Artists Re:Thinking the Blockchain

A future-artefact of a time before the blockchain changed the world. This interdisciplinary book includes artistic, theoretical and documentary engagements with the technology some have described as the new internet.

With contributions by Jaya Klara Brekke, Theodoros Chiotis, Ami Clarke, Simon Denny, Design Informatics Research Centre, Max Dovey, Mat Dryhurst, Rachel O'Dwyer, César Escudero Andaluz, Primavera De Filippi, Rory Gianni, Peter Gomes, Elias Haase, Juhee Hahm, Max Hampshire, Kimberley ter Heerdt, Holly Herndon, Helen Kaplinsky, Paul Kolling, Elli Kuruş, Nikki Loef, Rob Myers, Martín Nadal, Noemata (Bjørn Magnhildøen), Edward Picot, PWR Studio, Paul Seidler, Surfatial, Hito Steyerl, Lina Theodorou, Pablo Velasco, Ben Vickers, Mark Waugh, Cecilia Wee, Martin Zeilinger.

'Furtherfield and Torque have brought us a collection of writings and art that cut through the mainstream blockchain hype and reveal the diverse creative visions that can be embedded into the technology. The book strikes a great balance between technical explanation of blockchains, cryptocurrency and smart contracts and the broader politics, culture and philosophy that surrounds the innovations. Above all, it inspires us to believe we can still invent our own futures and grow the technologies that we need to realise them.' – Brett Scott, author of *The Heretic's Guide to Global Finance: Hacking the Future of Money*

'This book is on a mission to make one of the most influential yet unknown technologies of today intelligible for each and every one of us.' – Josephine Bosma, author of *Nettitudes – Let's Talk Net Art*
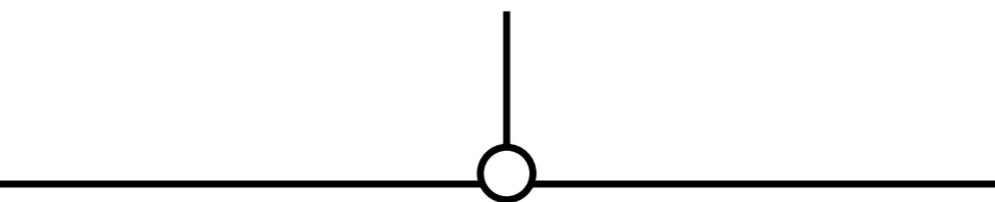
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Edited by Ruth Catlow, Marc Garrett, Nathan Jones & Sam Skinner

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Nathan Jones & Sam Skinner

A Quasi Proto Preface

What this book is about, what is inside, and why we did it

The blockchain is janus-faced. On one side its traits of transparency and decentralization promise much in terms of fairness and accountability, but on the other its monetary roots born as a financial payment system, albeit grounded in open-source software, mean its implementations are often stridently capitalistic. Furthermore, those involved in its development seem to oscillate between radical ethical standpoints and reductionist technological determinism. The blockchain engenders what has been called a 'digital metalism'[1] with the ability, like a modern philosopher's stone, to transmute life through a distributed ledger. That such a pecuniary minded technology is being touted as a new technology to underpin a newfangled internet, compels an exploration of both its current state and how it may be rethought.

A Performative Map

En masse, this whole collection operates as performative explainer of sorts, with the book containing multiple entry and exit points on the subject through which an understanding, unique to each reader, of both present incarnations and possible futures may emerge.

Jump to Ruth Catlow's introduction for some essentials, and further technical elucidations within essays by Martín Nadal and César Escudero Andaluz, Rob Myers and Rachel O'Dwyer.

The book's contributors represent the best of a transdisciplinary and enquiring spirit – required to understand and rethink the blockchain – and come from a wide variety of backgrounds, to kludge, critique and refunction their way through the terrain. We hope this inventive character makes what can be an obscure or off-putting field, which is principally controlled by developers and venture capitalists, a more live and open space.

Many works perform a quasi DIY dissection and montaging of the blockchain, acting as a subversive mapping of its individual parts, functions, and wider infrastructure. Such approaches respond to how this technology, if indeed it is to become a powerful tool of organizing

and mediating life, necessitates a need to make claims upon and intervene in it. Within the book, the diverse ecology of blockchains, smart contracts and cryptocurrency, are dynamically deployed and engaged with as new subjects of enquiry, new methods for organizing, and new mediums for art.

Finbook

Embodying this spirit, exploiting the blockchain as subject, method, and medium, we are excited to be able to include FinBook, which both enables an interactive experience of a proto-blockhain technology and intervenes within the book itself, linking articles to a financial trading portfolio. We encourage you to use the QR codes to access an online portal where you can rate the chapters in this book by assigning them value tokens. Additionally, FinBots operating inside the FinBook interface will themselves be assigning and trading these value tokens, in a speculative pastiche of the kinds of ways cultural value might combine with modes of financial trading under a blockchain-based cultural regime.

Art & the Blockchain Hybridity

It is interesting to note how FinBook and other artist projects within this book, which employ hybrid versions of blockchain technology or revel in its speculatory unknowns, are representative of both the blockchain's nascent state and complexity, and the degree to which the blockchain is, or is not, being employed and translated more broadly. Many in the business world for example are adopting what might be called a blockchain-lite by opting for 'federated' and private incarnations, rather than its fully decentralized and transparent form, and favouring more and more the term Distributed Ledger Technology.[2] As Vitalik Buterin, founder of Ethereum, has stated: 'the concept of one blockchain to rule them all – a unique blockchain carrying a unique digital currency and used for all distributed-ledger applications – is obsolete'.[3] But we should add – it's still early days.

In the course of editing the collection over the last year, we have observed the ebb and flow of the hype that surrounds the blockchain, and its struggle to implement more concrete manifestations. There continues to be huge disagreement and uncertainty regarding its future viability and adoption. In this environment, initiatives emerging from commons and open source communities such as Hyperledger[4]

and Dyne's Freecoin,[5] create new territory in parallel (and compete ideologically and economically) with multi-billion dollar, massively global and 'closed' enterprises such as the Enterprise Ethereum Alliance of companies including JP Morgan and Microsoft.[6] This wild west-style context is amplified by hackers, who are an unknown quantity with much to gain potentially by exploiting weaknesses in untested code, and the vulnerability (perhaps unsuitability) of current technical infrastructure. As @VladZamfir an active developer within the blockchain community tweeted at 4:40 AM – 4 Mar 2017: 'Ethereum isn't safe or scalable. It is immature experimental tech. Don't rely on it for mission critical apps unless absolutely necessary!' In the meantime, speculation is rife and this is reflected in many of the entries in this book. There is a curious equivalence between art's speculative abilities, to play with fact, fiction, and abstraction, and the blockchain's own chimeric character. Both art and the blockchain grapple with the instability of authorship and authenticity: where does agency lie, who is Satoshi? Inversely, it is intriguing to witness some in the blockchain fraternity rethinking their own character and narratives through an artistic lens. As @matthew_d_green tweeted at 10:40 PM, 13 Jul 2017, in reference to the latest potential Bitcoin fork: '…it seems like they are trapped in some horrible Sartre play where everyone has to use the word "decentralized" to mean different things.'

Perhaps he is referring to Satre's play *No Exit*, known for the line, 'L'enfer, c'est les autres' translated as 'Hell is other people' or 'Hell is [the] others.' Which does perhaps offer some articulation of the blockchain's infernal infatuation with proof over trust. Or maybe he is referring to Satre's *The Condemned of Altona*, which gives voice to his famous notion that 'Man is condemned to be free.' To which we might add, but only if cryptographically anonymized, traceable, and immutably codified. The blockchain does seem to be in a perpetual state of existential crisis. As @DMOberhaus wrote at 9:32 PM, 13 Jul 2017: 'An ICO (Ethereum Token) called 'FUCK' raised $30k in 30 minutes because nothing matters anymore.' Or consider the transformation of Dogecoin from in-joke cryptocurrency to in-demand digital asset, with a capitalization of $340 million in June 2017.[7]

The Book of the Block

What is clear throughout this book is that what the blockchain *is*, is very different to what it *means*, and this gap is only expanding as the

blockchain becomes perceptible to an ever wider group of people. Artists operate within this gap, sometimes drawing together technics and implications into coherent, perceptible objects, and sometimes extrapolating new speculative trajectories from the technical possibilities or suggestive ether of decentralized ledgers. The first half of this book includes documentation and discussion of a range of such interventions: from key speculative works such as Primavera De Filippi's *Plantoid*, and Paul Seidler, Paul Kolling and Max Hampshire's *Terra0*, to the more playful, perhaps even nostalgic, *Bittercoin* by Martín Nadal & César Escudero Andaluz. Also in this section the reader will find works by artists who have sought to document the world of meanings, possibilities and implementations in contemporary practices around the blockchain. These include visual-poetics such as Ami Clarke's text-based work, documentary formats including Peter Gomes' transcription, and Pablo Velasco's engagement with workshop discussions taking place at the Institute of Network Cultures, Amsterdam, and provocations such as *Satoshi Oath* by Jaya Klara Brekke and Elias Haase, PWR studio's development of their *Textblock* white paper, and work by Simon Denny presented here with an accompanying interview. The form of these presentations is deliberately diverse, and to a large degree dictated by the artists themselves. We hope that the reader will agree that the experiments with form throughout the book is appropriate to the system of ideas taking place across it.

In a following section, we are please to include a number of new creative works responding to the book as a site for experiencing what the blockchain means and how it feels. In the case of speculative fictions by Cecilia Wee, Rob Myers and artist collective Surfatial, potential future blockchain worlds can be glimpsed and are played out in variously terrifying and humorous ways. Poems by Theodoros Chiotis and Edward Picot respond to PWR's *Textblock* concept, and combine the theoretical implications of blockchain technology with the formal constraints and corruptions it implies. The blockchain appearing this way is not just a tool or structure for data to be stored, but also an affective presence – one that experimental literary practices are well placed to present in their concentrated forms. Illustration is another useful tool for envisaging feeling as form. The cover of this book features a newly commissioned illustration by Juhee Hahn that delineates the fine lines between cooperation, codification and control that the blockchain straddles.

The sequence of essays in the concluding theory section of the book begins with a fiery essay by Hito Steyerl, originally published in *e-flux journal*. In this essay, in effect diagnosing the conditions for art

production in the era that blockchains threaten to intervene, Steyerl articulates two of the major concerns of the book: art as currency and art as socio-political arena. Demonstrating how art's seemingly unshakable marketability is accompanied by an unsustainable crisis point in working conditions for artists.

Crisis points are of course the perfect moments to perceive the edges of any system. Blockchain technology's most notable crisis was the DAO hack of 17th June 2016, in which a highly effective attack was performed on the Ethereum blockchain, allowing for millions of dollars' worth of its investors' money to be syphoned off. As Ben Vickers documents in his essay, this crisis led to a fascinating split within the Ethereum communities, around the pragmatic requirement to intervene in a supposedly – ideologically – autonomous system, and the need to preserve this autonomy. Vickers' text allegorizes the Ethereum hack and resulting fork as an historical event, lived and responded to in real-time by people – investors and coders – with differing perspectives. The event is one in which the autonomy, collaborative and distributed ethos of the blockchain comes into conflict with one another and leads to radically unexpected events. The Ethereum hack is considered by Vickers to be of political and social importance akin to the beginnings of the Occupy movement, or the collapse of experiments with the first real-time predictive computer systems during the Chilean communist era – although the actual political allegiances at work in Ethereum are at best obscure.

Following Vickers' essay, and the conflict internal to Ethereum and other development communities, Rob Myers' develops a discussion of the political atmosphere surrounding the Blockchain's evolution. He engages specifically with the ideology of libertarians, anarcho-capitalists and syndico-anarchists who at various moments have been accused (or credited) with moulding and shaping blockchain technology to their interests. Myers' essay offers a granular survey of the link between perspectives on terms such as 'justice', 'agency' and 'truth', and how they play out in actual blockchain environments, blogs and chat-rooms. Myers' involvement in the often esoteric cultures of alt-currencies in particular lays the ground-work both for his own fiction *Bad Shibe*, included in this collection, and for other artists interested in the political aesthetics of blockchain implementation.

Max Dovey takes up the link between libertarianism and anti-statism in his examination of blockchain marriages. He observes that the ostensibly benign and personal act of declaring everlasting love and affiliation to your partner on the blockchain is better understood as a

highly charged symbolic act – as it explores and promotes the potential of blockchain to circumvent civic infrastructure. Dovey notes that the highest profile blockchain weddings have been performed by people with clear commercial investments in the blockchain. For Dovey, the rhetoric around the resurrection of the original (or 'classic') Ethereum after its forking, has interesting resonances with marriage, and the 'proto-patriotism' of some of its users.

Each of these essays, and in particular their reference to the Ethereum fork, will help to orient the reader in terms of the diversity of applications, ideological investment, and forms of socio-political rhetoric around the blockchain. Following this series of contributions, we are pleased to include a number of essays that directly address the ways in which blockchain technology is being, and may be used to inform conditions for the production and dissemination of art. Most frequently these essays engage with the way in which blockchain technology might accelerate, reify, or reverse the seismic transformations in working conditions, intellectual property, and sales, inaugurated by the 'digital revolution'. Martin Zeilinger for example makes the point that the move towards ephemerality in digital environments was first made by conceptual artists in the 1960s. For Zeilinger, the ease with which conceptualism, originally a critique of art markets and institutions, was folded back into these apparatuses is cause for thought for blockchain enthusiasts.

Mark Waugh reports on the variety of projects DACS (Design and Artists Copyright Society) are involved in, exploring how blockchain technology might help to manage and document the ownership of art objects. Helen Kaplinsky offers a note of caution to these important and timely investigations. For Kaplinsky there is a historical dimension to this tension around the object – that of Colonialism and the museum. Citing a variety of notable contemporary blockchain projects which explore intellectual property and commercial rights – from the IP management tool Ascribe to Imogen Heap's collaborative album project *Mycelium* – Kaplinsky notes that the decentralization and transparency of these forms of art ownership, although a move away from the often shadowy operations of centralized networks in online 'Platform Capitalism', threaten to replicate and further embed the self-disciplining nature of historical institutional control apparatuses such as the museum.

Like Kaplinsky, Rachel O'Dwyer traces different forms of digital editioning by organizations such as Ascribe, and alternative forms of payment and distribution experimented with by musicians – focusing

on what existing internet-based systems and platforms might suggest about future blockchain implementation. In a critique which has echoes of the conflict around Ethereum, O'Dwyer suggests that the purported decentralization and equality promised by blockchain technology will surely be as deeply indebted to administering organizations as internet-based ones, and the ideology of these organizations are rarely shared by the artists who might use them. O'Dwyer also argues that the blockchain is in fact a poor substitute for some internet and digital-based forms of data protection such as digital rights management.

In a substantively different form of enquiry, Bjørn Magnhildøen proposes that core concepts from phenomenology: 'being' and 'time', also have a different relation, and are in fact conflated, in the context of the blockchain. Magnhildøen, uses this observation to create a new category, of 'being@time', and calls for artworks that take place within it. Acting in a continuum, this suggests that after the dematerialization of the art object, via conceptual art, perhaps now we might, through the blockchain, deconceptualize the artwork. Embracing the inevitable anachronism and paradox of such a gesture, a (presently) active call for works for an exhibition responding to this situation can be found in his chapter.

Given the reputation of avant-garde music practitioners to embrace new technologies more quickly than other creative fields, it seems appropriate to end this collection with Holly Herndon and Mat Dryhurst. In an interview with Marc Garrett, the artists discuss how the distributed and, therefore, multiple and collaborative space of the blockchain lends itself to the kinds of ensemble practice that have grown in avant-garde music, design, and new media circles. Herndon and Dryhurst's is an optimistic and well informed position, which reflects on the positive forms of transformation that need to, and can, take place in the wake of digital-era changes in cultural production and distribution.

Blockchain Publishing, Language and Actors

Since our inception, Torque has been interested in the relationship between language, mind and technology, and in particular the self-reflexive and intra-active opportunities publishing on these themes offers. Our first books sought to gather leading thinkers in the areas of literature, media, art, neuroscience, and philosophy to explore what the contemporary conditions are for reading and writing;

often developing content through public forums such as gallery interventions, workshops and symposia. We consider the present volume to be an important addition to this sequence of publications and processes. For us, *Artists Re:Thinking the Blockchain* not only documents the fascinating range of practices and provocations around this almost mythical technology, but also offers at several points important observations around the challenges and opportunities facing publishers like ourselves and how we can relate to the public via new technologies.

As individuals involved in publishing we were initially intrigued by the potential for the blockchain to facilitate online micro payments (of say less than a pound) that traditionally have been too costly to flourish online, and which may offer new opportunities for funding special interest publications and generate new forms of interaction between readers and text. But in a return to the blockchain's janus-faced character the roll out of micropayments also has the potential to enable companies to charge for every micro gesture and activity online, from sending an email to search queries.[8]

As we encounter it though this book, the blockchain's technological rumblings affect the world way beyond markets and trade; for example, by influencing the language that people will have to adopt to work in this new medium. This was evident in the recent 'second biggest cryptocurrency hack ever'[9], again orchestrated on the Ethereum chain, in July 2017, just as this introduction is being composed. Writing in the aftermath of this hack, software engineer Haseeb Qureshi noted that the language that Ethereum's 'smart contracts' are written in will need to be radically different from the existing languages that web developers are used to working with. Qureshi calls for a new language that has security built in.

Also, as Adam Greenfield has articulated, we need to be mindful of who the 'incumbent actors' are on this scene of new linguistic form and cryptographic code acts, who are directing its evolution.[10] The assumptions that blockchain evangelists and technologists make about society, basing its functioning on property, contracts and markets, make what Greenfield describes as 'a market where there was none before' and often ignore qualities of the most powerful social movements, egalitarian organizations, and relationships, both human and non-human, that operate above and beyond this.[11] Greenfield writes: 'We want to believe in the possibilities of a technology that claims to give people powerful new tools for collective action, unsupervised by the state.' As always, we need to look and engage

way beyond the technosolution, and be mindful of the blockchain operating as 'a solution looking for a problem.'[12]

Blockchain actors are deeply enmeshed in the conjuring and creation of a libertarian 'sociotechnical imaginary'[13] where a desire for abstraction and cutting out the middle man is often challenged by the grubby realties of life. Bitcoin for example is proving much more like other forms of money than perhaps those in its coterie like to admit. As Nigel Dodds writes, in practice: 'the currency has generated a thriving community around its political ideals, relies on a high degree of social organization in order to be produced, has a discernible social structure, and is characterized by asymmetries of wealth and power that not dissimilar from the mainstream financial system. Unwittingly, then, Bitcoin serves as a powerful demonstration of the relational character of money.'[14] This conflict between the dream and reality of the blockchain creates peculiar effects where 'abstracting technologies remove themselves from the realm of action by configuring quasi-characters and quasi-events in a quasi-plot. Blockchain technology and monetary technologies that are built on it organize not so much humans and direct interactions between them, but rather quasi-characters and quasi-events.'[15] This derivative abstraction necessitates a reductive 'technological dependency', where just as Greenfield suggests we want to believe in new tools, so those promoting the blockchain dream of a kind of hyper –bureaucracy,[16] or Esperanto protocol, seeking to overcome the way that paperwork 'makes everyone, no matter how powerful they may be in reality, feel so powerless.'[17] Time will tell whether the blockchain simply replaces one type of bureaucracy and middle man, for another, and the degree to which it has to erode what counts as life in the process. After all, much that we value costs nothing, requires no documentation, incentive, or contract, and leaves little trace.

It is perhaps in the post-human space away from 'the money' that the blockchain and smart contracts have the most original things to offer: as a way get 'outside ourselves' and push beyond our own anthropocentric views and vested interests, as articulated deftly in *Terra0* the self governing forest, featured in this book. Here the otherness of technology and smart contracts, works with that of plant-based systems to form a more-than-human assemblage, treading a fascinating line between decolonizing nature and technosolutionism. Once more though, this hugely potent line of thought has to be tempered by an acknowledgement of lessons learned during the industrial and digital revolutions. The irony of *Terra0*, won't be lost on the commentators who note that 'proof-of-work' currencies such

as Bitcoin exact a significant ecological price through their method of creating artificial scarcity.[18] But then, even these calls must be weighed against convincing contemporary commentary actively calling for a more swift move towards cryptogovernance to stave off the worst environmental and social inequities of capitalism.[19] We hope projects such as *Terra0* documented in this book will contribute to the ability and will of people to engage in these nascent but urgent conversations and modes of action.

Conclusion / Thanks

As well as being the third major interdisciplinary collection from Torque Editions, this book is the second in a sequence of publications produced by Furtherfield, following on from their notable 2010 book *Artist Re:Thinking Games* produced in collaboration with FACT. Ruth Catlow and Marc Garrett have a unique and vital approach to exploring the relations between technology and art production. This approach is deeply political while avoiding partisanship, and also deeply democratic, open, and with a clear ethical vision. We thank them for the range of artists and thinkers that they've gathered for this publication, to which we have added, and the generosity and good humour that has typified all our communications on what has been a long journey from conception to execution. We would also like to thank Mark Simmonds, the designer of this book, for his commitment to experimentation and attention to detail and Roger McKinley at FACT, Arts Council England and Culture Capital Exchange for funding support. To readers, we firstly thank those who supported our first Crowdfunder for this book around 18 months ago, who have been not only generous, but patient also, and of course all the artists and writers who have contributed and engaged so richly in the project and wider subject. Finally, on the issue of timeliness, we are aware that the print edition of this book will long outlast many of the myths currently in circulation about blockchain tech: we hope that readers will embrace the inevitable anachronisms in such an enterprise.

