pereira, José Miguel Pereira, Poli Petrova, Simon Rangel, Ricardo Roberto, Catarina Sampaio, Bruno Santos, Gonçalo Silva, Marta Silvestre Saavedra, Margarida Sousa Silva, Richard Stevenson, Diogo Tomás, Robert Tranter.

xCoAx is also very thankful to: Sam Baron, Patrícia Almeida, Enrico Bacis, Isabel Barros, Renata Boria, Nuno Carinhas, Maria Grazia Castaldo, Giuseppe Cattaneo, Marta Cereda, Nicola Cortesi, Tiago Cruz, Joana Cunha, Guilherme Dantas, Vitor dos Reis, Dario Facchinetti, Fernando Fadigas, António Guimarães, Vitor Joaquim, Norberto Jorge, Iñigo Larrauri de Terán, Lia Manzella, Cláudia Melo, João Menezes, Jorge Morais, Aurora Morelli, Rui Nóbrega, Isabel Pacheco, Stefano Paraboschi, Alessandro Pavoni, Bruno Rabel, Marco Rabozzi, António Rasteiro, Aida Recheda, Cesare Resta, João Rodrigues, Rui Rodrigues, Marco Rosa, Matthew Rossi, Arlindo Santos, Salvador Santos, Telmo Teixeira, Filipa Teixeira Correia, Isabel Vieira.

xCoAx was organised by: Università degli Studi di Bergamo, Faculdade de Belas Artes da Universidade do Porto, i2ADS: Instituto de Investigação em Arte, Design e Sociedade, CITAR: Research Center for Science and Technology of the Arts, School of the Arts of the Portuguese Catholic University of Porto, Anhalt University of Applied Sciences, University of the West of Scotland, Bauhaus-Universität Weimar, ID+: Research Institute for Design, Media and Culture, Universidade de Lisboa, Faculdade de Belas-Artes, Centro de Investigação e de Estudos em Belas-Artes (CIEBA), INESC TEC: Institute for Systems and Computer Engineering, Technology and Science, MACA: Máster Interuniversitario en Comunicación Arquitectónica, ETSAM Escuela Técnica Superior de Arquitectura de Madrid, Universidad Complutense de Madrid, Politecnico di Milano, NECSTLab: Novel Emerging Computing System Technologies Laboratory, IEM: Institut für Elektronische Musik und Akustik, Kunstuniversität Graz, Faculdade de Ciências e Tecnologia da Universidade de Coimbra, DEI: Department of Informatics Engineering, CISUC: Centre of Informatics and Systems, CDV Lab: Computational Design and Visualization Lab., INESC Coimbra: Instituto de Engenharia de Sistemas e Computadores de Coimbra.

xCoAx was in part funded by: Programa Operacional Factores de Competitividade, Quadro de Referência Estratégico Nacional, Fundo Europeu de Desenvolvimento Regional, Fundação para a Ciência e a Tecnologia, Portugal 2020, Das Land Steiermark Wissenschaft und Forschung, Graz Unser Kulturjahr 2020.

xCoAx was supported by: Câmara Municipal do Porto, Centro Arti Visive Università degli Studi di Bergamo, Companhia Portuguesa do Chá, Creative Futures, CST Centro Studi sul Territorio "Lelio Pagani", FWF: Der Wissenschaftsfonds, DSType Foundry, FoAM, Instituto Italiano di Cultura, Instituto Pedro Nunes, L'Ora Osservatorio sui Segni del Tempo, Luís Pato Wines, Luz e Som, M2 Artes Gráficas, Neural, Porto Cultura, Rectory of the University of Porto, Santander Universidades, Teatro Nacional de São João Porto, Winchester School of Art.

xCoAx took place in the following venues: S. Agostino campus Università degli Studi di Bergamo, Biblioteca Municipal Almeida Garrett, Edifício AXA, Passos Manuel, Mosteiro de São Bento da Vitória, Centre for Contemporary Arts Glasgow, The Art School: GSA Students' Association, GAMeC: Galleria d'Arte Moderna e Contemporanea di Bergamo, Faculdade de Belas-Artes da Universidade de Lisboa, Museu Nacional de Arte Contemporânea do Chiado, Galeria Zé Dos Bois, ETSAM: Escuela Técnica Superior de Arquitectura de Madrid, C ARTE C, Museo del Traje, C/O Careof, Fabbrica del Vapore, MUMUTH: Haus für Musik und Musiktheater at Kunstuniversität Graz, Convento de São Francisco, Salão Brazil.

Kim Albrecht
Amy Alexander
Christian Ulrik Andersen
Nimrod Astarhan
Martin Bricelj Baraga
Victoria Bradbury
Vilbjørg Broch
Andreas Broeckmann
Joana Chicau
Małgorzata Dancewicz
Karen Ann Donnachie
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Francisca Rocha Gonçalves
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