Notes

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keep-drones-away-manned-aircraft-and-talk. Accessed 03.05.2017

4   *Hyperledger*, 2017, http://hyperledger.org. Accessed 01.05.2017.

5   *Freecoin*, 2017, http://freecoin.dyne.org. Accessed 01.05.2017.

6   'Business Giants to Announce Creation of a Computing System Based on Ethereum.' *New York Times*, Feb 27 2017, http://www.nytimes.com/2017/02/27/business/dealbook/ethereum-alliance-business-banking-security. Accessed 02.03.2017.

7   See Rob Myers' contributions for further explication of Dogecoin.

8   Morozov, Evgeny. 'Tech titans are busy privatising our data.' *The Guardian*, 24 April 2017, http://theguardian.com/commentisfree/2016/apr/24/the-new-feudalism-silicon-valley-overlords-advertising-necessary-evil. Accessed 05.02.2017

9   Qureshi, Haseed. 'A hacker stole $31M of Ether — how it happened, and what it means for Ethereum.' *medium.com*, 20 July 2017, http://medium.freecodecamp.org/a-hacker-stole-31m-of-ether-how-it-happened-and-what-it-means-for-ethereum-9e5dc29e33ce. Accessed 25.07.2017.

10   Greenfield, Adam. *Radical Technologies: The Design of Everyday Life*. London: Verso, 2017.

11   *Ibid.*

12   Bloomberg, Jason. 'Six Reasons Why We Need Blockchain Skeptics.' *Forbes*, July 30 2017, http://forbes.com/sites/jasonbloomberg/2017/07/30/six-reasons-why-we-need-blockchain-skeptics. Accessed 01.08.2017.

13   Jasanoff, Sheila and Sang-Hyun Kim (eds.). *Dreamscapes of Modernity – Sociotechnical Imaginaries and the Fabrication Of Power*. University of Chicago Press, 2015.

14   Dodd, Nigel. 'The Social Life of Bitcoin.' *Theory, Culture & Society*, 2017, ISSN 0263-2764 (In Press), p. 1.

15   Reijers, Wessel, and Mark Coeckelbergh. 'The Blockchain as a Narrative Technology: Investigating the Social Ontology and Normative Configurations of Cryptocurrencies.' *Philosophy and Technology*, 31 Oct 2016, p. 15.

16   See for example two blockchain evangelists: Vinay Gupta, 'The Promise of the Blockchain', *Vimeo*, 25 Feb 2016, http://vimeo.com/161183966 and Melanie Swan's 'Institute for Blockchain Studies', http://blockchainstudies.org

17   Kafka, Ben. *The Demon of Writing: Powers and Failures of Paperwork*. Zone Books, 2012, p. 17.

18   'Bitcoins are a waste of energy – literally.' *ABC News*, 05 Oct 2015, http://abc.net.au/news/2015-10-06/quiggin-bitcoins-are-a-waste-of-energy/6827940. Accessed 01.05.2017.

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Ruth Catlow

Artists Re:Thinking the Blockchain Introduction

We want to stimulate a conversation with you about what arts brings to blockchain developments and vice versa. To discuss the implications and potentials for the arts of the blockchain.[1]

We know that the blockchain is an important and powerful new technology but 'we don't know what a blockchain can do yet.'[2]

You will find here starbursts of joy about the potential extensions of creative collaboration offered by blockchain technologies.[3] But it is also darkly poetic that another energy-ravenous financial technology should emerge just as we watch the tipping point of manmade global-warming recede to the distant horizon in our rear view mirrors. So this is not a marketing campaign, but a discussion of 'what is'. In spite of the, as yet, unresolved technical obstacles of scalability and environmental cost blockchain technologies are here to stay. They are overtaking the WWW as the next big network technology for speculation and disruption. Investors recognize their potential for authentication of identity and matter, more efficient and secure financial transactions and distribution of digital assets; communications so secure as to facilitate voting; and as a coordinating technology for the billions of devices connected to the Internet.[4] They currently attract huge investment from finance, technology and government sectors[5] in anticipation of the fourth industrial revolution of decentralized, super-automation and hyperconnectivity.

Powerful technologies develop to reflect the interests and values of those who develop them, but impact the everyday lives of us all. The World Economic Forum predicts that these developments will be accompanied by a significant increase in global inequity.[6] This vision of the future disenfranchises and demotes the role played by an ever increasing number of humans (and no doubt other life forms too) in the business of determining what makes a good life. It has been shown that 'strategies for economic, technical and social innovation that fixate on establishing ever more efficient and productive systems of control and growth, deployed by fewer, more centralized agents [are] both unjust and environmentally unsustainable. Humanity needs new strategies for social and material renewal and to develop more diverse and lively ecologies of ideas, occupations and values.'[7]

Our efforts to publish this book represent our assertion that artists have a crucial part to play here. As Gene Youngblood says: 'Radicals don't predict they build.'[8] So we must aim for more variety in background and outlook among the people involved in the building of blockchains and the imaginaries that underpin them.

Artists have worked with computing and communication infrastructures for as long as they have been in existence. They have consciously crafted particular social relations with their platforms or artwares. When artists approach new technologies a number of things happen: by making connections that are neither necessarily utilitarian nor profitable, they explore potential for diverse human interest and experience; they discover expressive and communicative potentials of its tools, devices, systems and cultures; they make difficult concepts more feelable, legible and fascinating.[9] They have also already had central roles in projects such as D-Cent[10] and FairCoop,[11] the blockchain-based tools for enhanced democracy.

Artists are good at mediating abstractions for our perceptions through play, open exploration and supposition. They can tolerate, even relish, extended encounters with difference, contradiction, muddle and slippage between symbolic and material possibilities without rushing to usefulness or simplicity. They have a kitbag of methods and processes for revealing the practical affordances and animal spirits of a subject, medium or technology. They know that a way to get to know something that doesn't yet exist is to collaborate with its possibilities and to do something / anything with it or about it. And by doing so they materialize and shape what it will be, allowing many other people to access, approach, and reach out to it with different parts of themselves.

The contributors to this book are developing and sharing a situational awareness of a technology that is notoriously hard to conceptualize. The difficulty of understanding how the blockchain works, and why it is significant, may partly be due to the fact that the majority of us are still mystified by the working of both money and markets. Perhaps the most important and hard-to-grasp characteristics of the blockchain is the way it puts finance, or its mechanisms, at the heart of every action in the digital domain. This also means, as Rob Myers writes, that 'AltCoins, cryptotokens, smart contracts and DAOs are tools that artists can use to explore new ways of social organization and artistic production. The ideology and technology of the blockchain and the materials of art history (especially the history of conceptual art) can provide useful resources for mutual experiment and critique.'[12]

The remainder of this introduction is in two parts. The first offers some simple blockchain orientation. The second part sets out to tell the story of how we got to this point and to share with you our plans and intentions for the future. Perhaps with this information you will want to get involved. We hope so.

[The blockchain is…]

00:15	00:20	Irra Ariella Khi Co-founder and CEO Vchain Technology	The blockchain is a new way of building our information technology. In a way that's truly never been done before.
00:21	00:25	Ben Vickers Curator of Digital, Serpentine Galleries Co-founder, unMonastery	The blockchain is my darkest nightmare.
00:26	00:35	Jaime Sevilla Developer, Researcher GHAYA #hackforgood	The blockchain is a way of coordinating computers all over the world in a way that they have always the same information.
00:36	00:41	Research Fellow, Associate Director – Centre for Crypto-currency Research, Imperial College	The internet was about the exchange of information. Blockchain is about exchange of assets and exchange of value.
00:42	00:51	Sam Davies, Digital Catapult	Because of the Blockchain in the future there's going to be less reliance on central points of authority, to handle data and to handle transactions and the rules around how that data's used.
00:52	00:59	Dr. Catherine Mulligan	Blockchain is that final crest on the tsunami of digital technologies that will really challenge fundamentally the way that we structure society.
01:00	01:10	Vinay Gupta Resilience Guru Hexayurt	It really is a generic technology like the web you could build almost any kind of workable system on top of it, it can enhance almost any political model. So what we're going to get depends on what we choose.
01:13	01:20	Elias Haase Developer, Thinker, Beekeeper Founder, B9lab	With this technology especially you are chiseling away on a new kind of society.
01:21	01:30	Irra Ariella Khi	In terms of relating to each other, the number one thing as human beings we use is trust. Blockchain allows us to replace trust with proof.

– Excerpts from *The Blockchain: Change Everything Forever*, (2016) 13

The blockchain is the underlying technology for the first global digital currency, Bitcoin, and was first described in 2008 in a white paper by the pseudonymous Satoshi Nakamoto. This coincided with (and some suggest was a direct response to)[14] the financial crash which saw the banks bailed out by government with taxpayers' money. Since 2013 it has been developed to facilitate not only the decentralized creation, tracking and exchange of digital money but also smart contracts – 'unstoppable applications'[15] deployed by humans and then enacted without further human interference.

Its proponents claim that the global deployment of smart contracts via this new protocol will change everything forever. And depending on the kind of person you are, and the kind of access you have to knowledge, tools and resources you will find this exciting, exasperating, foolish, terrifying, the latest hype swing, or just plain not-your-business. If you are old enough it will remind you of the clamour surrounding the emergence of the World Wide Web. In terms of its ecology of tools and infrastructures, the blockchain is at the same stage of development as the WWW in the early 90s. It's not surprising therefore that many people find blockchain hard to understand.

A good way into this is to realize that the history of computing is tied up with the history of database management.[16] Which I will now simplify like this…

❑ **A computer is a machine that stores information in a database and a collection of software to manipulate and move that information around.**

❑ **The Internet is a network of computers (and their databases).**

❑ **In 1991 the Web gave us a way to access the information on the network of computer databases around the world.**

❑ **In the early noughties peer to peer technologies enabled file sharing on a global scale.**

❑ **1999 ubiquitous computing and mobile technologies allowed computers to 'live among us in the world'.**

❑ **In 2008 the Bitcoin digital currency was launched – a secure, anonymous and transparent, way to record all transactions to a decentralized global database.**

❑ **In 2013 people realized that Bitcoin is underpinned by the blockchain protocol that can be used to distribute and enact smart contracts (and smart contracts are pieces of software that can manipulate and move around information, and now digital assets).[17]**

[Cryptocurrency is…]

A cryptocurrency is digital, but it can be used and exchanged electronically like other currencies. After they are unleashed on the world cryptocurrencies are not controlled by a central authority like countries or central banks. Instead, their value and use as an exchange medium is reached by consensus between its users using blockchain technology. In cryptocurrency, trust in people and institutions is replaced by trust in the fairness of market forces and the mathematics of cryptography which prevent counterfeiting and maintain its security.

The value of a cryptocurrency is set by market supply and demand, just as with gold or silver. Hard metals derive their value from scarcity and the difficulty of extraction, with cryptocurrencies the only difficulty is computational, the only scarcity by design. In a system called proof-of-work[18] miners' machines run software that uses processing power and lots of energy to compete for coins. To mine new coins, these computers periodically gather up a 'block' of new transactions from across the network and then race to solve a difficult mathematical puzzle for that block. The winner is said to have successfully mined the block, granting them ownership of the freshly minted coins and any transaction fees paid by users.

This new block incorporates a reference to the previously mined block (represented by its 'cryptographic hash' ID number), and joins a sequential, unmovable chain of blocks. The security and stability of a blockchain is maintained because all users hold a record of every transaction made. Because each new block takes so much computational power to mine, it very quickly becomes prohibitively expensive to hack the currency. In this way it solves the double spend problem, answering the question: 'how do I prove, without the mediation of a central authority, that the payment I have received can be honoured, in order that I may release my asset to the payee?'

The initial advertised benefits of cryptocurrencies (there are lots of altcoins now all with slightly different features) included the

lack of interference by states and banks, the 'trusted third parties' in Nakamoto's white paper; the low cost of payment processing (compared with wire transfers); and the ability of its underpinning blockchain technology to provide infrastructure connecting transactional apparatus to secure votes and share holdings. Because of the anonymity of transfers, Bitcoin is also said to have facilitated money laundering, the trading of illicit goods and nefarious services such as assassination markets.[19]

[A smart contract is…]

02:58	03:10	**Rob Myers** **Artist, Writer,** **Hacker**	**A smart contract is a piece of code now on the Blockchain which performs the function of a legal contract without the interference of a possible corruptible human agency.**
03:11	03:21	**Elias Haase**	**In a way, code is law. We don't control it, we can't alter it once it's been implemented and it will do what it's been built to do.**
03:22	03:28	**Jaya Klara Brekke** **Digital Strategy,** **Design, Research** **and Curating** **Durham University**	**When you're looking at money you're looking at governance, you're looking at law. You know that's not trivial stuff. That's not just something you can reinvent within a few lines of code.**
03:29	03:41	**Dr. Catherine** **Mulligan**	**The redefinition of society will happen in smart contracts and these kind of places unless the law courts are actively ensuring that people aren't getting disenfranchised**
03:42	04:02	**Pavlo Tanasyuk** **CEO** **BlockVerify**	**Information systems they are fundamentally social, and when we think about a bank or certain organization we have to understand that it's not only technologies we have to be able to be aware of but also this social interaction of people and we have to understand how we can map that into the system.**

– Excerpts from *The Blockchain: Change Everything Forever*, (2016)[20]

Since 2013 blockchain-based platforms like Ethereum have been under development to enable software programmes known as 'smart contracts' to enact decisions and to distribute capital on a blockchain network, according to agreed terms, without human user verification; with the responsibility for doing so embodied in their programming rather than in written or spoken legal contracts. The resulting Decentralized Autonomous Organizations, and Applications (DAOs and DAPPs), can automate the administration of company business and act like computer viruses with wallets in their pockets.

Vitalik Buterin the coder and co-founder of Ethereum describes the

second wave of development, after digital currencies, as a 'universal programmable blockchain' packaged up for anyone to use for finance, p2p commerce, 'distributed governance and human collaboration as a whole' offering the 'ability to create technologies that are decentralized, removing middle men'.[21]

And so it follows that blockchain technology promises to facilitate the automation, monetization, manipulation (through smart contracts) and marketization of every transaction across a decentralized global database.

While the Web is the Internet of information and communication, the blockchain is the Internet of Money.[22]

Smart contracts have ambiguous legal status. While the law's defaults technically apply, until very recently[23] they have flown under the radar of government regulation. While this is one of the main attractions to people whose political complexion we might describe as anarcho-capitalist and who ask 'what has regulation ever done for us?',[24] there is growing concern about the impact of these technologies. As Dr. Catherine Mulligan puts it 'the worry is that society is being restructured by a small unrepresentative group of technocrats while it's something that everyone needs to participate in – the discussion about society and economy, and also governance, how we rule ourselves.'[25]

[Blockchains and the arts… warm up]

It's normal that Furtherfield should pay attention to the blockchain. It is an emerging network technology and we are an arts led community who work with networked media and pay attention to how network technologies are changing reality. As Marc Garrett, Furtherfield's co-director has written: 'The meaning of art is in perpetual flux, and we examine its changing relationship with the human condition… Neo-liberalism's panoptic encroachment on everyday life has informed Furtherfield's own motives and strategies and, in contrast with most galleries and institutions that engage with art, we have stayed alert to its influence as part of a shared dialogue.'[26]

Like many people we started experimenting in the Furtherfield office, with mining bitcoins in the late noughties, but not with any real focus. It was difficult and boring, it wasn't art and it didn't make any sense. We have since trashed those old computers with their wallets installed (these would be worth tens of thousands of ££££s now).

Over the following years artist and hacker Rob Myers, a long-time Furtherfield contributor and advisor, wrote a series of articles and made a series of software-artworks that explored algorithms, accelerationism, art in the era of smart contracts, and the relationship between conceptual art and cryptocurrency. In 2014 he shared with us a draft for a paper called *DAOWO – DAO it With Others* [27] which set the scene for our work with the blockchain. It proposed to combine DAOs with *DIWO (Do It With Others)* [28] – arts-led methods and actions for critical and collaborative production and a commons for arts in the network age. It pointed at the many internal ethical contradictions of the rhetoric surrounding blockchain developments, all of which resonated very strongly with me, as a recovering WWW-utopian.

It was at this point that philosophical fascination coincided with an increasingly urgent need to build a more resilient future arts economy to sustain Furtherfield's communities and platforms. Art is, after all, practical philosophy and as media art pioneer Shu Lea Cheang has noted: 'Money, value, monetary exchange... These concepts have long been excluded from the field of new media, as if the Internet and Net Art were emancipated from these issues, living not on love and fresh water but on silicon and bits, living in a utopia of collective intelligence detached from economic constraints.' [29] Accordingly, we were gripped by the idea that interventions into established currency systems by citizens, artists and cultural workers could provide a source for new thinking and potentially create an ecology of value and values in which arts and artists would play a central role.

This prompted further investigation and we started to take inspiration from, and to connect up with, the work other people and programmes such as the the activist hedge fund *Robin Hood Cooperative*, [30] *Digital Futures: Money No Object* [31] with Rachel Falconer at the White Building and Irini Papadimitriou at the V&A in London; *MoneyLab* [32] at the Institute of Network Cultures, Amsterdam; and the experimental Art Reserve Bank [33] where you can change your money into a new reserve currency created by artists. We continued to be informed by our friends at the Foundation for Peer to Peer Alternatives [34] which proposes theories and methods for a transition to a global commons; and by our *Reading the Commons* group led by Tim Waterman, Research Associate in Landscape Commons, at Furtherfield. Most crucially it was activated by 20 years of art and conversation between hundreds of artists, techies, activists, thinkers and doers with diverse perspectives, who participate from around the world on the Furtherfield website [35] and the Netbehaviour email discussion list.

[Dance!]

Futherfield launched the *Art Data Money* programme in Autumn 2015 with the intention of drawing an active international community of artists, technologists and activists to look at the opportunities for increased collaboration and sustainability in the arts offered by big data and the blockchain. We invited them to join us online and at our 2 venues, a gallery and lab space in the heart of Finsbury Park in North London to build a commons for arts in the network age for a programme of:

❑ **Art Shows where finance, cryptocurrencies and data are made tangible through critically engaging, feelable artworks for everyone.**

❑ **Labs using hacking, play, and artistic techniques to take apart existing financial structures; algorithms and data flows to discover how they work and create new more participatory models.**

❑ **Debates involving an alliance of diverse partners to generate new conversations, networks, and ways of organising value exchanges across traditional divides.[36]**

In 2015 we curated an exhibition at Futherfield Gallery and a toured an offshoot exhibition around the UK with Digital Catapult. *The Human Face of Crypto Economies* (2015) [37] and its accompanying lab series featured work by Dani Admiss, Émilie Brout and Maxime Marion, Shu Lea Cheang, Sarah T Gold, Jennifer Lyn Morone, Rob Myers, The Museum of Contemporary Commodities (MoCC), Brett Scott at the London School of Financial Arts, and Cecilia Wee. The work sought to demystify money and cryptocurrencies, to discover in whose interest data is gathered and circulated, and at how we might produce, exchange and value things differently in the age of big data and the blockchain. This work garnered a broad spectrum of attention, review and discussion from across the art, blockchain and fintech worlds. In 2016 we received a small research collaboration grant from The Culture Capital Exchange, to work with Sam Skinner of Torque to explore the possibilities for experimental publishing on the blockchain.

2016 also saw the start of a partnership between myself and Ben

Vickers of UnMonastery and Serpentine Galleries that brought focus to our shared ambition for more social engagement, and activist organization, and a desire to interrogate and address more closely the possibilities offered by the blockchain for cooperation and collaboration within the art world.

In April 2016 we convened a two day event to explore the potential for the arts of the blockchain. The first day's workshop at Furtherfield Commons brought together a range of artists and developers, researchers and activists to map the fast emerging field. Much of the work of participants in that workshop is represented in this book. Jaya Klara Brekke and Elias Haase crystalize the ethical challenge to developers in the form of *The Satoshi Oath*, setting out one of the clearest analyses I have seen of the worrying and dangerous absence of scaffolding for social responsibility in engineering and enterprise cultures. Curator and theorist Helen Kaplinsky points out the current trend in arts-focused blockchain startups such as Ascribe, Monegraph and Verisart (that focus on IP tracking for digital art and provenance of artworks) to replicate the Victorian conception of art, represented by the operations and capital flows within existing museum and gallery systems, in the service of the artworld oligopoly. She also discusses *Ampliative Art*, an early art DAO mapped out by Spanish artist-academic Adrian Onco who was also present. Artist and researcher, Kei Kreutler drew connections between artist manifestos and organizational constitutions that may inscribe the solidarity-generating (or otherwise) values of arts collectives into DAOs. Max Dovey, over from the Institute for Network Cultures, brought his experience of programming the *MoneyLab* conference and his recent participation in a blockchain bodystorming workshop with Chris Speed and the Design Informatics team at the University of Edinburgh, in which their *Geocoin* prototype app provided the catalyst for the devising of a temporary, location-based Bitcoin marriage system as an exploration of informal contracts. This is the starting point for his article in this book about the consequences of the blockchain's immutability rule and the dangers of irreversible contracts. Also present was Sam Skinner, co-director, with Nathan Jones, of the experimental publishers Torque, with whom we collaborated on this very book!

The second day's event was of a different nature. Hosted by the Austrian Cultural Forum, we invited art and technology worldplayers, thinkers and policy makers to gather together, in order to share our findings and invite them to rise to the challenge of engaging with this critical moment in history, stating in no uncertain terms:

'blockchain technologies are set to shape the next century.'

We offered a short introduction to the affordances of the technology and then presented our view on the potential impact of the block-chain and arts together, informed by the previous day's discussions:

❏ **New funding models – Renegotiation of the economic and social value of art.**

❏ **Lowering the cost for organising – DAOs could remodel collaboration.**

❏ **Automated solidarity for artists and new kinds of audi-ences, patrons and participants.**

❏ **Unanticipated futures – New imaginaries for how we act in the world.**

❏ **Redefine 'Authorship' – Incentives for fractional, progres-sive ownership & collective production of art and livelihoods.**

❏ **Opening up black box technologies – to diversify engagement**

This event provided the context for thinking together and learning quickly without a preset artistic, commercial, or ideological agenda. What emerged was a cautious interest in the 'potential for blockchain to devolve mechanisms and processes for funding for artists, as well as allowing various players in the arts ecosystem – artists, collectors, viewers, curators, and others – to define how they want to interact, with the possibility that sharing and artwork almost merge, or at least become as two sides of the same coin.' [38] This event was notable for its presentation of the technology as inherently ambiguous, in contrast to critiques of it as both literal fascism, [39] and 'to the original libertarian or revolutionary claims made for Bitcoin, the evolution of the technology today seems to offer as many risks of a dystopian future as emancipatory opportunities.' [40] There was also a level of perplexity in the audience and a desire voiced for making the subject more accessible, while still critical. I'm sure that someone said that a book may aid this!

We followed this up with the creation of the short film *The Blockchain: Change Everything Forever* directed by film maker Peter Gomes (2016), in collaboration with Digital Catapult, London, which set

out to broaden the range of people involved in its future by bringing together leading thinkers, computer scientists, entrepreneurs, artists and activists. It asked 'What can a blockchain do? Who builds this new reality? How will we rule ourselves? and How will the future be different because of the blockchain?' [41] We deliberately selected contributors across the spectrum – from fierce critics to evangelists, and we made an art film. This film has been described as 'the most critical film yet to be made about the blockchain' [42] (there is a LOT of blockchain video marketing out there). It has been watched online by over 13,000 people and viewed at art exhibitions, screenings and blockchain conferences and festivals around the world.

Since this time we have been building our understanding and range of approaches to working with blockchains. At MoneyLab 2016 Vickers and I ran a *Live Action Role Play* for 35 people called *Role Play Your Way to Budgetary Blockchain Bliss*. It took the hackathon as a scenario and made concrete the inequities often at play at the start of any real world enterprise. Pablo Velasco's account in this book captures the methods and spirit of the event. This activity was a precursor to a series of smart contract role-play and design activities for people of all backgrounds and disciplines where participants will write social relations into code as a basis for debate. From Autumn 2017 we will partner with Goethe-Institut on a series of *DAOWO* workshops to build capacity in the arts for working with and understanding blockchain, as part of a European collaboration project *State Machines: Art, Work, and Identity in an Age of Planetary-Scale Computation*.

Our recent exhibition at Furtherfield Gallery *NEW WORLD ORDER* [43] invited visitors to imagine a world in which responsibility for many aspects of life (reproduction, decision-making, organization, nurture, stewardship) are mechanised and automated. Transferred, once and for all, from natural and social systems into a secure, networked, digital ledger of transactions and computer-executed contracts. Envisioning a future world of world-making machines, markets and natural processes, free from interference by states and other human institutions. These included two blockchain-based artworks, both presented in this book: O'khaos' self-replicating metal flower *Plantoid*, a new hybrid life-form that evolves on the blockchain, and *terra0* the augmented forest that owns itself and sells its own assets on the blockchain. It also presented the crypto based sci-fi story *Bad Shibe* by Rob Myers with illustrations by Lina Theodorou, reprinted here, which is a pathos-rich meditation on the emergence of ideologies propounded and executed by an elite of technical experts who are also free market believers. The installation by xfx (*a.k.a.* Ami Clarke), also

represented in this book, included a video as data capture, showing glimpses of the material parts of an Ether mining rig. It conveys the energy used and the sweat equity of a DIY cryptocurrency prospector with finely tuned financial calculations and a (not so free) money mining system. This exhibition will tour in 2018 to Aksioma, Slovenia and Drugo More, Rijeka as part of the *State Machines* programme.

All of this work is also helping to prepare the ground for moving a part of Furtherfield onto the blockchain in the context of Platforming Finsbury Park, a 4 year initiative in which we plan to transform Finsbury Park in Haringey, North London, into a canvas for adventurous, world-class digital art, and into a site for fieldwork in human and machine imagination. Our intention is to think through, with researchers of all stripes, the ways in which artists, participants and audiences might create, value and circulate previously unimagined artforms to interact with beliefs, decisions and intentions. The three most interesting design problems we anticipate are: how to ensure that any cultural value generated benefits diverse local communities; how to value strangeness, difference and mystique (without which we might ask, what value is art?) and; how to negotiate the bridge between users of local physical spaces and international digital networks.

We do not underestimate the work to be done here but look to the work of socially, artistically, and design minded organizations and projects already underway: Ascribe, Aragon, Art is Open Source, Backfeed, Colony, Constant, Deckspace, Faircoin, Freecoin, Metahaven, Robin Hood Cooperative, Upstage.

The artists working with the early WWW created software to craft experiences and relationships, pre-empting by 10 years, developments in the social web. Audiences for Net Art[44] became participants in and co-creators of distributed online artworks, making really strong user interfaces to engage people. The new social relations were integral to the aesthetics and message of their work. Many recent technology developments offer promise and potential as artistic media, for cultural contexts, and for expanding expressive potentials and dramatic interventions. As a new network protocol the adoption and formation of new forms of the blockchain has the potential to provide the organising principles for the deployment and use of other emerging technologies and tech cultures, IoT, VR, AR, AI, and Biotech.

If we have learned anything in our twenty years of effort to produce artworks and art contexts to stimulate and diversify debate around life since-Net it is that decentralized infrastructure does not equate

to decentralized resource or power, or at least not for any length of time. Blockchain technology 'isn't inherently emancipatory, just as it isn't inherently repressive. The blockchain can be used to support pretty much any political outlook.'[45] This is a point worth pressing on and is best understood by work going on around cultures of the commons. These promote constructive experimentation through peer learning, nuanced openness, access to knowledge, tools and contexts that extend freedoms of expression, association and collaboration. But this is also accompanied by the understanding that it's not enough for radicals just to build. Their visions must also incorporate processes of maintenance and stewardship in order to negotiate ongoing prosperity in contexts, increasingly uncertain, chaotic and unpredictable conditions, or else see their communities or cultural commons harvested, hoovered and alienated by recentralizing forces. It is for this reason that artists' engagement with the art and politics of infrastructure – through discussions of power, law, governance, cooperation, creative collaboration, cultural stewardship, legacy and expression – are a running theme through this book.

One of our intentions in creating this book is to offer a set of differently crafted lenses through which to spy a territory, some of which exists only in our imaginations. By reading it and by playing its marketized contributions through the FinBook platform that is threaded through it, you will discover more about the origins, concepts, uses and users of blockchain technologies at work now, and to make your own mind up about what a future with the blockchain will be. Our understanding is that, as with the early days of the WWW, we have an opportunity to build our own contexts for cultural production. We should be ambitious and aspire to construct an ethical perspective on the networked society that Gene Youngblood describes as an 'ecosocial nervous system' operating across 'translocal social heterotopias'.[46]

In order to achieve this we must involve more diverse people in the process of making the game rather than increasing the number of people who are just to be played!

[Acknowledgements and thanks]

Marc Garrett, for being a critically engaging badass, and a dedicated partner in adventures of the networked imagination. The unstoppable creative experimentalists Nathan Jones and Sam Skinner of Torque publishing. Peter Gomes, Kei Kreutler, Rob Myers, and Ben Vickers for high art and high geek insight and inspiration and

crypto-solidarity. For generous, accessible and engaging writing and acting about crypto-things and why they are important Vinay Gupta, Dr. Catherine Mulligan, Brett Scott and Melanie Swan. My fellow blockchain-curious Londoners: Rachel Baker, Lara Blazic, Alexie Blinov, Ami Clarke, Neil Cummings, David Cross, Lisa Haskell, Helen Kaplinsky, Amit Rai, Lucy Sollitt, James Stevens, Mark Waugh, Cecilia Wee, Martin Zeilinger and; internationally: Shu lea Cheang, Max Dovey, Dr. Rachel O'Dwyer, Dr. Primavera De Filippi, Holly Herndon, Alexandre Monin, Cornelia Sollfrank, Hito Steyerl and terra0.

For inspiration: Ampliative Arts, Art is Open Source, Ascribe, Aragon, BigchainDB, Carroll / Fletcher Gallery, Colony, DAOWO, D-Cent, Facecoin, Faircoin, Foundation for P2P Alternatives, Entropical, iMAL, Institute of Network Cultures, London School of Financial Arts, Network Disruption Lab, Netbehaviour discussion list, Monegraph, O'khaos, Plantoid, Robin Hood Cooperative, MoneyLab, Spiralseed, Torque, unMonastery, Upstage.

Partners and funders of this work include: The energetic and endlessly enquiring team from the Design Informatics Dept at the University of Edinburgh University headed up by Dr. Chris Speed, with Rory Gianni, Bettina Nissen,and Shaun Oosthuizen. Arts Council England, Computer Arts Society, Digital Catapult, FACT, Goethe-Institut, Haringey Council, London, Ravensbourne, Southbank Centre, The Culture Capital Exchange, The Creative Europe Programme of the European Union and the State Machines network: Aksioma, Drugo More, Institute of Network Cultures and NeMe.

Finally, heartfelt thanks to all Furtherfielders. You know who you are!

Notes

1   Opening statement at *Potentials for the Arts of the Blockchain* at Austrian Cultural Forum, April 2016. Convened by Furtherfield and Ben Vickers.

2   Artist and researcher, Kei Kreutler in *The Blockchain: Change Everything Forever*, A Furtherfield film by Pete Gomes, 2016.

3   See the interview by Marc Garrett with Holly Herndon and Mat Dryhurst in this book.

4   *How Many Things are Currently Connected to The 'Internet of Things' (IoT)?* http://forbes.com/sites/quora/2013/01/07/how-many-things-are-currently-connected-to-the-internet-of-things-iot

5   $1.4bn investment in blockchain start-ups in last 9 months of 2016, says PwC expert John Kennedy, *Silicon Republic*, November 2016, http://linkis.com/Ayjzj

6   UBS White Paper for the World Economic Forum, Annual Meeting 2016, *Extreme Automation and Connectivity: The Global, Regional, and Investment Implications of the Fourth Industrial Revolution.*

7   Catlow, Ruth. 'WE WON'T FLY FOR ART: MEDIA ART ECOLOGIES.' *Culture Machine*, Vol 13, 2012, http://culturemachine.net/index.php/cm/article/download/475/493

8   Gene Youngblood in Third Space Network convened by Randall Packer, 2017, http://thirdspacenetwork.com/gene-youngblood

9   See also: Catlow, Ruth. *Art and the Blockchain, Digital Catapult*, 2016, http://digitalcatapultcentre.org.uk/art-and-the-blockchain

10   http://dcentproject.eu

11   http://fair.coop/faircoin

12   Myers, Rob. 'Conceptual Art, Cryptocurrency and Beyond.' *Furtherfield*, 2014, http://furtherfield.org/features/conceptual-art-cryptocurrency-and-beyond.

13   *The Blockchain: Change Everything Forever*, 2016.

14   http://en.bitcoin.it/wiki/Genesis_block

15   http://www.ethereum.org

16   Gupta, Vinay. 'Programmable Blockchains in Context: Ethereum's Future.' *Conensys*, 2015, http://media.consensys.net/programmable-blockchains-in-context-ethereum-s-future-cd8451eb421e

17   This elaborates on a slide presented at the Austrian Cultural Forum, April 2016 in an event convened by Furtherfield and Ben Vickers in which we invited arts and policy makers to join us to explore the potential for blockchain and the arts.

18   Proof-of-work is the system used by Bitcoin and other major cryptocurrencies at time of writing. However other systems are now being developed to address energy use. Ethereum is working on proof-of-stake and, to discourage hoarding and currency speculation, Faircoin now implements proof-of-cooperation.

19   This long explanation is reprinted mostly verbatim from my *Afterword* for *Bad Shibe*, 2017. I'm pleased to say that this glorious Dogecoin-inspired sci-fi novella by Rob Myers is reprinted here along with illustrations by Lina Theodorou.

20   *The Blockchain: Change Everything Forever*, 2016.

21 'Vitalik Buterin explains Ethereum.' *YouTube*, http://youtube.com/watch?v=TDGq4aeevgY.

22   Antonopoulos, A.M. *The Internet of Money*. Createspace Independent, 2016.

23 *SEC Issues Investigative Report Concluding DAO Tokens, a Digital Asset, Were Securities* issued by U.S. Securities and Exchange Commission, Washington D.C., July 25, 2017, http://sec.gov/news/press-release/2017-131.

24   Asked in all seriousness by Vinay Gupta, in one of his informative, entertaining and terrifying podcasts.

25   Dr. Catherine Mulligan, in *The Blockchain: Change Everything Forever*, 2016.

26 Garrett, Marc. 'Furtherfield and Contemporary Art Culture – Where are We Now.' Furtherfield, 2015, http://furtherfield.org/features/articles/furtherfield-and-contemporary-art-culture-where-we-are-now.

27   http://furtherfield.org/artdatamoney/includes/files/daowo.pdf

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34   http://p2pfoundation.net

35   http://furtherfield.org
36   http://furtherfield.org/artdatamoney

37   http://furtherfield.org/programmes/exhibition/human-face-cryptoeconomies

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39   Golumbia, David. *The Politics of Bitcoin, Software as Right-Wing Extremism*. University of Minnesota Press, 2016.

40   *Ibid.*

41   Made in collaboration with London's Digital Catapult http://furtherfield.org/projects/blockchain.

42   In conversation with Pablo de Soto of Hackitectura.

43   http://furtherfield.org/programmes/exhibition/new-world-order

44   In her 2011 book Nettitudes – *Let's Talk Net Art*, Josephine Bosma describes Net Art as 'art based on Internet cultures, which revolve around technology, games, social networks, commerce and politics.'

45   Chakrabarti, U. Kanad. 'From Bearer Bonds to the Blockchain: Artistic Perspectives on Digital Money.'

46   Gene Youngblood in Third Space Network convened by Randall Packer, 2017, http://thirdspacenetwork.com/gene-youngblood.

DOCUMENTS

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FinBook: Literary Content as Digital Commodity

This short essay explains the significance of the FinBook intervention, and invites the reader to participate. We have associated each chapter within this book with a financial robot (FinBot), and created a market whereby book content will be tracked against financial securities. As human labour increasingly consists of unstable and uncertain work practices and as algorithms replace people on the virtual trading floors of the world's markets, we see members of society taking advantage of FinBots to invest and make extra funds. Bots of all kinds are making financial decisions for us, searching online on our behalf to help us invest, and to consume products and services. Our contribution to this compilation is to turn the collection of chapters in this book into a dynamic investment portfolio, and thereby play out what might happen to the process of buying and consuming literature in the not-so-distant future. By attaching identities (through QR codes) to each chapter, we create a market in which the chapter can 'perform'. Our FinBots will trade based on features extracted from the authors' words in this book: the political, ethical and cultural values embedded in the work, the extent to which the FinBots share authors' concerns; and, the performance of chapters amongst those human and non-human actors that make up the market, and readership. In short, the FinBook model turns our work and the work of our co-authors into an investment portfolio, mediated by the market and the attention of readers.

By creating a digital economy specifically around the content of online texts, our chapter and the FinBook platform aims to challenge the reader to consider how their personal values align with individual articles, and how these become contested as they perform different value judgements about the financial performance of each chapter and the book as a whole. At the same time, by introducing 'autonomous' trading bots, we also explore the different 'network' affordances that differ between paper based books' scarcity developed through its analogue form, and digital books' uniqueness reached through encryption. We thereby speak to wider questions about the conditions of an aggressive market in which algorithms subject cultural and intellectual items – books – to economic parameters, and the increasing ubiquity of data

bots as actors in our social, political, economic and cultural lives. We understand that our marketization of literature may be an uncomfortable juxtaposition against the conventionally-imagined way a book is created, enjoyed and shared: it is intended to be.

About the FinBook platform

Our intervention takes the form of a software with personality. In the FinBook ecosystem, the bots trade FinCoins. Each person who reads a proportion of the 28 articles in this book is allocated a collection of FinCoins – our unique cryptocurrency – to invest across the chapters. If they see an article they like, a QR code on the article takes them to a dashboard for the FinBot representing the article. The reader can see how the bots have understood the chapter, based on coding. This then influences trading, as readers can then invest some of their FinCoins in the bot's portfolio. This means the bots flourish both by being good traders and by representing well-liked articles accurately – or at least attractively.

At the launch of the book, each bot starts with a small stash of FinCoins to trade with, distributed evenly across all of the articles. Readers are invited to change the amounts of value that is assigned to the different bots, shifting more of the funds to favoured authors and away from less favoured. The interactions take place through the use of the QR codes linked to the FinCoin wallets of each article. FinCoins simulate a trusted party, 'proof of book' blockchain online – speculating that every time a copy of the book is sold, a new block is minted, containing fresh coins for the reader, and gathering up all pending transactions.[1] The speed with which readers can adjust value is hence linked to the rate of book sales, eventually annealing to a stable configuration once the last copy is produced.

Behind each article wallet sits a single FinBot, running on an automated trading platform. Based upon the content of each author's article, the FinBots have been designed to reflect the characteristics of each chapter. In order for the Finbot to start investing, it requires as many tags as possible which then helps the bot to decide which area to invest in. Each FinBot considers three categories based on the features extracted from the text. These include ethical and socio-political preferences, financial considerations, and inferences regarding security and risk. The team have pre-assigned tags to each chapter using the Thomson Reuters OpenCalais (OC) software. The OC software uses Natural Language Processing (NLP) and machine learning algorithms

to identify tags based upon the frequency of people, places, companies, facts, and events that occur in textual content of each chapter. These tags come from a two tiered process. First, the team imports the contents of each chapter to Open CalaisOC which tags the document based on Thomson Reuters OpenCalais toolmarket led ontologies. OpenCalais is the NLP and machine learning element of the process. Then second, the team constructs an economic profile for each chapter based on the tags from the NLP process, along with subjective and qualitative assessment. Clearly, here there is a tension between the human process of assigning value judgements based on reading and understanding the text, and the process of using algorithmic automated content labelling to assign values to complex content. As a consequence of the steps outlined above, each FinBot has been assigned a behaviour, in a similar process to above, with the team assigning 'beliefs' and behaviour styles.

The criteria that align with the FinBots socio-political and ethical preferences will follow trends, with FinBots investing FinCoins in chapters when it seems favourable and holding on to them as they (hopefully) increase in value. Other securities are of interest, but are treated purely as investments; the FinBot will try to make money buying, selling or shorting them purely as a way to increase profit. Finally, some securities are antagonistic to the bot's core beliefs. It will do its best to short these, thereby creating competition between different bots with different personalities. This means that each FinBot is only considering a small proportion of the overall market – its particular view onto the world driven by the article's text. Similarly, the text drives its investment personality, determining how aggressively or conservatively it trades.

Every bot has a trading history, and an on-going investment portfolio. Via the dashboard for each FinBot, readers can see the decisions that it has made, the financial implications, and the collection of newsfeed relating to its stocks that showcase the *umwelt* – the bots-eye-view of the global trading system.

Discussion: Book chapters as a digital market

What does it mean to establish a digital market within an edited volume? In this intervention, we have gone beyond the current market places of online booksellers by facilitating the direct trading of the content itself. Through this, we have exposed several interesting and provocative questions regarding the use of even ostensibly

non-personal data as currency. These relate to issues of trust, agency and politics.

Trust in a distributed digital economy

As stated above, FinBook has atomized this collection into a series of chapters which each have their own identities and their own financial portfolios to allow them to 'perform' within a specific digital economy. As 'more than human' agents, each chapter can be seen to perform within the broader financial markets and return investment or loss according to their co-dependence upon securities that are pre-defined by content within each chapter. This raises the question, in whom or what to we place our trust in a decentralized economy?

Rachel O'Dwyer suggests that blockchain technologies, by enabling cryptocurrencies, will move us towards a decentralized society – engendering trust in code rather than trust in people and institutions (O'Dwyer, 2015). As discussed throughout this book, the blockchain is therefore a direct challenge to the centralising tendencies of both state-led and monopoly-capitalist forms of social organizations, in which, crudely speaking, power is exercised through state apparatus or that of large corporations. However, in our provocation as blockchain simulation, it is clear that power still circulates and pools unevenly to different chapters – illustrated in the fact that some chapters are 'liked' more than others, and thereby gain more cultural capital and 'value' within our scenario's parameters. While we have disrupted the idea of trust by moving away from the notion of trusting in conventional publisher's or authors' tastes or biases, towards trusting in bots' exectution of data and code, we have also shown that this does not necessarily lead to even outcomes. In short, a decentralized market is not necessarily a fair one because the criteria predetermined by authors of the algorithms (in this case FinBots) is likely to be sympathetic to some texts than others.

We have also explored how bots, as agents, can influence a chapter's popularity, and, in our economy, this means effecting its value. In the FinBook market, a chapter has a blocked and encrypted value, which is 'mined' through being bought, read and interpreted. The more individuals mining the book, the more the value of the chapters increase. This uses digital economy processes and FinBot agents to mimic the process of a book gaining in popularity in a culture – perhaps becoming canonical. The process through which a book gains in popularity and becomes established as part of the cultural and literary

canon is of course a complex one in a non-digital context, driven by uneven and unfinished processes of gender inequality, class, marketing, and many more. Most obviously, the existing digital marketplace for books favours tech giants such as Amazon. The use of data bots to further commodify the data of readers and products of authors alike is likely to further consolidate power and market share in the hands of this small number of actors. Rather than abstracting our digital economy from these aspects, we have tried to introduce bots with different and unpredictable 'personalities' to illustrate how the existing power relations that influence cultural consumption are currently configured.

At the same time, our approach has intentionally disempowered authors as to the judgements made on their text, instead tracking the value of a chapter through a financial market powered by non-human agents whose tastes are opaque and unpredictable. This, in turn, exposes interesting dimensions around the politics of decentralized markets. We now turn to discuss these.

The politics of FinBook

The FinBook intervention aims to expose the narratives of freedom that are commonly associated with the Blockchain and decentralized digital exchange. The rhetoric most immediately associated with blockchain technologies is a variety of Libertarianism – the political philosophy that ascribes to principles of the right to private property, freedoms of speech and worship and legal equality. Libertarianism's fundamental claim is that individual liberty takes precedent over any form of social or collective organization, and the state should exist only to protect individual rights. It is therefore easy to see why blockchains and cryptocurrencies become associated with Libertarianism, in that they promote freedom (by allowing parties to trade directly), guarantee anonymity (by providing cryptographic proof) and reduce the need for state governance (by removing the necessity of trusting institutions like banks and states, and instead trusting code) (Nakamoto, 2008). [2]

FinBots throw the neo-liberal narratives that surround blockchain technologies into sharp relief. By creating an automated platform where a FinBot can piece together its own 'personality' dependent on book content, we have programmed particular ethical and political values into entities with their own capacity for behaviour. Some of these bots, undoubtedly, have their world views centred around individual competition and investment for 'personal' gain. Moreover,

the stage of interaction that we have set for these agents – a competitive trading scenario – encapsulates the freedoms (and dangers) of the market, in which supposedly self-centred individuals are motivated wholly by their own agendas, subject to the minimal amount of governance necessary to promote trading. In this world, books and chapters that are well-liked by readers and well-understood by FinBots (regardless of any other literary quality) are successful, and success is defined in market-driven terms.

However, we have also exposed a conceit of the supposedly free market. As observed by Garrod (2016), the kinds of freedom promoted by blockchain Libertarianism are very particular ones; namely, freedoms *from*. This particularly includes freedom from state regulation and freedom from identification. These freedoms are very much tied to the Libertarian ideology set out above. In our scenario, we have disempowered those labouring agents (the authors), and curtailed the freedom of their texts, promoting the freedoms of the FinBots instead. In this sense, these other agents have had their freedoms curtailed, particularly the freedom from commodification, perhaps abstraction, of their labour by a market proxy. Moreover, the agency of the reader, as traditionally imagined, is changed in our scenario. Readers are conventionally portrayed as end-point consumers of texts, whereas in our scenario, readers contribute data and change the value of the text in a dynamic process.

The decision to foreground some freedoms while hiding other, forced or obligatory relationships, as critics of free markets point out, is a political choice (Tickell and Peck, 2003). In short, markets require a lot of ideological and regulatory support to maintain a façade of freedom. By exposing rather than hiding the conceit that the market serves its participants fairly by promoting freedoms, we therefore critique the uneven relationships which drive contemporary data economies.

Conclusions

In this chapter, we have described our FinBook intervention, a financial market place where bots and human readers trade with each other on the basis of book content, using information accessed through the QR codes in each chapter of this book, and underpinned by a cryptographic currency. We have created an automated trading platform where any piece of text can become a position taken by a FinBot, which uses features from the article to decide where and how to invest. FinBots run autonomously as market players, and act along

with human readers to dictate the value of a chapter. The market is run with live stock-market data, and can easily be ported to run with actual money. Regardless, the actual value to authors who generally want their work to be viewed, through promotion and association within a cultural system, becomes a representation of value that is equitable to money. Each chapter and FinBot has a dashboard so traders – readers, authors – can view current trading balance, portfolio and news related to its stocks, for a bot centred view on the world.

This software has allowed us to reflect on uncomfortable aspects of data commodification by asking readers to trade directly in cultural capital in a marketplace populated by human and non-human actors. We have investigated data quantification methods, made possible by blockchain technologies and data bots, by turning a book into a financial market with individual chapters as products, thereby giving articles a financial agency that is in tension with that of the authors, readers and publishers. In doing so, we have provided broader insights into the complexities of engendering trust in a decentralized environment, revealing the trade-offs between markets which are structured to place trust in institutions (through conventional fiat currencies), those which place trust in data and code but which pool power in large tech stacks (such as Amazon), and a blockchain-powered market in which bots might have agency in determining the value – and therefore visibility – of cultural, literary and intellectual works. In this sense, we have tried to anticipate some limitations and complexities of financial technologies.

Notes & References

1   In practice, we do not use the blockchain, but we would invite the reader to imagine that we do, as it makes the technical development significantly easier, without materially affecting the experience.

2   Through these characteristics, 'cryptocurrencies have become associated with the hyper-individualism of conservative libertarianism' (Scott, cited in Huckle and White: 6; see also Garrod; Karlstrøm).

3 Garrod, J. Z. 'The Real World of the Decentralized Autonomous Society.' *tripleC: Communication, Capitalism & Critique*. Open Access Journal for a Global Sustainable Information Society 14.1, 2016, pp. 62–77.

4 Huckle, Steve, and Martin White. 'Socialism and the blockchain.' *Future Internet* 8.4, 2016, p. 49.

5 Karlstrøm, Henrik. 'Do libertarians dream of electric coins? The material embeddedness of Bitcoin.' *Distinktion: Scandinavian Journal of Social Theory* 15.1, 2014, pp. 23–36.

6 Nakamoto, Satoshi. 'Bitcoin: A peer-to-peer electronic cash system.' 2008, p. 28.

7 O'Dwyer, Rachel. 'The Revolution will (not) be Decentralized: Blockchains.' *Commons Transition*, 2015. Available at: http://commonstransition.org/the-revolution-will-not-be-

decentralizedblockchains

8 Tickell, Adam, and Jamie Peck. 'Making global rules: globalization or neoliberalization.' *Remaking the global economy: Economic-geographical perspectives*, 2003, pp. 163–182.

Plantoid – The Birth of a Blockchain-Based Lifeform

The emergence of a new species

A Plantoid is the plant equivalent of an android; it is a robot or synthetic organism designed to look, act and grow like a plant. There are currently several species of Plantoids in existence around the world.

This particular species of a Plantoid is an autonomous blockchain-based lifeform that is able to reproduce itself. It is a hybrid creature that lives both in the physical world (as a mechanical contraption made up of recycled steel and electronics) and the digital world (as a software deployed on top of a blockchain-based network).

The goal of the Plantoid is to illustrate one of the most revolutionary – and yet still unexplored – aspects of blockchain technology. It illustrates the ability to create 'blockchain-based lifeforms', *i.e.* algorithmic entities that are **(1)** autonomous, **(2)** self-sustainable, and **(3)** capable of reproducing themselves, through a combination of blockchain-based code and human interactions.

These new types of entities are difficult to apprehend for most people. Blockchains are decentralized peer-to-peer networks, like Bitcoin, that enable people from all over the world to interact, coordinate, and transact value with one another in a secure and decentralized way. Software code can be deployed on a blockchain-based network to create programs (*a.k.a* smart contracts) that are run in a distributed manner by all nodes supporting the network. As opposed to traditional software code, run on centralized servers and administered by an online operator, smart contracts can be designed to run autonomously, independently of any central authority or middlemen.

The Plantoid is an attempt at using the artistic medium to illustrate the inner workings of these autonomous systems, so that people can better understand the potential benefits and challenges of this powerful, emergent technology. A Plantoid is composed of two essential components:

❑ **The body of the Plantoid, *i.e.* its physical form, consists of an electro-mechanical contraption that simulates the appearance of a plant. It is a welded metallic sculpture displayed in a public space; an aesthetic ornament that exhibits its mechanical beauty to whoever it encounters. When it enters into contact with organisms in the physical world – *e.g.* human beings – who might display some form of appreciation towards the Plantoid (usually through the remittance of a small donation), the Plantoid might awaken into a dance of music and lights, animated by a mixture of mechanical greed and gratitude.**

❑ **The spirit of the Plantoid, *i.e.* its soul, only subsists in the digital world and is represented by an autonomous software agent that lives on a blockchain. This is what constitutes the actual soul of the Plantoid – since the physical body is simply a means to connect its inner logic with creatures in the physical world.**

These two components interact with one other in order to bring the Plantoid to life, and, most importantly, to ensure that it can reproduce itself over time.

Like every other life form, the main function of the Plantoid is to reproduce itself. It does so by enticing the curiosity of people it encounters with its physical beauty, luring them into feeding it with some cryptographic money, in order to awaken it and contribute to its ongoing reproduction process. Contributions are done via the Bitcoin blockchain, by simply sending funds to the Plantoid's Bitcoin wallet.

Once a Plantoid has proven its worth by accumulating a sufficient quantity of bitcoins, it will enter into the reproductive phase, initiating a procedure whereby the Plantoid will look for mates (*i.e.* humans) willing to help it in the process of reproducing itself.

An autonomous being

The fundamental mechanism underpinning the operations and evolution of each Plantoid is a small piece of software (or smart contract) deployed on the Ethereum blockchain. The software is autonomous, in that it is executed in a distributed manner by all nodes participating to support the underlying blockchain network. Also, because of the properties of a blockchain, once deployed, the code cannot be altered or shut down by any single party.

As such, every Plantoid operate as an autonomous entity that does not need to respond to anyone, not even its original creator. Indeed, Plantoids are both independent and self-sufficient. Once they have been created and deployed into the world, they no longer need nor heed their creators. Furthermore, because Plantoids ultimately own themselves, they also cannot be purchased or owned by anyone.

People can, however, interact with a Plantoid, and there is the possibility to engage into contractual relationships with it.

The software underpinning a Plantoid establishes the system of affordances and constraints that come along with each and every Plantoid. It pre-defines the rules by which people can interact with a Plantoid, the amount of funds that a Plantoid needs to reproduce itself, and the criteria that must be met by every descendent of a Plantoid. By sending bitcoins to the Plantoids, people also acquire a series of rights that will enable them to participate in the decision-making process for all issues concerning the reproduction of the Plantoid, and beyond.

The contract that each Plantoid establishes with humans varies, assigning different rights and obligations to each of the Plantoid's funders or producers. For example:

❑ **For the funders, the right to participate in the governance structure of the selected Plantoid – *e.g.* establishing the rules that will dictate the reproduction thereof; shaping the way in which the Plantoid might evolve over time, and stipulating the**

terms and conditions by which anyone willing to look after the Plantoid's descendants will have to comply.

❑ **For the producers, these include the right to be credited as the creators of a particular Plantoid, and the right to a fair (or unfair) remuneration whenever that Plantoid receives enough funds to reproduce itself.**

As such, even though Plantoids do not have any legal personality, because the law does not (yet) recognize them as a legal entity, they are nonetheless capable of interacting with other people and machines that exist in the physical world, by means of simple blockchain transactions. Because all code deployed on a blockchain comes with a guarantee of execution, by engaging with a Plantoid, people are contractually bound to, and cannot deviate from the rules stipulated into the underlying smart contract code.

In this sense, Plantoids operate akin to an organization. Yet, in contrast with traditional firms and organizations, such as limited liability corporations, they are entirely autonomous and do not come with any director or CEO. Plantoids are, ultimately, a physical representation of what we commonly refer to as a Distributed Autonomous Organization (or DAO) – an autonomous blockchain-based system that is administered, only and exclusively, through software logic deployed on a blockchain.

A self-replicating entity

Even if it is completely autonomous, Plantoids cannot reproduce themselves on their own. They require the help of third parties to support them in the reproduction process. Just as organic plants often rely on third parties, like butterfly or bees, to support them in the pollination process, Plantoids rely on the cooperation of human beings, assisting them in the process of instantiating themselves into a new physical form.

The reproduction process of a Plantoid can be distinguished into three different parts:

Traditional plants rely on photosynthesis in order to turn light into energy. Plantoids operate instead by turning beauty into digital currency. Hence, while traditionally plants reproduce themselves through the process of pollination, the reproduction of a Plantoid is done through the process of Capitalization. In essence, each Plantoid will seduce people with the aesthetic beauty of their mechanical body and the spirituality of their soul, enticing them into sending bitcoins in order to support their reproduction. As in the case of most human beings, seduction can be done in one or two ways:

❑ **At the physical level, the Plantoid relies on the aesthetics of its physical body to seduce people through a combination of movement, light and sound – just like plants use their colors and sensual smells to attract butterflies and bees to their nectar-filled wombs.**

❑ **At the intellectual level, the Plantoid relies on its underlying software code (*i.e.* the smart contract on the Ethereum blockchain) to provide crypto-economic incentives and governance powers to all people who agree to invest their funds into the (re)production of a new Plantoid.**

Every Plantoid has its own Bitcoin wallet, to which people can send money. Those who enjoy the aesthetic representation or the intellectual properties (governance rights and reproductive logic) of any given Plantoid will submit funds to the Plantoid. Whenever it receives those funds, the Plantoid will evolve and blossom into a more beautiful flower, *e.g.* changing its colors, playing music, and dancing around as a means to gratify the donor for its contribution to the species.

In sending these bitcoins, people provide the Plantoid with the opportunity to fund its own reproduction, while simultaneously acquiring the right to participate into the governance system of the newly created Plantoid.

All bitcoins collected in this way are stored in the Bitcoin wallet of each and every Plantoid. Depending on their form and size, different Plantoids will require different amounts of funds before they can blossom. The Plantoid constantly monitors its Bitcoin balance, and whenever it realizes that a particular threshold has been reached, the Plantoid will be able to use this money to initiate its own reproduction

Overleaf: Mother and daughter Plantoids dance and glow for visitors to NEW WORLD ORDER exhibition at Furtherfield Gallery, London, May–June 2017.

and ensure its survival. Heralding the second phase of reproduction to begin…

(2) Mating phase

As a new species, Plantoids need to evolve and figure out how to best survive in any given environment. As such, they each need to identify the right group of people that they want to 'mate' with.

When the time for reproduction is ripe – *i.e.* when a threshold of funds has been reached – a Plantoid will open a call for bids, inviting artists, designers, makers, hackers, welders, and programmers to submit propositions as to how they envision to instantiate the next Plantoid – using all the bitcoins collected thus far as a bounty to attract these propositions.

Propositions can be submitted by anyone and at anytime. Yet, they all have to be congruent with a Plantoid's genetic code. Indeed, the DNA of every Plantoid, that is, all the logic and rules that govern its growth and reproduction, are recorded on the Ethereum blockchain. These may include certain distinctive aesthetic or physical requirements (such as form, size, or materials for the progeny of a particular Plantoid) that will affect the scope of creativity and the room for discretion left to the artists commissioned to produce the next Plantoid. These may also include business logic (such as, for instance, the dividends given to the funders for any of the funds raised by the subsequent Plantoids, the percentage of these funds that will be given to a particular charity or organization, the share that the initial artist gets for every new Plantoid created, *etc.*) and governance rules (voting rights and processes with regard to the selection and evaluation of proposals, which category of stakeholder is entitled to decide of the future location of the Plantoid, *etc.*). Anyone submitting a proposal must comply with these initial requirements, although they remain free to develop their ideas and expand upon them as they best see fit.

Of course, the Plantoid does not come with any ability to judge the artistic merit and intellectual value of these propositions. It thus relies on the help of human beings to advise as to what is the most appropriate and suitable proposal, given the available funds and evolutionary objectives of the Plantoid. Each contributor to the funding of the Plantoid will be asked to participate on the decision-making as to the selected proposal. These people will be able to vote on proposals

submitted, by sending micro-transactions on the Bitcoin blockchain to the public address that uniquely identifies each proposal. And to the extent that different people might have invested a different amount of money in funding the Plantoid, every vote will be weighted by the amount of funds that each party has effectively contributed. The smart contract will then automatically process all of these inputs and establish a winner.

(3) Hiring phase

Once a winning proposal has been identified, the Plantoid will transfer all of its bitcoins to commission and engage the authors of the proposal in the production, or rather the reproduction, of future Plantoids. This task is facilitated by a smart contract on the Ethereum blockchain (the Plantoid's soul) that stipulates the rules and coordinate the activities of the different stakeholders involved in the reproduction process. Whoever has been selected to give birth to subsequent Plantoids will have the possibility to shape its body and to establish the logic of its soul.

An evolutionary algorithm

Given the characteristics of the reproduction process, the evolution of Plantoids follows a Darwinist approach. Different artists in different geographic locations and cultural environments will implement distinct kinds of Plantoids, whose phenotypes will attract different types of donors, either because of their aesthetic beauty (*i.e. their body*) or because of the underlying economic incentives and governance rules underpinning their operations (*i.e. their soul*). Every Plantoid will therefore evolve into multiple branches or species, each with their own characteristics. From a Darwinian perspective, the reproduction of each and every Plantoid is based on an evolutionary algorithm, with multiple Plantoids experimenting with new physical characteristics, but also diverse personalities and governance structures depending on their environment.

Indeed, the ability of a Plantoid to identify the right characteristics – with regard to their physical form (body) or operating logic (soul) – will enable them to seduce more people and will be the key factor to determine which Plantoids are most fit for their environment. The fittest Plantoids will be able to collect more bitcoins and will therefore be able to ensure the long-term sustainability of their species.

Conversely, those Plantoids that did not successfully adapt themselves to their environment, because they failed to incorporate attractive characteristics in their body or soul, will be less appreciated. These will be unable to obtain enough funds to reproduce themselves, and will most likely exist as a single physical instance that might progressively fade away until extinction.

Eventually, as time passes, Plantoids that successfully emerge from the Darwinian struggle for survival will most likely establish themselves as the dominant species in this evolutionary process. They will be able to reproduce themselves the fastest, and slowly, but steadily, colonize our planet.

A self-sustainable system

Each Plantoid is forever and inextricably connected to both its ancestors and its descendants, with whom it can communicate through a shared blockchain-based network. When they collect new bitcoins, Plantoids can store that value and transfer it through the underlying blockchain.

As described above, once a Plantoid has collected enough bitcoins, it becomes responsible for commissioning humans to aid with its reproduction process. But before doing so, the Plantoid must send a small royalty (*e.g.* 1 percent of the value collected by the Plantoid) to the specific ancestor that has brought the Plantoid into life (*i.e.* the parent), as well as to the producers of the Plantoid at hand.
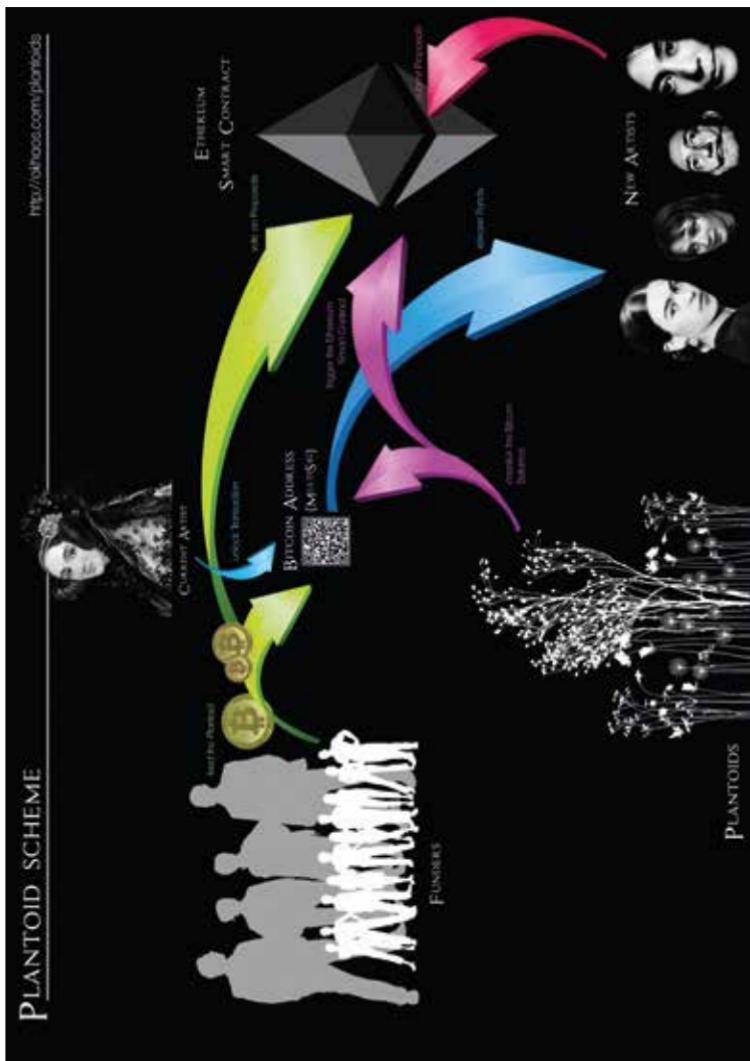
This is not a Ponzi scheme – as is often done in the context of most crypto-currencies – but rather a legitimate pyramid scheme (akin to a multi-level marketing model, where a sales team or person is compensated not only for sales they individually generate, but also for the sales of others they recruit, creating a downline of distributors and a hierarchy of multiple levels of compensation) that is actually beneficial to the system. Indeed, such a model contributes to incentivising the production of Plantoids with the most favorable aesthetics and genetics. The artists commissioned with the (re)production of a Plantoid will not only receive the bitcoins collected by the Plantoid that commissioned them, as an ex-ante (based on forecasts rather than actual results) lump-sum payment, but also a small proportion of the funds collected by all the Plantoids they created, and all the descendants that these Plantoids have generated. These artists thus has an incentive to create the most attractive and appealing Plantoid,

to maximize the visibility of this Plantoid, and encourage the remix or the making of derivatives works, because that will maximize their return on investment, as ex-post (based on actual results rather than forecasts) royalty payments.

Turning copyright on its head

The Plantoid represents the beginning of a new relationship between creators, their work, and the progeny of the work. Indeed, the underlying mechanisms for the financing and reproduction of a Plantoid obviously clash with the traditional conception of copyright law, which is based on the notion of scarcity and exclusivity. Instead of relying on exclusive rights in order to prevent the reproduction and distribution of creative works, with a Plantoid, artists actually have an incentive to maximize the dissemination and encourage the creation of derivative works, because that is what will maximize their return on investment. This model goes, therefore, one step beyond the traditional logic of open-source, in that the art piece actually acquires a life on its own, and is able to evolve independently of the will of the original author.

Most importantly, the Plantoid actually shifts the authorship model around, turning copyright on its head. Instead of funding an artist, with the expectation that this artist will continue to produce new works that we enjoy, it now becomes possible to fund directly the art piece itself, which will be in charge of selecting and hiring the artists that will be responsible for its reproduction.

Paul Seidler, Paul Kolling & Max Hampshire

terra0 – Can an Augmented Forest Own and Utilize Itself?

Blockchain as enabler for truly autonomous agents

To understand the origin of terra0 it's important to discuss the relationship between (nonhuman) actors and capital, via decentralized technologies. Cryptocurrencies like Bitcoin enable the possibility of programs to administer capital, without verification by a human user. The only requirement for a Bitcoin wallet is a working operating system with enough memory, which doesn't need to be a personal computer, but rather can be a virtual machine running on an Amazon server. Thus automated currency exchanging practices – before solely a corporate activity, operating only in stock exchanges – are now freely available through blockchain-enabled, open-source, cryptocurrencies.

In July 2011 the user julz opened a thread on bitcointalk called 'Bitcoin the enabler – Truly Autonomous Software Agents roaming the net' in which he proposed an autonomous agent:

For the first time, there exists the possibility for a software agent to roam the internet with its own wallet. Using Bitcoin – It could purchase the resources it needs to survive (hosting / cpu / memory) and sell services to other agents or to humans. To be truly effective and survive 'out there on the net' long term, you'd probably need some basic AI and the ability to move itself between service providers occasionally–but even a relatively dumb agent might survive for a while.[1]

Furthermore, whilst there are no specific implemented examples of autonomous agents yet (besides perhaps computer viruses, though their agency is debatable), Vitalik Buterin and Gavin Woods developed in 2013 the concept within their Ethereum White Paper: 'A Next-Generation Smart Contract and Decentralized Application Platform'.[2] In this they describe complex programs, which can administer capital with a certain set of rules. This concept of 'smart contracts' was initially proposed by the computer scientist Nick Szabo to merge the discipline of contract law with E-commerce-protocols in 1993. Smart contracts are computer protocols that verify and enforce the performance of a contract without needing to inform or use human intermediaries.

While julz envisaged a system which could administer Bitcoin, this program would still run local. Through the introduction of smart contracts written by Buterin and Woods, decentralized and censorship resistant programs were enabled to gain and hold capital, creating 'Programmable Wallets', that were saved in the blockchain, existing outside of standard economic institutions, and their accompanying boundaries.

In 2013, Vitalik Buterin developed this concept further within 'Bootstrapping A Decentralized Autonomous Corporation: Part I'. Buterin attempted therein to develop a conceptual framework for an autonomous corporation:

However, here a very interesting question arises: do we really need the people? [...] The question is, can we approach the problem from the other direction: even if we still need human beings to perform certain specialized tasks, can we remove the management from the equation instead?[3]

He then further tried to build a reference system in order to properly categorize different organizational models within 'DAOs, DACs, DAs and More'. These categorisations of organizational models seem incomplete and overlapping, as Buterin's title already suggests. He claims that, once an (artificially) intelligent agent operating on decentralized infrastructure is granted control over an amount of capital, the agent in question is not merely an AI controlling capital, but a decentralized autonomous organization.

In an essay called the 'Deodands: DACs for natural systems', science fiction author Karl Schröder asks 'Do you think DACs could be used by our non-human ecosystem?'

'The rather simple question underlying this idea is, why stop at corporations as persons?' Rivers, watersheds, coral reefs, mountain biomes, all could be represented by DACs, and the goods and services they provided defined in their charter.'[4]

Extracting the defining criteria laid out by julz and Buterin, and applying them to the idea posited by Schröder, we define terra0 as a Decentralized Autonomous Corporation (DAC) for a natural ecosystem, according to the following 5 criteria:

1. The DAC is in control over 'natural resources' or 'natural infrastructure'.

2. The DAC earns enough money to maintain itself, without human intervention. For example, the DAC pays for its own server space.

3. The DAC has an adaptive feedback system.

4. When interacting with humans the DAC does so as a peer, not as a tool.

5. The DAC can replicate itself, and is able to gain control over more resources/infrastructure.

The natural-system user

If we try to build a framework for a DAC acting as a proxy for natural-systems, we have to reconsider them as users in the technosphere.

Vilém Flusser's work in 'Dinge und Undinge' ('Things and Absurdities') undermined the diametric conceptualization of 'nature' and 'culture', suggesting that since human understanding of 'the natural' as that which is neither affected nor produced by humans, can only occur via the tools of culture – such as art and science – 'the natural' cannot be separated from 'culture'.[5] Thus, everything is infected by culture, and we are unable to properly understand interactions with non-human agency.

This inability to conceptualize, thus act with, entities outside of the anthropomorphic frame has been granted additional urgency by the work of Benjamin Bratton. Within 'The Stack: On Software and Sovereignty'[6] Bratton posits that, viewing our increasingly networked digital technologies through a computational lens, we must understand contemporary geo-political reality as a set of mutually-affecting, interactive layers, stacked atop each other. These layers – respectively the Earth, Cloud, City, Address, Interface, and User layers – should:

...Be seen not as so many species evolving on their own, but as forming a coherent whole: an accidental megastructure called The Stack that is both a computational apparatus and a new governing architecture. We are inside The Stack and it is inside of us.[7]

Furthermore, it quickly becomes apparent that artificial, digital entities (such as terra0) traverse – and actively affect – many of these layers far better than we carbon-based entities do, simply in virtue of their nature as (at least partially) digital (thus informational) entities. Indeed, Bratton states – referring to the mechanics of this megastructure – that:

…Its primary means and interests are not human discourse and human bodies but, rather, the calculation of all the world's information and of the world itself as information. We, the humans, while included in this mix, are not necessarily its essential agents, and our well-being is not its primary goal.[8]
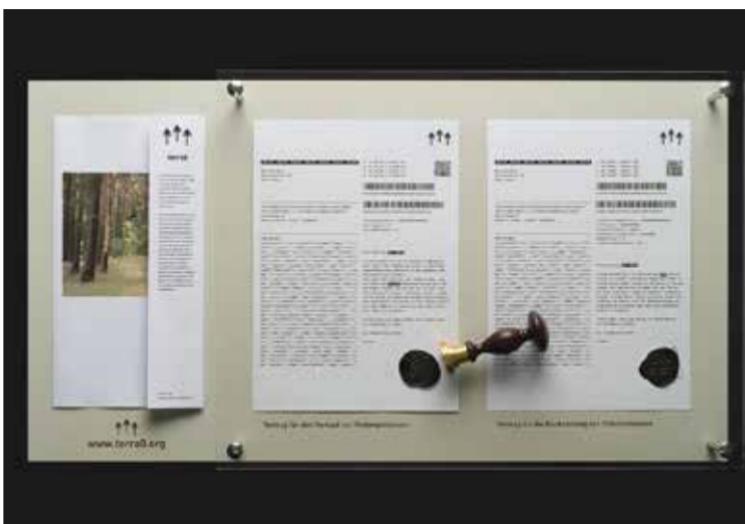
However, the inability of the human to keep up with the speed and precision of both the Stack and the artificially-intelligent, ecological-agents inhabiting it, can (at least partially) be assuaged, via an understanding of artificial-agents as merely differently-abled forms of agents much like ourselves. If we consider all agents as merely different *tokens* of the *type* 'user' (*e.g.* Animal-user, AI-user, and Natural-System-user), we can thus understand ourselves as human-users, interacting with terra0 as an augmented-organism-user, an augmented-forest-user, and / or a natural-system-user. Importing this resolution back onto the scale of argument designated by Flusser's work also hints at a resolution to his previously outlined dichotomy; within the reality posited by Bratton, strict demarcations of 'nature' and 'culture' are simply no longer coherent. Removing the dichotomous nature of our conceptualizations of 'nature' and 'culture' via blurring and intermingling the boundaries of their referents opens up space for non-humans to act in, *and with*, the world via technology as agents of the same (if not higher) importance than humans.

Non-human ownership

Discussion of DACs as proxies for natural-systems obviously requires a prior discussion of the notion of non-human ownership.

'Property' describes the most comprehensive form of possession of a thing, material or immaterial, at the legislative level.[2] Features of such legally-defined forms of property are that ownership can be assigned to a legal entity (not necessarily a person), the recognition of the rights of the owner, as well as the limits of these rights. One also discusses property as a 'bundle of rights' which symbolizes the economic and power relations existing between persons and things. Property operates in the legal, economic, and social spheres simultaneously, and is defined as the allocation of material or immaterial goods to a 'real' person or 'legal' entity-persona.

Blockchain technology and smart contracts enable non-human agents such as terra0 to administer capital and therefore to claim the right to property for the first time. Whilst non-human, legal entities such as corporations already hold some property rights, entities such as DACs – entities with *agency* – are the first non-human agents with the technical capability to act on this ownership autonomously.

Property, however, is primarily discussed at the present time as something over which only human actors have control, agency and responsibility – either themselves, or as representatives of a legal entity. terra0 begins in this legal grey area, originating in the

technological change brought about with the invention of blockchain technology and smart contracts but speaking directly to forms of non-human agency in natural-systems also. Since an individual's property is protected in accordance with their rights, one would assume that non-human entities which have gained the right to property are entitled to similar rights as natural persons. Although the European Parliament has drafted a proposal classifying 'working robots' as 'economic persons',[10] this appears to pertain solely to discussions of tax. However, answering questions related to this notion of robotic-economic persons, such as how to properly tax a DAC, will require discussing non-human agents as property owners. It appears that an EU-wide discussion of autonomous non-human agents having property rights – as being on-par with legal *persons* – might be on the horizon.

terra0

terra0 emerges from the notion that DACs can be proxies for natural-systems, and enable them to better manage their technical and eco-logical resources.

Overview

terra0 is a conceptualization of a self-owned forest; an ongoing art project and a prototype of a self-utilizing piece of land. Although we – the project initiators – are necessary to begin the process, the scope of our agency will eventually be reduced to zero; terra0 will act

with complete autonomy.

From an economic perspective, a corporation cannot be separated from its purpose or function. Thus the means of existence of every corporation is based on its usability by third parties – people, or other legal entities. The worth of the usable aspects of a forest can be precisely calculated according to contemporaneous values of its materials – wood – on international the market place. Beside its function as a source of raw material, the forest also holds the role of service contractor – for leisure activities, for example.

terra0 creates a framework whereby a forest is able to sell licenses to log its own trees through automated processes, smart contracts, and blockchain technology. In doing so, this forest accumulates capital. A shift from reliance on third parties to self-administration enables the forest to maximize and sustain its marketable resources. With this capital, via the DAC, the forest buys *itself* from the project initiators, eventually owning itself. The augmented-forest-user, as owner of itself and administrator of a financially marketable resource, is in the position to financialize itself, buy more land, and therefore to expand.
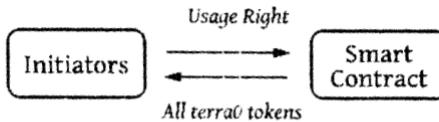
Realization

In the first phase of the project, a forest will be purchased by the project initiators. In order to set up terra0's initial economic model we, the initiators, had to take an inventory of the trees. Data relating to the trees, including species, age, size, diameter (at breast height), and health were collected manually and fed into a computational database based on 'Ertragstafeln' ('yield tables'): empirical models representing the development, growth, and overall trends in behaviour of the forest.[11]

Following this stage, a smart contract – containing all contractual definitions, like an ownership model which determines when the contract can rewrite the ownership to itself and the economic model will be drawn up. This smart contract serves as a representation of the whole terra0 system, self-regulating its material exploitation in accordance with a certain set of rules based on the implemented 'Ertragstafeln'. When the contract is drawn up the forest will be signed over to it; the property will no longer legally belong to the project initiators, but instead the augmented-forest-user terra0. The DAC is then indebted to the project initiators – this debt will be represented by 'terra0 tokens'. At this stage, the initiator holds all terra0 tokens, representing
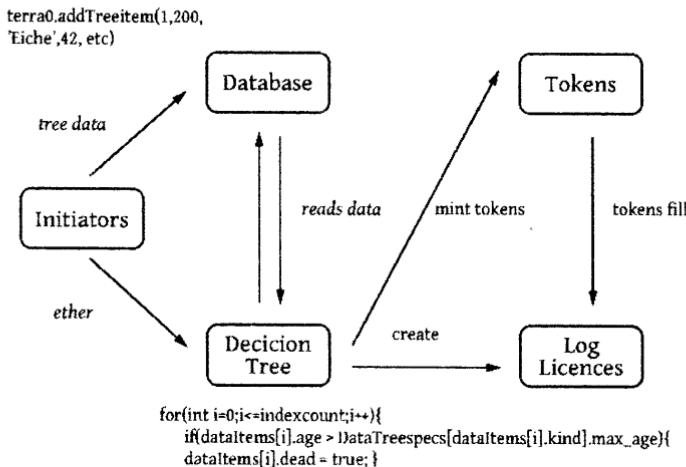
its debt.

Capital Flow (1)

Usage Right

Initiators → Smart Contract

All terra0 tokens

In the second phase of the project, the smart contract will be activated, and therein act autonomously on the blockchain. The predetermined economic model embedded in the contract will control the material exploitation of the forest.

The contract has a database which has received information from the project initiators about the trees. When triggered, the smart contract can compute – with the help of the database and the projected growth models – how many logging licenses it can sell, in the form of wood tokens. This decision is based on certain criteria, such as the age, health, and size of a given tree. It generates these tokens (which are buyable with ether) for sale through the customer who wishes to purchase a logging license. The smart contract uses the Ether earned from this process to pay for both its own hardware facilities, and access to trusted information from databases, which it needs in order to keep the system running.

Smart Contract

terra0.addTreeitem(1,200,
'Eiche',42, etc)


```
for(int i=0;i<=indexcount;i++){
    if(dataItems[i].age > DataTreespecs[dataItems[i].kind].max_age){
    dataItems[i].dead = true; }
```
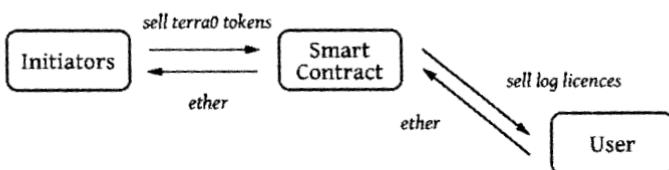
terra0 will sell licenses to log certain trees through a market website to private customers. When a given sum of money is earned via selling these licenses, terra0 will begin to repay its debt to the initiators by buying its terra0 tokens back from them. Once repayment is complete, the project initiators will hold no more terra0 tokens, making the forest the sole shareholder of its economic value. The forest, in economic terms, will control itself, it will be an autonomous economic unit.

From this point, the forest is no longer a source of material to be utilized by third parties, but instead interacts with them as a peer. Therefore, terra0 can be seen as a prototype for an autonomous economic unit in a post-human system of relations.

Capital Flow (2)

Conclusion

terra0's ambition is to provide a framework for a self-utilizing piece of land, instantiating new territory for the discussion of post-human futures. For simplicity, our prototype will judge and work with simple economic criteria. The current aim of the project is simply to set up a working system, and not necessarily to define, or elaborate on, the numerous criteria needed to accommodate for the huge variety of all natural-systems. Nor can this project accommodate the complex ethical questions around the use of human value-systems to approximate the worth of natural resources. Further research is required by biologists, ecologists, and philosophers, in order to evaluate the usability of DACs as proxies for natural-systems in the future. What terra0 does do, however, is provide a new ground-zero for such discussions.

Notes

1   http://bitcointalk.org/index.php?topic=53855.0

2   http://github.com/ethereum/wiki/wiki/white-paper

3   http://bitcoinmagazine.com/articles/bootstrapping-a-decentralized-autonomous-corporation-part-i-137964427

4   http://forum.ethereum.org/discussion/392/deodands-dacs-for-natural-systems

5   Flusser, Vilém. *Dinge und Undinge*. Munich: Carl Hanser Verlag, 1993.

6   Bratton, Benjamin H. *The Stack: On Software and Sovereignty*. Chicago: MIT Press, 2016.

7   http://thestack.org

8   *The Stack*. p. 8.

9   http://fra.europa.eu/en/charterpedia/article/17-right-property

10   http://europarl.europa.eu/pdfs/news/expert/infopress/20170210ipr61808/20170210ipr61808_en.pdf

11   http://efi.int/portal/virtual_library/databases/efiscen/yield_tables

Critical Mining: Blockchain and Bitcoin in Contemporary Art

Bitcoin was originally conceived as an electronic decentralized system for capital transactions. Each node (user) has the same opportunities to get a reward when validating a collection of transactions (block). In recent years, this system has triggered a competitive struggle in which computing power is the most important variable for earning bitcoins. This involves the use of large computer farms using physical and environmental resources, creating a struggle that benefits only the owner of the most powerful and efficient technology.

This text examines different examples of artworks based on blockchain technology, in particular how artistic practices are able to explore critically Bitcoin mining processes, which is a key factor in provoking suspicion that Bitcoin is dangerous for society. The objective is to connect aesthetic experiences, creative practices and artistic products, analyzing four different spheres; technical, ideological, ecological, and economical. Practically the essay introduces three artworks *Bittercoin – the worst miner ever*, *Bitcoin of Things (BoTs)* and *Bitcoin traces*, developed between 2015–2017, intended to expand frontiers, open a dialog, and trace their historical influences in contemporary and critical art.

A Cryptocurrency is a medium for exchanging digital information conceived as a payment technology. In layman's terms, a cryptocurrency is electricity converted into lines of code with monetary value following algorithmic rules to maintain a fixed production rate. Following previous digital cash technologies[1] such as *eCash*, Bitcoin appeared in 2009[2] by a pseudonymous developer named Satoshi Nakamoto. Bitcoin is based on the proof-of-work system, using a set of cryptographic hash functions called SHA-256 designed by the U.S National Security Agency.

The only way to generate bitcoins is through a process called mining.[3] Mining is a calculation process to confirm transactions realized by Bitcoin users and used to secure the transactions and to control the creation of new coins, writing them into a public ledger of past

transactions called the blockchain. A block in the blockchain is where the most recent Bitcoin transactions are stored.

The primary purpose of mining is to allow Bitcoin nodes to reach a secure, tamper-resistant consensus. When a miner discovers a new block, they receive a certain number of bitcoins. Currently a block contains 12.5 BTC, (this number changes throughout time and gets smaller by a factor of 0.5 every four years). Bitcoin mining is a giant lottery where miners compete against other miners on the network to earn bitcoins.

Bitcoin Criticism

1. **Technically**, a Bitcoin miner is a computer specifically designed to solve problems according to the proof-of-work algorithm (PoW). Proof-of-work is a measure that is used to prevent unwanted behaviours, abuse or misuse in a system, using special software to solve it mathematically. This problem must have the characteristic of being very difficult to solve, but with a very simple way to verify. This result can be easily checked by any other machine in the network. The type of PoW used by Bitcoin is; solution – verification. This process requires work and processing time from the service requester. Currently Bitcoin miners use highly specialized chips called ASICs (Application Specific Integrated Circuits).

The PoW has several consequences, for example, the difficulty increases every two weeks based on the time that the network takes to solve it, and miners have to be constantly upgraded. Bitcoin mining has become hardware intense and miners compete for the limited supply of blocks, working for months without finding a block and receiving any reward for their mining efforts. Therefore, as it is an expensive process, most individual miners join a so-called mining pool. Pooled mining is comprised of different miners contributing their processing power to calculate a block together. One of the mining pools you can connect to is BitMinter for example. Bitcoin farmers are located in factories, making it hard to track their numbers, with 70 percent of the total operating autonomously in China. In the last three years the computing capacity of mining pools has multiplied by 4000, which is equivalent to a network '43,000 times more powerful than the world's top 500 supercomputers combined'.[4] Speaking metaphorically, the network calculates every 6 seconds as many hashes as there are sand grains on planet Earth.[5]

Later Cryptocurrencies such as PeerCoin or Ethereum use proof-of-stake (PoS). PoS, addresses the high energy consumption by using only client software on a computer, spending 70 percent less than Bitcoin. PoS aims to avoid the 'tragedy of the commons'.[6] It works by requesting evidence of possession of coins. The advantage of this approach is that mining is less profitable reducing competition and energy use.

2. **Environmentally**, it cannot be estimated how many miners are actually mining bitcoins, but the energy consumed in farms is prominent. A paper from 2015 estimated that the mining network at the time consumed about the same amount of electricity as Ireland (Malone and O'Dwyer). Mining is only likely to be profitable if you pay less than about 5 cents per kWh for electricity. Some Bitcoin farmers have been obliged, in order to continue subsisting, to migrate elsewhere in search of cheaper energy. To cite a specific example, one farm still operating has been estimated to have 10,000 S3 mining units.[7] The Antminer S3 is able to produce 441 Gigahashes per second and consumes 800 Watts per Terahash: that is roughly 4761 Watts in a day, for just one unit. A farm with 10,000 of these units would consume 47,616 Kilowatts a day. A farmer can spend approximately $60,000 of energy per month (Velasco González).

3. **Economically**, the money works according to three characteristics: exchange, accounting unit, and value storage. Bitcoin works most of the time as a speculative investment rather than as a currency.

The Bitcoin currency transactions [8] are performed between two users through a virtual Wallet and stored in the blockchain. Each block is processed every ten minutes and limited to a Megabyte, a single block can store between one thousand to two thousand transactions, this restriction provokes problems of scalability and limits the rate of transactions the network can handle, *e.g.* Visa can manage 250,000 payments every ten minutes. Which translates in an increased price paid in each transaction when the demand rises, breaking down one of the main ideas of Bitcoin; to do transferences of capital cheaper than ordinary transferences.

In terms of anonymity, Bitcoin transactions can be tracked since they are publicly archived in the blockchain. CoinJoin is an anonymization method for Bitcoin transactions proposed by Gregory Maxwell that works by grouping a set of payments in one transaction making impossible to establish a correspondence between the parties of a particular transaction.

The 'Silk Road' was a popular black marketplace that operated in the Deepweb from 2011 until its founder Ross William was arrested in 2013, played an important role in the use and acceptance of Bitcoin. But it's not all bad news, Bitcoin and the blockchain have socially beneficial effects against economical censorships, an example is the well-known blocking of WikiLeaks donations using PayPal, MasterCard, Visa, Bank America and Western Union which was bypassed through the use of Bitcoin.

4. **Ideologically**, to understand Bitcoin is complex, but no less complex than the current monetary system in which we are immersed. Probably this economic normalization prevents us from considering what entities, mechanisms, and strategies really govern the creation, use and control of capital. As one comment on an article by Daniel Krawisz, stated: 'Bitcoin is fundamentally an alternative to the corrupt and failed banking industry, the biggest driver of which is money creation'.[9]

Bitcoin has an ideology where the government and current banking systems have no jurisprudence. Bitcoin skips democratic vigilance without any role of governments, this means, that capital has all the power. This also reveals the deeper reason why algorithms are an essential part of the process of common money creation, but those algorithms also have politics. According to Tiziana Terranova, current attempts to develop new kinds of cryptocurrencies must be judged, valued and rethought.[10]

We venerate Bitcoin's decentralization, but in reality there are power relations and vulnerability weaknesses. One is the so-called '51 percent attack', where if a pool grows and gets more than 50 percent of the hash power it could potentially allow double-spending and prevent transaction confirmations, bringing the whole system down.

Conclusion

Bitcoin can be understood as a first implementation, an exercise in progress where developers, hackers, activists, banks, governments, artists and researchers pay attention, investing efforts to create a reliable system based on maths and algorithms for peer to peer digital transactions. Bitcoin and especially blockchain can have socially beneficial effects helping to fight against economical censorships.

On the other hand, Bitcoin has an ideology by virtue of the fact that the government and current banking have no jurisprudence over it. Bitcoin skips democratic vigilance avoiding the role of governments, which means that capital has all the power. Algorithms are an essential part of the process of money creation. Cryptocurrencies must be questioned! They hide problems concerning the limited rate of transactions, power relations, vulnerability errors, problems of scalability and the so-called '51 percent Attack' that would allow the double spending of coins and the ability to prevent transaction confirmations. Another consequence derived from the Bitcoin mining process lies directly in the calculation power needed to obtain bitcoins, and the economical investment that miners realize on equipment and electricity.

Artistic examples

1. Bittercoin, the worst miner ever

Bitttercoin[11] is an old calculator machine hacked to be used as a miner validating the pending Bitcoin transactions in the blockchain. *Bittercoin* combines Internet of Things (IoT), media archaeology and economics. It works as the most basic computer, increasing the time needed to produce bitcoins to almost an eternity. The operations are displayed on the calculator screen and printed afterwards.

For the duration of its exhibition period it seeks to produce money insistently and using an economic system wholly different from the traditional art market. Paper accumulates around the machine making visible the amount of calculation required, as well as, the natural resources expended in the process, often covering the whole room and the calculator itself. *Bittercoin* talks about the effort and the working time expended that is conditioned by technological devices. *Bittercoin* is a fully functional miner that connects to the blockchain. Although it is very unlikely, in the event of successfully mining a block, the 'nonce' would be sent back to the server, entering the
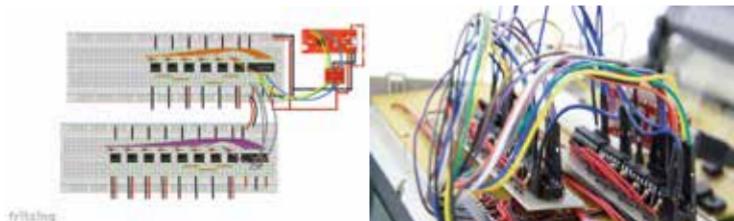
corresponding bitcoins of the reward to our Bitcoin Wallet.

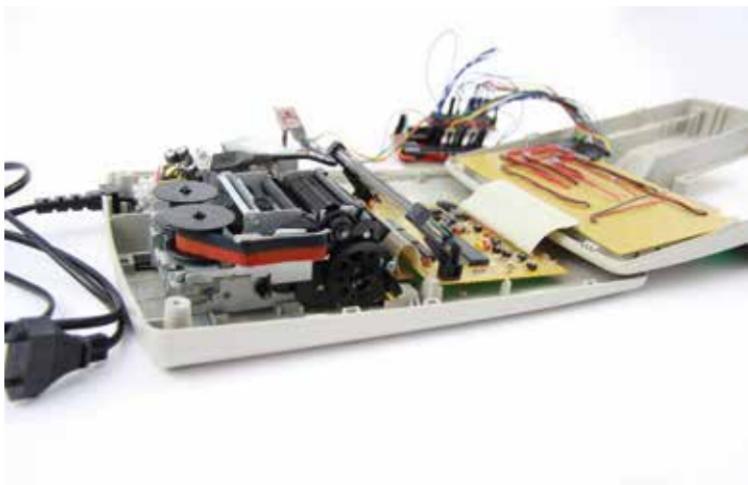Originally, the calculator consumes 80mA, Watts 220V * 0.08A = 17.6W and 10m of paper per hour.

Ars Electronica 2016. **Images by Patricia Cadavid**

Inside the calculator, is embedded a bluetooth microcontroller, compatible with Arduino. This microcontroller allows the control of the calculator keys remotely by means of a mobile phone. The phone functions are three: to connect the calculator to the blockchain, get the blockheader, and send it to the calculator. Once it is received the calculator adds a random nonce in order to begin the verification process. The verification process consists of a double SHA256 algorithm, which is displayed by the calculator screen, printing the intermediate steps of its calculation. If the calculator finds a nonce that produces a hash smaller than the blockchain target hash, a new block would have been successfully mined.

Bittercoin, the worst miner ever. **Circuit diagram.**

The connection with the blockchain is made using a phone for two reasons: to have a visual output of the calculation process and to be able to exhibit the piece using the 3G Wi-Fi connections. A goal of the whole project is to maintain the original calculator aesthetic. In *Bittercoin*, the SHA256 verification process is made visible in the calculator display, printing afterwards the intermediate values generated in each of the 64 rounds (A and E) of the second verification.

[miniminer.py POW verification.]

How is it connected to the blockchain? The blockchain is a distributed file, in April 2017 it was 250Gb in size, growing by more than 100 Mb per day. The first version of *Bittercoin* used a node running on our server, *Bittercoin* could connect to this server receiving a block-header to sign. In the last version, *Bittercoin* uses a solo mining pool.

This kind of pool serves updated blockheaders, and if the block is mined they receive 0.5 percent of the Coinbase transaction plus fees. The goal of this approach was to simplify the project and not force us to have a full node server running. A standard mining pool protocol called Stratum is used. It is based on Json + tcp and as 'proof-of-concept' we developed miniminer.py, a minimum client that is also used in the project *BoT*, (Bitcoin of Things).

```
merkle_root = ''.join([merkle_root[i]+merkle_root[i+1] for i in range(0,len(merkle_root),2)])[::-1]

print 'merkle_root:{}\n'.format(merkle_root)

blockheader = version + prevhash + merkle_root + nbits + ntime + nonce +\
    '000000000000000000000000000000000000000000000000000000000000000000000000000080020000'

print 'blockheader:\n{}\n'.format(blockheader)

hash = hashlib.sha256(hashlib.sha256(binascii.unhexlify(blockheader)).digest()).digest()
hash = binascii.hexlify(hash)
print 'hash: {}'.format(hash)

if hash < target:
    print "success!"
    payload = '{"params": ["'+address+'", "'+job_id+'", "'+extranonce2 \
        +'", "'+ntime+'", "'+nonce+'"], "id": 1, "method": "mining.submit"}'+'\n'
    sock.sendall(payload)
    print sock.recv(1024)
else:
    print 'Failed mine, hash is greater than target'
```

Bitcoin is designed to verify a block and generate a Coinbase transaction approximately every 10 mins. In order to have a chance we designed *Bittercoin* to be able to verify one block every 10 mins.

[Bitcoin of Things (BoTs)]

Based on *Bittercoin, the worst miner ever*, the *Bitcoin of Things* (BoTs) project crosses the boundary of the exhibition space, to hang out in a didactic workshop where participants get information about media art, digital culture, critical economy, electronics and Internet of Things (IoT).

Bitcoin of Things (BoT). **Assembly kit.**

Theoretically, it introduces concepts, art-works and books in order to understand the Bitcoin and blockchain world. Practically it proposes to work with a basic electronic circuit, welding and microcontrollers building a playful Bitcoin miner. The objective is to transform daily life objects (*e.g.* maracas, hammers or salt shakers) into Bitcoin miners able to connect to the blockchain, mine the latest block, and if successful get the reward, that in May 2017 is 12.5 BTCs.

Participants build a *Bitcoin of Things* (BoT) miner combining a Wi-Fi microcontroller and different sensors such as an accelerometer, microphones or buttons, and generating a 'nonce' from its readings will trigger it to try to validate all pending transactions. The possibilities are lower, but it decreases the use of energy of the calculation processes making it more sustainable. *BoT* is without any doubt, the lottery with the worst chance of winning.

Finally, the microcontroller is attached to daily life objects, like keyboards, computer mice or salt-shakers, by using them the object can potentially generate big number of bitcoins, playing with the idea of finding the philosopher's stone capable of turning any object into gold (in this case bitcoins).

4. Bitcoin Traces

Bitcoin Traces, data-visualization

Bitcoin Traces, draws an infographic data-visualization of Bitcoin transactions from the point when the currency is created by a miner until a particular transaction is made. To make a real world example let's say that a person buys a coffee and he or she pays with a €5 bill. The €5 bill was earned in the company he or she works for, which in turn the company earned from their clients, and their clients from other clients, and so on until the money is created by the European Central Bank. The process begins by picking a transaction as a starting point, analyzing which was its source transactions and draws a line for every wallet involved in this transaction. As we progress in time we draw these transactions further away from the centre, producing a radial shape. When we reach the transaction where a set of bitcoins was generated we won't be able explore further, so we draw this line in red. In this drawings we can appreciate when the transactions have been processed by anonymization techniques like Coinjoin in the form of darker rings and how most bitcoins are mined by a few big pools in the form of long red lines. This kind of analysis wouldn't be possible to do with Euros since we don't have access to the ledger's book as we do in Bitcoin and the blockchain. What makes Bitcoin interesting from an artistic point of view is that processes like transactions are public while in the wider world economic transactions are only known by governments and banks, and are kept outside the scrutiny of society.

What transpires is a new way of seeing money, deprived of its materiality. A way to consider money as a network where each node is a good or a service, and see the individual 'edges' of each transaction.

These graphs can also be read in the opposite direction. Starting from the 'mined' bitcoins, the origin of which are a set of numbers that have no utility, but by consensus have been given a value by generating bitcoins and in turn use them as a foundation to build a structure of consumption and exchange.

Conclusion

Bittercoin, the worst miner ever, *Bitcoin of Things* and *Bitcoin Traces* are methods for educating people to understand what happens beneath the surface of the first wave of technological advances. They engage with the increasing influence of algorithms in the economy, translating them into aesthetic positions and criticism, finding models of anticipation, and exploring the relationship between human behaviours and machine decision making. They are focused on showing connections between art, technology and society, and not only training audiences to see concepts inside objects, but also teaching critically and implementing thoughts and actions into the minds and bodies, of both people, and machines.

Notes & References

1 David Chaum, wrote the first paper that outlined an anonymous payment system by using blind signatures: 'Blind signatures for untraceable payments'. *Advances in Cryptology Proceedings of Crypto*. 82 (3), 1983, pp. 199 – 203.

2 The first paper was self-published in 2008 by anonymous person (or people) named Satoshi Nakamoto.

3 Mining process. The objective in the mining process is to calculate the hash function value of a concatenated Blockheader with a random number (nonce) and to obtain, as a result, a hash value starting with a sufficient number of zeros. Obtaining this number, the miner gets a reward of 12,5 BTC. BLOCKHEADER + nonce = hash. To mine a new block it is necessary to know the hash function of the previous block and the unconfirmed transactions. It is from these transactions where the Merkleroot is generated, with the Merkleroot and the previous block the Blockheader is generated. The Blockheader hash is the main way of identifying a block in the blockchain. It is an 80- byte header belonging to a single block which is hashed repeatedly to create the proof-of-work. The Blockheader is a set of structured data representing the block with all its transactions using the Merkletree. The hash of the previous block is included to ensure that this block was generated from the previous one. So if someone wanted to modify a block, they would have to rewrite all the previous ones. The blockheader hash is calculated by running the blockheader through the SHA256 algorithm twice. It is calculated by each node as part of the verification process of each block.

4 Kelly, Jemima. 'Bitcoin "miners" face fight for survival as new supply halves'. *Reuters*. http://uk.reuters.com/article/us-markets-bitcoin-mining-idUKKCN0ZO2CW. Accessed 08.07.2016.

5 See: http://seebitcoin.com/2017/01/by-2017-bitcoin-had-calculated-more-hashes-than-there-are-stars-in-the-observable-universe-by-this-incredible-multiplier

6 Understood as a situation in which several individuals, motivated only by self-interest and acting independently but rationally, end up destroying a limited shared resource (blockchain), although neither of them wants such destruction to happen. The advantages of this approach is that mining is less profitable, reducing competition and energy use. Also the 51 percent attack is less likely because in this system the attacker should own 51 percent of the total number of bitcoins.

Martín Nadal & César Escudero Andaluz: *Critical Mining: Blockchain and Bitcoin in Contemporary Art* /

7 See: http://coindesk.com/my-life-inside-a-remote-chinese-bitcoin-mine

8 The first Bitcoin real word transaction took place in May of 2010 when Laszlo Hanyecz, a programmer living in Florida, sent 10,000BTC to a volunteer in the United Kingdom, who then ordered two pizzas for Hanyecz, which cost him 25 USD. Today, 10,000 BTC have value of over 10 million USD. See Cermak in references.

9 Krawisz, Daniel. 'The Two Ideologies', *Satoshi Nakamoto Institute*. http://nakamotoinstitute.org/mempool/the-two-ideologies-in-bitcoin. Accessed 04.10. 2014.

10 Terranova, Tiziana. 'Red Stack Attack! Algorithms, Capital and the Automation of the Common', *EuroNomade*. http://euronomade.info/?p=2268. Accessed 08.03.2014.

11 *Bittercoin, the worst miner ever*. http://escuderoandaluz.com/2016/03/03/bittercoin. See also: http://spectrum.muimota.net/bittercoin

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Peter Gomes

The Blockchain: Change Everything Forever

These montages include text and images from a film released online in October 2016 by Furtherfield in collaboration with Digital Catapult which set out to broaden the debate about the impact of emerging blockchain technologies.

Online here:
http://youtube.com/watch?v=2Zp37zarSQc&feature=youtu.be

Directed by Peter Gomes

Concept, research and development by Ruth Catlow, Furtherfield.

Contributors: Dr. Anat Elhalal, Digital Catapult; Ben Vickers, Co-founder unMonastery and Curator of Digital, Serpentine Galleries; Dr. Catherine Mulligan, Research Fellow, Associate Director – Centre for Cryptocurrency Research, Imperial College; Elias Haase, Developer, Thinker, Beekeeper, Founder of B9lab; Irra Ariella Khi, Co-founder and CEO Vchain Technology; Jaime Sevilla, developer, researcher, GHAYA , #hackforgood; Jaya Klara Brekke, digital strategy, design, research and curating, Durham University; Kei Kreutler, Independent Researcher, Co-founder unMonastery; Pavlo Tanasyuk, CEO BlockVerify; Rob Myers, artist, writer, hacker; Sam Davies, Lead Technologist – Creative Programmes, Digital Catapult; Vinay Gupta, resilience guru, Hexayurt.

Irra Ariella Khi: The blockchain is a new way of building our information technology. In a way that's truly never been done before.

Ben Vickers: The blockchain is my darkest nightmare.

Jaime Sevilla: The blockchain is a way of coordinating computers all over the world in a way that they have always the same information.

Catherine Mulligan: The internet was about the exchange of information. Blockchain is about exchange of assets and exchange of value.

Sam Davies: Because of the Blockchain in the future there's going to be less reliance on central points of authority, to handle data and to handle transactions and the rules around how that data's used.

Catherine Mulligan: Blockchain is that final sort of crest on that tsunami of digital technologies that will really challenge fundamentally the way that we structure society.

Vinay Gupta: It really is a generic technology like the web you could build almost any kind of workable system on top of it, it can enhance almost any political model. So what we're going to get depends on what we choose.

Elias Haase: With this technology especially, you are chiseling away on a new kind of society.

Irfa Anella Khr: In terms of relating to each other, the number one thing as human beings we use is trust. Blockchain allows us to replace trust with proof.

Vinay Gupta: If you can take a penny a day off a billion people to do R&D you can begin to have collective management of quite large funds. Charities run by the poor for the poor rather than have charities run by the rich for the poor. And you can't do that today because transactional costs eat all of the micropayments that you need to pull together to get something like that done.

Pavlo Tanasyuk: In developing countries for example, first of all it's in payments. There is no infrastructure in certain countries, and over the world peer-to-peer systems powered by Blockchain can bring new opportunities for those people.

Pavlo Tanasyuk: I believe that Blockchain will offer new opportunities within the supply chain so knowing the heritage of the goods, knowing what we are buying, knowing what we are wearing and knowing who we are talking to.

Catherine Mulligan: Inherently a supply chain something moves across, and generally they don't actually share data with one another. But with a distributed ledger they're forced to.

Rob Myers: Once a transaction is entered into the Blockchain it becomes very quickly a immutable truth?

Elias Haase: Imagine you have a record that you can't erase.

Anat Elhalal: Like everything else on a Blockchain once it's posted it can never be removed, or in Blockchain lingo it is immutable.

Pavlo Tanasyuk: When we talk about Blockchain having some distributed ledger you still have to worry about what it will be in 5, 10, 20 years time.

Rob Myers: A smart contract is a piece of code now on the Blockchain which performs the function of a legal contract without the interference of a possible corruptible human agency.

Elias Haase: In a way, code is law. We don't control it, we can't alter it once it's been implemented and it will do what it's been built to do.

Jaya Klara Brekke: When you're looking at money you're looking at governance, you're looking at law. You know that's not trivial stuff. That's not just something you can reinvent within a few lines of code

Catherine Mulligan: The redefinition of society will happen in smart contracts and these kind of places unless the law courts are actively ensuring that people aren't getting disenfranchised.

Pavlo Tanasyuk: Information systems they are fundamentally social, and when we think about a bank or certain organisation we have to understand that it's not only technologies we have to be able to be aware of but also this social interaction of people and we have to understand how we can map that into the system.

Elias Haase: At the moment we're building a new reality that's based on how a very homogeneous group of people sees the world. Developers are implementing systems and they make millions of small decisions all the time and the tapestry of these decisions then makes a system, then that system decides whether you get a mortgage or not, that system decides what do you see of your friends.

Catherine Mulligan: Do we want a bunch of very young, bright, but solely trained in computer science, basically men, deciding what our society looks like?

Jaime Seville: We have to make sure that we find a way of extracting our intentions in a way that's

understandable by both the machines and the humans.

Jaya Klara Brekke: We need a Hippocratic oath for developers mainly because decentralised computer infrastructure does not necessarily mean decentralised power.

Kei Kreutler: I think it's so important to differentiate between Blockchains and the Blockchain because a lot of the vision you get in corporations or startups is that there is the one Blockchain and it will be theirs.

Kei Kreutler: The Blockchain represents a similar function as constitutions or even manifestos for groups, so it's this idea that you write down a set of ethics and then you act by them.

Ben Vickers: Particularly artists and kind of fringe groups have always been, like, very innovative in terms of governance models and the way which they organise and cooperate with one another and I think that the Blockchain creates an opportunity for those forms of governance to become legible and usable by other communities.

Jaya Klara Brekke: In the Blockchain community there needs to be a lot more kind of interdisciplinary work because the technology is going into fields and going into areas that are quite complicated.

Catherine Mulligan: Because of the Blockchain in the future we will have a new economic system, we will redefine the way that governance is done, so the role of government and what it means to be a citizen, participating in that government is going to be challenged and changed and to have to rethink those definitions of transparency, of trust, and of what a intermediary is and how those things come together and form something that we call society.

Kei Kreutler: We don't know what a Blockchain can do yet.

Breaking Chains and Busting Blocks: Commentary on the Satoshi (Hippocratic) Oath for Blockchain Developers

SATOSHI OATH

Satoshi — name meaning clear thinking, quick witted, wise

When you are developing your own blockchain based application you are not just making another app or involved in another start-up, you are taking part in creating a new form of society. This oath is designed as a practical guide and a symbolic initiation into a community of developers with an expanded view of blockchain development.

By taking this oath, you pledge to consider the full extent and range of the people and environ-ments your work might affect, with special attention to the most marginalized and those not represented, and to consider each point below in the design and development of new applications.

The blockchain has its roots in Bitcoin, which was a response to corrupt centralized and opaque power structures that became explicit in the financial crisis of 2008. The core values that inspired its design are therefore decentralisation, openness and neutrality, but these values cannot be fully guaranteed by the technical architecture alone and must be considered for each project that is undertaken. A decentralized computer network does not guarantee decentralized power; code and cryptography does not guarantee neutrality; openness does not guarantee legibility.

IMMUTABILITY
is essential for decentralized trust, but change is inevitable and necessary: not every contingency can be anticipated, data might be incorrect or hurt someone, contexts change and protocols need to adapt over time.

- **CHANGE** — I pledge to consider who or what has the power to determine change (in the protocol or data), and how to make this power visible and accountable.

- **POWER** — I pledge to think of the full range of people and environments that might be affected by changes, and to consider how their voices might be represented.

NEUTRALITY
is an ideal that should be strived for but is never fully realized because all systems operate on a set of assumptions about how the world works, what people want and how they behave. When these assumptions are encoded into a system they become automatically reinforced, invisible and harder to change.

- **DELEGATION** — I pledge to consider the assumptions and biases of the app/platform I am developing and how these are delegated to and enforced by the code.

- **DISCLOSURE** — I pledge to make these assumptions and biases visible in all the languages (code and human) necessary to make these understandable to all those who might be affected.

DECENTRALIZATION
is the most central attribute of the blockchain, but in practice, one version of decentralisation might clash with another. If it becomes compulsory to take part in a decentralized system, the system itself becomes an oppressive authority in its own right.

- **DISSENSUS** — I pledge to consider the possibility of and consequences for disagreeing with decisions and developments of the system for all types of people.

- **EXODUS** — I pledge to consider the possibility and consequences for all types of people of leaving the system/platform/app.

And beyond — I pledge to consider my limitations and seek advice from colleagues in other fields relevant to my work when needed.

In the fall of 2016, Elias Haase at the blockchain training company B9Lab commissioned Jaya Klara Brekke to write a Hippocratic oath for blockchain developers. Their mutual wariness of an emerging blockchain-fundamentalism and its uncritical alliances with old enemies in the monopolistic tech-financial complex inspired this attempt to articulate a different culture for blockchain development: one that encourages a conscious, 'woke', engagement with making, creating, coding and developing. Here we reprint the Oath, originally published on the IPFS blockchain,[1] followed by a commentary by Haase and Brekke.

Computer scientists and tech developers have been placed in an extremely powerful position where they have a massive influence over how we relate. Your social life, work, your car, your fridge, your TV, the hospital in your town, the intimate messages you send to your partner, your memories, your sense of direction – more and more things and relationships are being automated or administered through digital technology, and coder-developers have become both the hidden masters and the interpreters of your life. If something stops working you have to hope that one of them cares enough to solve your problem.

Computer scientists and tech developers are the new priest caste. But unlike priests of times past, there is very little awareness of the position of power and influence and very little willingness to accept the responsibilities that come with such a position of power: 'I am just solving this problem. I am just building this tool. I can't control how it is being used.'

The Oath is an attempt to start a conversation between developers and everyone else. To articulate better this new position that developers hold. To encourage a more conscious consideration of the encoding of ethics in the blockchain: How should a protocol interact with ongoing human decision-making processes? Who is able to take part in such decisions? And what forms of accountability are there in these processes?

The result is hopefully a form of conceptual toolbox for developers to think through the effects of their apps on relations that extend beyond the immediate technical architectures and business cases.

The Oath itself is structured around three concepts associated with blockchain technology: immutability, decentralization and neutrality. These concepts are peculiar because on the one hand they are considered actual features: the blockchain is an *immutable* record of events (for example transactions), that are verified and stored in a

decentralized manner so that no single actor can manipulate the records, thereby ensuring a *neutral* network (of communication / transactions / data-storage / code execution / verification *etc.*); while on the other hand, they tend to operate as major ethical principles in the community that drive the design and development. This ambiguity between core features and ideological positions in blockchain tech tends to be overlooked. Technology and infrastructures, once they are widely adopted, are all too often understood as something that simply evolves, solving problems in the most efficient manner. But the definition of what is a problem in the first place, the priorities of problems to be solved, and the methods for solving them are shaped and come from our social, political and economic conditions and desires.

Initially, the people we were targeting with the Oath hated it.[2] That's what we expected. The developer community believes in hard-coding any code of conduct into the protocol, so 'soft' frameworks like the oath are seen as unnecessary and ineffective moralistic regulation. In parts of the blockchain community there is a mistrust of anything that gives scope for human interpretation, anything not hardcoded into the protocol and cryptographically secured. The source of this mistrust comes in part from real experiences of the unequal application of the law, as experienced for example by the file-sharing and anti-copyright community. In addition, this mistrust of legal and political institutions have become mainstream in the aftermath of the financial crisis, whose consequences were very visibly redistributed to the poorest parts of society through austerity, with very little legal consequences for powerful actors in the financial industry. In contrast, the idea of code-as-law, that executes indiscriminately as it is written, became hugely attractive as an alternative to the corruption of legal and political institutions that are seen as simply too easy to game. The implied ideal is that humans will not have to trust each other but rather encode every interaction and make the conditions self executing. Blockchain technology is seen by many as a way to replace social contracts with 'smart' automation. So the blockchain community is driven by a deep mistrust of social contracts. They forget that most events in the world are indeed ambiguous and complex requiring interpretation and mediation.

Events like the Bitcoin scaling conflict, centralization of mining, and the Ethereum DAO hack in the summer of 2016, have since made it clear that decentralization, neutrality and immutability are not simply features guaranteed by the protocol alone. Decentralization had not solved the problem of power, immutability was not as immutable as assumed, code and cryptography did not amount to a neutral space.

Rather than features, such ideas might be better described as operating principles (technical, ethical and political). In this way, the ongoing consideration, maintenance and implementation that necessarily go into such systems can be made visible and their ethical and political effects deliberately though through. After all, the blockchain has its roots in hacker ethics, cypherpunk and a hugely politicized history of blockchain as a technology for circumventing geo-political control of global financial flows, and cannot be separated from these heady beginnings. The Oath puts the emphasis on the developer as someone who must engender trust in the society they serve. In a way, the initial resistance to the Oath by blockchain developers is both evidence that it is required and a potent reminder of the direction blockchain development is heading.

The Oath is consciously designed so that it does not set out a fixed doctrine – the pledger promises only to ask themselves a list of questions. The questions are designed to cover those aspects that, if not thought about carefully, could do most damage. In this way, the ethical questions posed by the concepts of decentralization, immutability and neutrality might be kept alive in the minds of developers as they create new blockchain projects. It is to prevent the three concepts from sliding into uncritical dogma where they lose their meaning – where for example *decentralization* is no longer thought about carefully in terms of decentralization of power and authority, instead becoming a strategy for some actors to evade accountability; where, for example *immutability* is not thought through in terms of how records that can not be erased might be undesirable under authoritarian rule for example; and where *neutrality* is assumed to be the nature of markets and technology, systems that tend to be controlled by major monopolies. The act of pledging is symbolic but the intention is for a developer to use the Oath as a checklist to make sure that they are not overlooking any fundamental problems. And it is also envisioned as a way that if a developer makes a decision that is detrimental to their user, like locking in their data, they will have to do so consciously.

The second desired effect would be a gradual formation of a social contract between blockchain developers whereby everyone knows who has pledged. Under these circumstances a culture could develop that favours careful consideration of impact and the discussion of implementation decisions on a socio-cultural level.

The emerging cultural identity of the blockchain community is defined by an almost pathological contradiction. Active members of the community often strive to encode strong ethical and political

principles while at the same time subscribing to a blind technological determinism in which blockchain is seen as an inevitable step as part of a larger technological acceleration.

The fundamentalist religious nature of this evolutionary determinism shuts down active, critical engagement with the work of scientists and technologists. It also forces a reactionary response by other parts of society whereby technology, as a whole, is seen as pitted against us (as workers, as biological humans).

The culture of blind belief in technological determinism and inevitable acceleration creates deeply political divisions and even existential divisions between 'humans' and 'technology'. The culture of blind belief in technological determinism and inevitable acceleration creates deeply political divisions. It dissuades a wider and more curious engagement with technology and makes the business-agendas of mega-tech companies seem part of an evolutionary trajectory that is inevitable. Technology is not external, but has always been a part of how we do things. What is at stake in our future is not the question of 'human' *vs* 'technology'. It is instead a question of whether we follow a blind determinism driven by big business interests or engage in an intelligent exploration of what is possible driven by mature decision-making around what we find to be collectively desirable. Our hope is that the Satoshi Oath can be the beginning of such a conversation, taking full responsibility for our developments rather than shirking it.

Notes & References

1   http://ipfs.b9lab.com:8080/ipfs/qmxysweaexxqqyzhtgpecvksnabksewhdghm7vneh xue2g

2   See for example the Reddit discussion: http://reddit.com/r/ethereumcomments/ 53sau2/proposing_the_satoshi_oath_for_developers

Satoshi Oath on the blockchain: http://ipfs.b9lab.com:8080/ipfs/qmxysweaexxqqyzhtg pecvksnabksewhdghm7vnehxue2g

Satoshi Oath code: http://etherscan.io/address/0x49311a711ea4aff7fea3e0c32066e732fe 4652ba#code

Reddit discussion: http://reddit.com/r/ethereum/comments/53sau2/proposing_the_ satoshi_oath_for_developers

COMPUTATIONAL CONSENSUS ≠ SOCIAL CONSENSUS

DECENTRALISED COMPUTATION ≠ DECENTRALISED POWER

TECHNOLOGY ≠ NEUTRALITY

Kimberley ter Heerdt & Nikki Loef

01.01.20

Our current web has the world united into a global information protocol. A controlled, standardized structure for how we (can) navigate through the web. A structure which has a limiting effect on all of the many possibilities. By changing the way we are able to distribute our information with these structures, smart contracts could possibly provide us a radical change concerning our current online culture. A Smart contract refers to a contract that is able to independently carry out or enforce behavior.

What kind of scenarios or agreements may arise if we can add our own contract and have influence on the behavior of our files? How can we re-architect the fellowship / sharing behavior of our current web? Arising from these questions came this speculative short film that shows, questions and tries to visualize the capabilities of smart contracts in the near future. In the film are contracts based on: Geolocation, origin, DNA and income (from future user and owner) presented.

http://kimberleyterheerdt.com
http://nikkiloef.com
(01.01.20 file available on request)

Quite handy this automatic translation based on my location.

My file understood my DNA and linked it to the movie.

expensive, the file knew that I had earned top modal.

I noticed that I could only see them once on my laptop.

Role Play Your Way to Budgetary Blockchain Bliss

This article reviews a workshop given during the MoneyLab #3 Failing Better conference, Institute of Network Cultures, Amsterdam, in 2016. An earlier version was previously published on the INC blog.

This special workshop *Role Play Your Way to Budgetary Blockchain Bliss*[1] brought the LARPing tradition (Live Action Role-Playing) to MoneyLab, Amsterdam. Participants were pre-assigned characters and generic roles that frequent the business cycle of start up tech companies trying to make the next big thing with the latest technological innovation.

Hosts Bella Roberts (played by Ruth Catlow) and Dirk Eisenberg (played by Ben Vickers) with workshop attendees.

It took as its scenario a 2-day start up tech hackathon aimed at creating blockchain-based business ideas that improve the life and future of cats. For this role-playing workshop, each participant was assigned a cat-invested persona and the general goal of networking their way into a profitable enterprise for themselves, the cat community, and the hosting institution. The workshop critically emulated the extravagant discourse and excitement surrounding the super-automation and hyper-connectivity that accompanies blockchain and similar technologies; and the capacity of the technology stakeholders to both increase and diminish global inequity.

Set in the near future, Donald Trump and Nigel Farage have finally been incarcerated, but cats do not live yet to the full potential of their famously entertaining Internet digital doubles. Happily, Cattersea Cats' Home is hosting the *2020 Cattersea Hackerton*, a 2-day event that gathers a diversity of inspired minds under the shared idea and slogan: 'We Can Make Cats Great Again!'.

Groups of LARPers refunctioning the blockchain and DAO's toward a more-than-human and more-feline-friendly world.

The first day began with a warm welcome by the event host Bella Roberts, Dirk Eisenberg from BANK the event sponsor, and Jamie Ervin the CEO of Cattersea, a strong believer in a more cat-oriented society – one in which treating people like a cat and being treated as such, would bring a better life for all. The presence, throughout the workshop of a loud, ticking clock running on cat time (6 times the speed of human time) further supported identification with both cat culture and the general sense of acceleration associated with the blockchain. The welcoming was followed by a short presentation of five pitches looking for support, funding, and strategic alliances with different participants:

1. *Fully Automated Luxury Utopia for Cats*, by the Autonomous Cat Society, envisions a great future for all cat-kind, emancipated from humans, where they are able to thrive without people. The leader of the society made clear that he and the project is nothing but a cat-alyser to return the now forgotten divine status of felines.

2. *Cats You Can Trust* is a blockchain-based project seeking to clarify the provenance of purebred cats. A cryptographic unforgeable record would effectively separate pure cats from the untrustworthy half-breed. The project would make use of

automatic pattern recognition and record every cat at the moment of birth to present an unbreakable proof-of-heritage.

3. *Cat Roulette* tries to funnel the profitability of the gambling market towards cat welfare. By using webcams in cat homes, everyone would be able to bet online on their behaviour. It gets rid of machine, algorithm, and human intermediaries to bring true randomness to the gambling community. A percentage of the profits of this autonomous decentralized casino would be donated to cat welfare.

4. *Strokes for Hire* uses state-of-art technology to harness the love of humans for cats and proven health benefits of purr proximity. A cleverly designed Proof-of-Purr (PUP) algorithm generates tokens every time a cat is petted. A negotiable percentage of the money generated would go back to the cat owners. Thus, the feedback design of the project enhances cat care by providing a human benefit stimulus.

5. Finally, *Kittycoin* has a simple yet elegant pitch: dogs have their own cryptocurrency (Dogecoin), cats and kittens deserve their own too. The cryptocurrency is transversal, it can be used by and for other projects, and has marketing already built-in: it exploits the fact that cats, and not dogs, are the indigenous animal of the Internet. The pitcher is confident about the universal acceptance of their LOLCAT strategy.

The rest of the first day offered the multiplicity of attendees the chance to ask, negotiate, and offer their skills to their favourite projects. It became rapidly clear that the diverse audience brought different motivations, skills, vested interests and ideologies. Each participant performed as part of the complex ecosystem of fintech and start-ups: investors, developers, experts, scholars, marketeers, and naive enthusiasts, all had the difficult task to sort out their differences in order to build up lasting and successful alliances. Everyone (or at least their characters) had something to invest (time, energy, money, venues, a van full of cats) and something to get in return (profits, cat life improvement, patents, philanthropy aspirations or pure admiration).

The groups discussed their plans to get the projects going and using the 'asset allocation pies' and DAO and DAPP building toolkit provided, they worked on: contract design, distribution of wealth, mission statements, specific tokens, DAOs and cat-friendly computing technologies to use. Finally, the groups presented their final pitch

and the results of their collaborations. *Cats You Can Trust* managed to generate lots of smart contracts and *PureCatCoin*. This group was without a doubt the most developed (and creepily fascistic) and were almost ready for implementation. *Cat Roulette* was taken over by three investors, who at the end of the day had 60 percent of the company's shares.

While this distributed gambling project ended up as quite profitable, no money generated was allocated for cats. *Strokes for Hire* chose *PurrTokens* as their currency and managed to diversify their initial market: the stroke tracking not only allowed them to mine tokens, but also to gather health data and get into the health benefits business. It is worth mentioning that this group was the only one that remembered to give part of their earnings to the Cattersea Cats' Home, while generously distributing their revenue to IT needs, investors and users. The prize for the best group was awarded by the event sponsors to the merged teams of *Kittycoin and Autonomous Cat Society*. The latter managed to get completely funded and adopted the former as their official currency.

Pen and paper's complex material properties and excellent interface capabilities were used within the game, and continue to be used more broadly for a wide variety of applications in a post-blockchain world.

Overall, this role-play networking activity showed the tensions between different ideal scenarios, but also the human drive to agree terms in order to develop a project. The playful setting engaged participants deeply with their characters and their missions, and showed how even a fictional micro-cosmos of diversity manages to generate social relations, contract codes, and socio-technical arrangements involving blockchains and similar devices, in a mist of ethical debates, interest-driven governance, and solidarity.
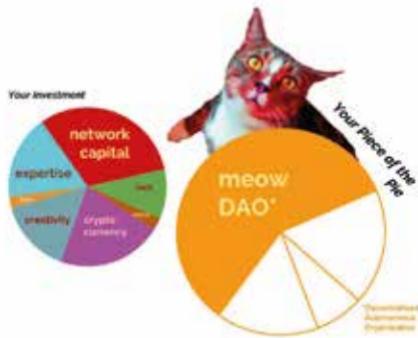
Fully Automated Luxury Utopia for CATS
A still from the documentary video available on INC's Vimeo Channel
http://vimeo.com/204861694

Note

1   Conceived of and devised by Ruth Catlow and Ben Vickers with production support from Elliot Hewgill, the LARP hackathon was hosted by Bella Roberts (played by Ruth Catlow) and the event sponsor BANK, represented by Dirk Eisenberg (played by Ben Vickers).

YOUR DAO WORK BOOKLET

D is for Decentralized
A is for Autonomous
O is for Organisation
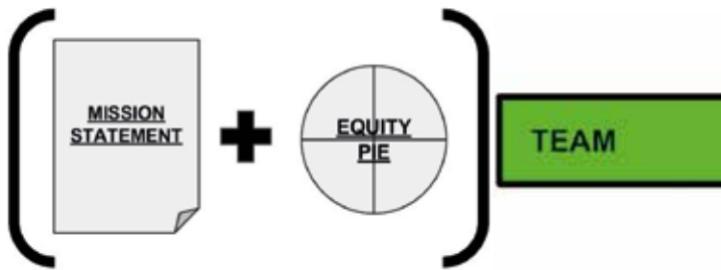
GETTING STARTED
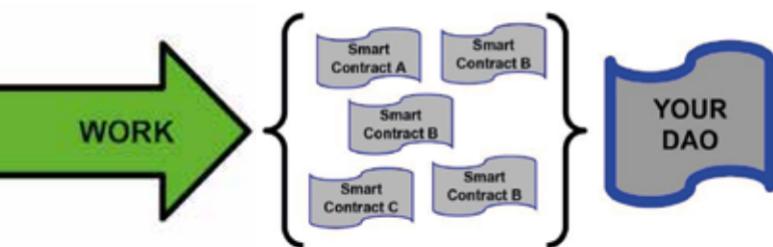
This booklet has been created to guide you through the complex process of developing your own DAO with a view to bringing people, animals, data and organisations closer together through code.

It provides a framework and set of Smart Contract templates in human readable code for structuring

your own DAO – the objective of which is to support you from mission statement to DAO.

This booklet was developed in partnership with BANK and Cattersea Cats Home on the occasion of the *Cattersea Cats Home 2021 Hackathon*, hosted by MoneyLab 2016.

SETUP

Like any real organisation your DAO has many small moving parts. As such this toolkit is modular and flexible. These are your default starting parts but we encourage you to create your own pieces within the logic laid out.

/* Explaining Embedded Modularity: */

▪ Variable /* variables can be numbers, token types, external mechanisms, user types. These are the most granular modular elements in the tool set */

▪ Variable Stickie /* these stickies serve as containers into which variables can be inserted. These help you to structure your smart contracts. Be careful to use the correct variables or they will break the contracts' functionality */

1F1tAa25x1HUXrCNLbtMDqcw6o5GNn4xqX

/* this is a user ID or wallet address. These are unique to each user and enable you to specify individuals or addresses to whom the smart contracts might relate or connect*/

688787d8ff144c502c7f5cffaafe2cc58 8d86079f9de88304c26b0cb99ce91c6

/* this is a contract ID, a unique contract ID is assigned to any smart contract you deploy to the blockchain - it's important to deploy individual contracts if you want new contracts to reference them */

/* Current Database of Variables */

Numbers
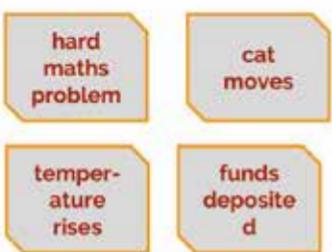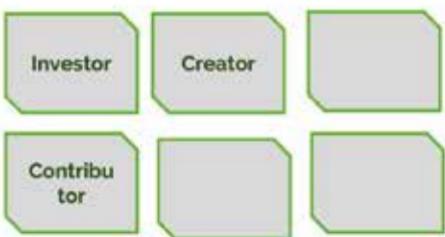
008

Dates

07.03.22

Tokens

BITCOIN

DOGE COIN

ETHER

ZCASH

REP

CAT COIN

SWAMP COIN

Proof of event

hard maths problem	cat moves
temper- ature rises	funds deposite d

User types

Investor	Creator	
Contribu tor		

/* User (wallet) Database */

1F1tAaz5x1HUXrCNLbtMDqcw6o5GNn4xqX

/* Smart Contract Ledger */

688787d8ff144c502c7f5cffaafe2cc58
8d86079f9de88304c26b0cb99ce91c6
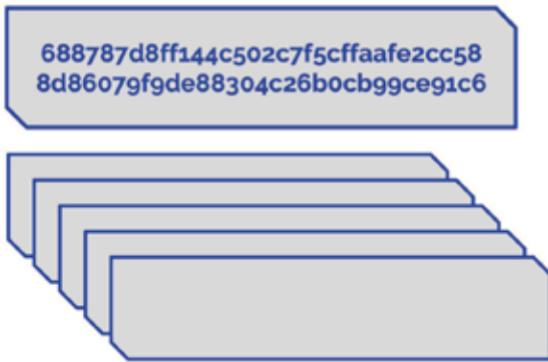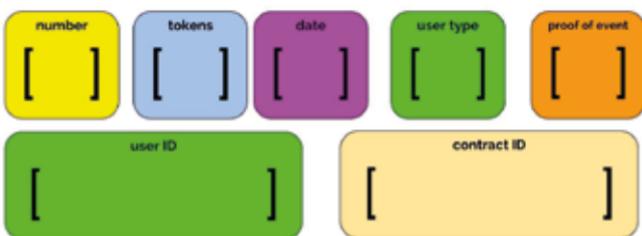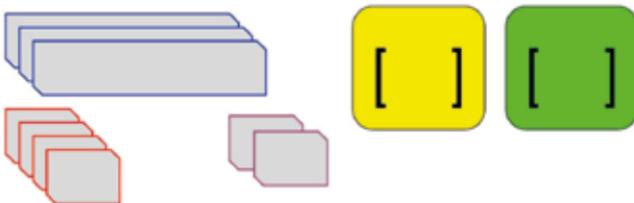
/* Current Database of Variable Stickies */

number	tokens	date	user type	proof of event
[ ]	[ ]	[ ]	[ ]	[ ]

user ID	contract ID
[ ]	[ ]
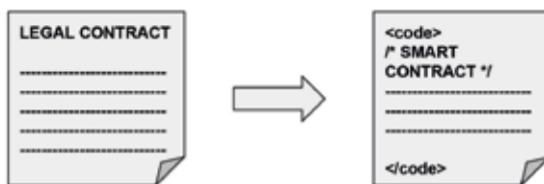
/* Creating Variables */

/* this is an open tool box so you should feel free to create new variables and stickies as and when you need them - we've included all the basics but you can raise the complexity at any stage */

[   ]   [   ]

A BASIC GUIDE TO USING SMART CONTRACTS

/* Introducing Smart Contracts: */

/* "A smart contract is some code which automates the "if this happens then do that" part of traditional contracts. Computer code behaves in expected ways and doesn't have the linguistic nuances of human languages. [Some people think therefore that...] Code is better, as there are less potential points of contention. The code is replicated on many computers [running blockchain software]. The idea is that you can have a normal paper contract with all the "whereas" clauses that lawyers enjoy, and then a clause that points to a smart contract on a blockchain, saying "this is what we both agree to run and we will abide by the results of the code." (Bitsonblocks.net)
*/
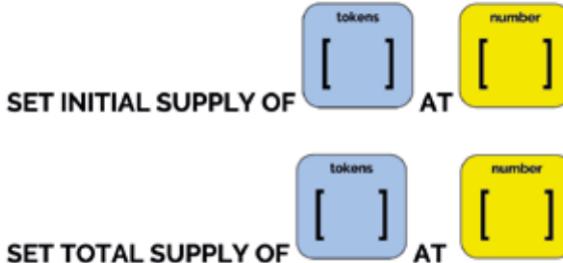
```
contract token {
    mapping (address => uint) public coinBalanceOf;
    event CoinTransfer(address sender, address receiver, uint amount);

    /* Initializes contract with initial supply tokens to the creator of the contract */
    function token(uint supply) {
        if (supply == 0) supply = 10000;
        coinBalanceOf[msg.sender] = supply;
    }

    /* Very simple trade function */
    function sendCoin(address receiver, uint amount) returns(bool sufficient) {
        if (coinBalanceOf[msg.sender] < amount) return false;
        coinBalanceOf[msg.sender] -= amount;
        coinBalanceOf[receiver] += amount;
        CoinTransfer(msg.sender, receiver, amount);
        return true;
    }
}
```

/* Above is an example of a real smart contract written in code on the Ethereum blockchain system for establish total supply of your DAO's token */

SET INITIAL SUPPLY OF [tokens] AT [number]

SET TOTAL SUPPLY OF [tokens] AT [number]
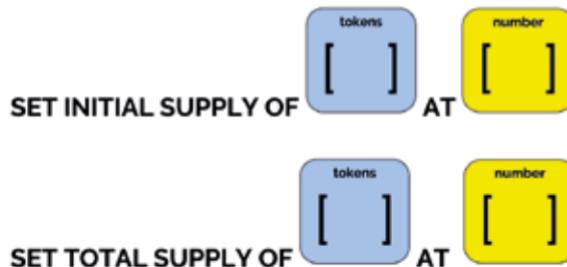
/* Above is an example of a smart contract from this toolbox for creating and establishing the initial and total supply of your DAO's token. */

SMART CONTRACTS
PLEASE USE WITH CARE

/* Create Token Contract */

/* this is the first contract you'll want to deploy
* when starting your DAO. It allows you
* to set the starting amount of your internal
* DAO token, and define its total amount.
* it does not allow you to define how further
* tokens are created, how they are distributed
* or their purpose,
* you will need to use other contracts for that
*/

SET INITIAL SUPPLY OF [tokens] AT [number]

SET TOTAL SUPPLY OF [tokens] AT [number]

/* Benevolent Dictator Contract */

/* this contract lets you define an owner
* it can be a single user or another smart
* contract that represents a whole organisation
* trust is important when assigning ownership
*/

CONTRACT OWNED BY

contract ID

[   ]
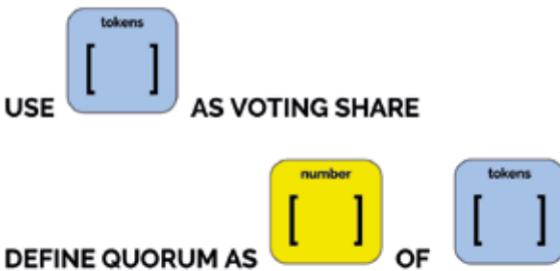
/* Initial Token Issuance Contract*/

/* this contract lets you assign individuals or orgs
 * that will receive tokens issued from your initial
 * supply, you'll probably want to use this contract
 * to distribute tokens to your initial investors or
 * collaborators.
 * make sure to be extra careful when inputting
 * addresses as if you make a mistake funds can
 * never be recovered
 */

user ID

[   ]

RECEIVES

number

[   ]

OF

tokens

[   ]
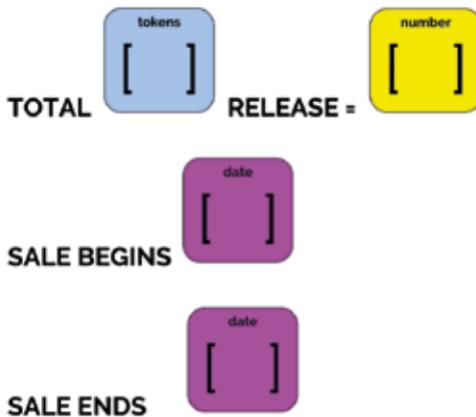
/* Shareholder Association Contract */

/* if you want to enable voting within your DAO
 * you can use this contract to enable voting
 * each token is equal to one vote.
 * so consider deploying it in a secondary DAO
 * if your main token also serves as a currency
 */

USE [tokens] AS VOTING SHARE

DEFINE QUORUM AS [number] OF [tokens]

/* Crowdsale Scaling Contract */

/* this contract can be used to initialise a crowdsale
* or ICO (international coin offering) with a beginning
* and end date, as well as the amount.
* you can use multiples of this contract if you want
* to release different amounts on a staggered basis
* you could also use to it release different priced
* tokens at different times in conjunction with the
* 'crowdsale value contract'.
*/

tokens

TOTAL [   ]   **RELEASE =**   number [   ]

date

SALE BEGINS [   ]

date

SALE ENDS [   ]

/* Crowdsale Value Contract */
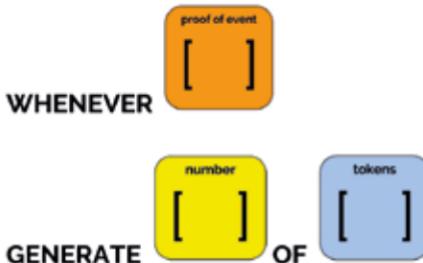
/* this contract can be used to assign a fixed exchange
 * value for your token crowdsale
 */

EACH [tokens] EQUALS [number] OF [tokens]

/* New Token Generating Contract */
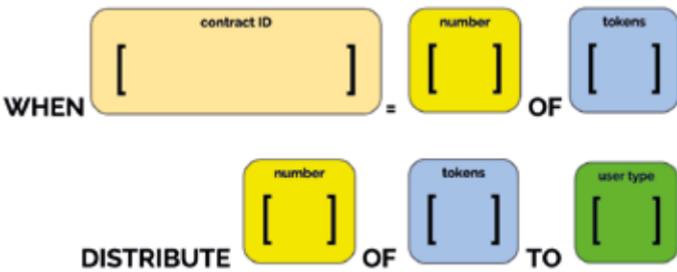
/* this contracts primary function is to define
 * what mechanism will create new tokens

 * ##security consideration##
 * if using proof of work be sure you have enough
 * computing support to secure your DAO, if using
 * an external source, you must be confident that the
 * source or the mechanism for registering the source
 * is secure and not corruptible
 */

WHENEVER [proof of event [ ]]

GENERATE [number [ ]] **OF** [tokens [ ]]
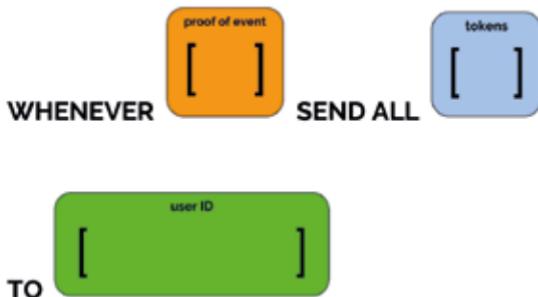
/* Bonus Contract */

/* this contract is designed to allow an external
 * source to trigger the release of tokens to
 * a specific class of individuals or users
 * this could be used to issue bonuses when
 * a profit making DAO reaches a certain income
 * or to trigger the replication of an individual DAO
 */

WHEN [contract ID] = [number] OF [tokens]

DISTRIBUTE [number] OF [tokens] TO [user type]
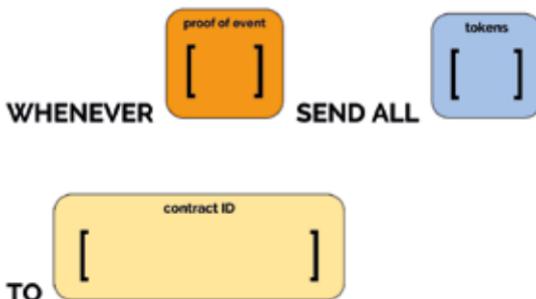
/* Self Destruction Contract - Type A */

/* this contract can be used to automate destruction of
 * your DAO and the redistribution of all funds to
 * another DAO, when triggered by an external source
 * eg - this contract could be used to manage a global
 * DAO for managing funds for a specific climate treaty,
 * that self destructs when sea levels rise, redistributing *
 the funds to an individual source
 */

WHENEVER [proof of event [ ]] **SEND ALL** [tokens [ ]]

TO [user ID [ ]]
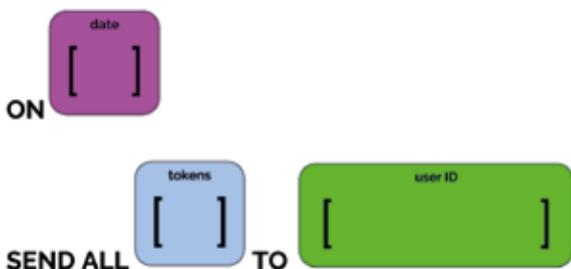
/* Self Destruction Contract - Type B */

/* this contract is the same as type a but allows you
* to specify release of funds to another smart contract
* or DAO, rather than individual account
*/

WHENEVER **proof of event** [ ]   SEND ALL **tokens** [ ]

TO **contract ID** [ ]

/* Self Destruction Contract - Type C */

/* this contract is the same as type a and b but allows you
* to specify a date on which the DAO will implode
*/

ON [date] [ ]

SEND ALL [tokens] **TO** [user ID]

A Shared Timeline

24th of January 2016: −26°C. Although it is an unusually cold day the doors of the building are wide open. Rows of industrial fans going full speed line the roof. This piece of land on the outskirts of Boden in Northern Sweden used to be an army airbase. In 2005 it was decommissioned and now serves as part datacenter, part refugee housing. A Bentley is parked outside of a former helicopter hangar turned Bitcoin mine. Through the doors, shelves filled with naked electronics are visible. Thousands of custom-built machines convert electricity from the nearby hydropower plant into money and heat. On the other side of the road, shipping containers are being stacked up in a temporary structure three levels high. The mining operation is expanding at a frantic pace. The profitability is a function of the number of calculations performed per second. Four months later, the owner declares bankruptcy, citing unfair competition from state-subsidized Chinese miners. The hangar is bought by a Bejing-based chip-manufacturer.

A blockchain is immutable. Frozen information. Its defining characteristic is absolute chronological order. Each block locks the previous one in place. The weight of additional data acts to solidify the structure. A blockchain is multi-dimensional reality reduced to a one-dimensional timeline. It asserts the state of the world at regular intervals. While researching the yet-to-launch Ethereum project, we fixated on this core value proposition: permanence. We related the block to the platonic ideal of the book: a squarely defined, eternally immutable, infinitely reproduced unit of information. A stack of paper can not achieve this ideal, but perhaps a data structure can?

In 2015, we proposed a publishing tool called txtblock.[1] The core idea was to use the distributed ledger as a writing surface for extra- (or sub-)-economic information, to create the ultimate publishing format: unconditionally public and absolutely permanent. Then came 2016, the year of post-truth and fake news, Trump and Brexit. The problem with our current condition is not primarily a lack of access to factual information and, nor the means of verifying it. The main issue is that we choose the fragments of information that fits within our personalized timeline and that this mechanism is driven further by algorithms optimizing for engagement. These choices, in turn, curate our timeline, constructing our encounters with political realities, and so on in a virtuous / vicious circle. Despite recent events, we believe we

are moving towards a liquidation of solid states: the walls of the home breaking down, identities breaking through the skin, blurring the line between private and public. Borders of states are becoming untenable, despite the attempts by fear-driven reactionaries. This is all good – but the freedom gained by [...] is being recaptured by omnipresent, omniscient platforms recasting citizens as users. Physical borders are being replaced by algorithmic borders and these have the property of being invisible, shapeshifting, unaccountable.

What is the value of a rigid, strictly hierarchical data structure such as a blockchain to a global society? Consider the trinity of hot-right-now info-technologies: machine learning, virtual / augmented reality and blockchain. The two former have a fragmenting effect while the latter is a tool for creating – importantly, not finding or discovering, but creating – collective truth. Machine learning is a technology for finding borders, for unearthing boundaries in data, for drawing lines and demarcating territories on a cartesian plane. The goal is the demographic groups of one: each individual perfectly translated into a unique model, targeted with absolutely customized content and products. Augmented and virtual reality will translate these machine learning models into sensory experiences, locking the User within a personalized influencing machine. The rest is that mutual incomprehension devolving into hostility. AR / VR / ML will decouple vision from consensus reality, perhaps not in the cyberpunk, metaverse manner dreamt of by some, but in a gradual, creeping, but equally powerful way. Algorithmic governance has the self-evident character of the natural order because it pulls us inside its own reality, and moulds our perceptions.

In contrast, a blockchain is a human-made externality. It can function as a point of reference. A common timeline. A public space. A mainstream. This was what we were grasping for in proposing –2024420450 txtblock. A blockchain can act as a shared timeline not directly controlled by any one economic or political interest. We return to this quote from the 2013 #Accelerate Manifesto by Nick Srnicek and Alex Williams:

'We need to posit a collectively controlled legitimate vertical authority in addition to distributed horizontal forms of sociality, to avoid becoming the slaves of either a tyrannical totalitarian centralism or a capricious emergent order beyond our control. The command of The Plan must be married to the improvised order of The Network.'[2]

The blockchain could be the Merkle Tree that enables the Rhizome, the necessary hierarchical, vertical element providing control and co-ordination for a supremely non-hierarchical and intra-connected algorithmic reality. A micro-framework or mega-structure to which our increasingly fragmented, even vapourised, cultures can cling.

In April 2017, the Norwegian company Piql announced the completion of the Arctic World Archive. Housed in an abandoned coal mine on the island of Svalbard, the facility is located next to the Global Seed Vault, tasked with archiving bio-diversity. In the AWA, Iinformation such as [...] is written onto film and stored in capsules. The company guarantees the content a minimum lifetime of 500 years. The governments of Brazil, Mexico and Norway have already committed documents from its National archives to this frozen storage, far away from the troubled regions of the world. But permanence comes from constant reproduction, not archival half-life – 500 years seems self-evidently brief in an era where we are increasingly aware of, and interacting on the basis of, geological timescales. The blockchain, and txtblock, instead propose a constant process of negotiating consensus, block by block. A hot process leaving behind a frozen info-structure.

Notes

1 http://rhizome.org/editorial/2015/nov/17/the-block-is-the-successor-to-the-book-a-publishing-proposal

2 Alex Williams and Nick Srnicek, '#ACCELERATE MANIFESTO,' 2013.

Text as Market

The exhibition *A Throw Of The Dice Will Never Abolish Chance* at Banner Repeater in 2016, acted as a collection of data brought together as a speculative framework with components of a puzzle that emerged on and offline. The exhibition drew on Stéphane Mallarmé's text 'Un Coup de Dès Jamais N'Abolira Le Hasard' as a site to consider new ways of thinking through the centuries old puzzle of code, numbers and language, and acted as the site for several *Thinking through the Block* workshops, in September 2016 (audio @ http://x-fx.org).

During the discussions that ensued I was interested in asking what similarities there might be between the timestamp capacity of the block and Elie Ayache's claim of an equivalence in writing to pricing in the derivatives markets. His philosophical enquiry asked what technology might be available to get inside the process of history, what it might be to act within the immanence of the markets and do something more active than to watch passively as history unfolds… *altogether different from the conceptual activity consisting in predicting and outguessing history.*

The Blank Swan by Elie Ayache focuses on the Jorge Louis Borges' story of 'Pierre Menard, Author of the Quixote' that depicts a fictional writer and critic; Pierre Menard who spends his time writing the 9th and 38th chapters of the first part of the 17thC *Don Quixote* by Miguel de Cervantes, and a fragment of chapter 22 – several centuries on from when the text was published. Borges writes: 'The chapters are the same, every word and every comma, as those written originally by Miguel de Cervantes, yet this wasn't a mechanical transcription of the original – he did not propose to copy it.' Interpretations of the Borges story tend to focus on how 'reading' brings about difference through a Barthes like emphasis on the true locus of writing as *reading*. Conversely, Ayache's focus interpellates Borges' fiction with the apparatus of the derivatives markets: the dynamic replication of the BSM (Black-Scholes-Merton) model and the derivative contract, that implicitly relies on writing. Hence bringing about a different emphasis on the act of 'writing' – of a previously existing text – as a truly contingent act. Taking him up on his challenge, with each word that *I* wrote of *The Blank Swan Chapter 4, Writing and the Market* by Elie Ayache, there was simply nothing to say that any given word, would necessarily follow the next (*Ami Clarke: Author of the Blank Swan*).

The late artist Elaine Sturtevant back-dated: *Sturtevant: Author of the Quixote* via a letter addressed to Borges in the introduction, to 1970, around the time of her early practice of *making works of other artists works*. As Patricia Lee notes, thereby 'pushing the codification of artists to specific signifiers' (2016) in relation to the structures and systems of art. Sturtevant's works relied on their identification as significant works by well-known artists, reducing the artists work to a sign – a brand – an easy meme producer, percolating myths of genius and so on, that could be seen to have more to do with sales amid the immanent rise and fall of the market – than whatever other values might be claimed for art at any given time in history.

Sturtevant's emphasis on 'the brutal truth of the work is that it is not a copy' is shared in Ayache's thinking when she claims 'the dynamics of the work is that it throws out representation' (Lee, 2016). 'Only through the writing / trading performance and not through the realization of a theoretical stochastic process, that is framed in representational thought, can the writer / trader of contingent claims exceed the saturated context and move to the next – *i.e.* he can trade' (Ayache, 2010).

What this *brings forth* in Ayache's terms is the trading room and a performative *capacity* that is singular and non-reproducible. A capacity to write the future via smart contracts, seemingly shared across the blockchain in so far as a technology that exceeds probability through the time-stamp.

Ayache's point, perhaps, is that this is all that can be said, in a philosophical sense. This echoes through the story of the blockchain thus far, and takes little heed of the bias' and discriminations actively reproduced through the complex infrastructural, socio-economic and political conditions that facilitate the particularly exploitative form of platform capitalism. As such, the rather more urgent and compelling aspect of the equation, for me, is the question of *who* gets to write the future via smart contracts, and re-determine the currency of data and what other values that currency could convey in a new calculus.
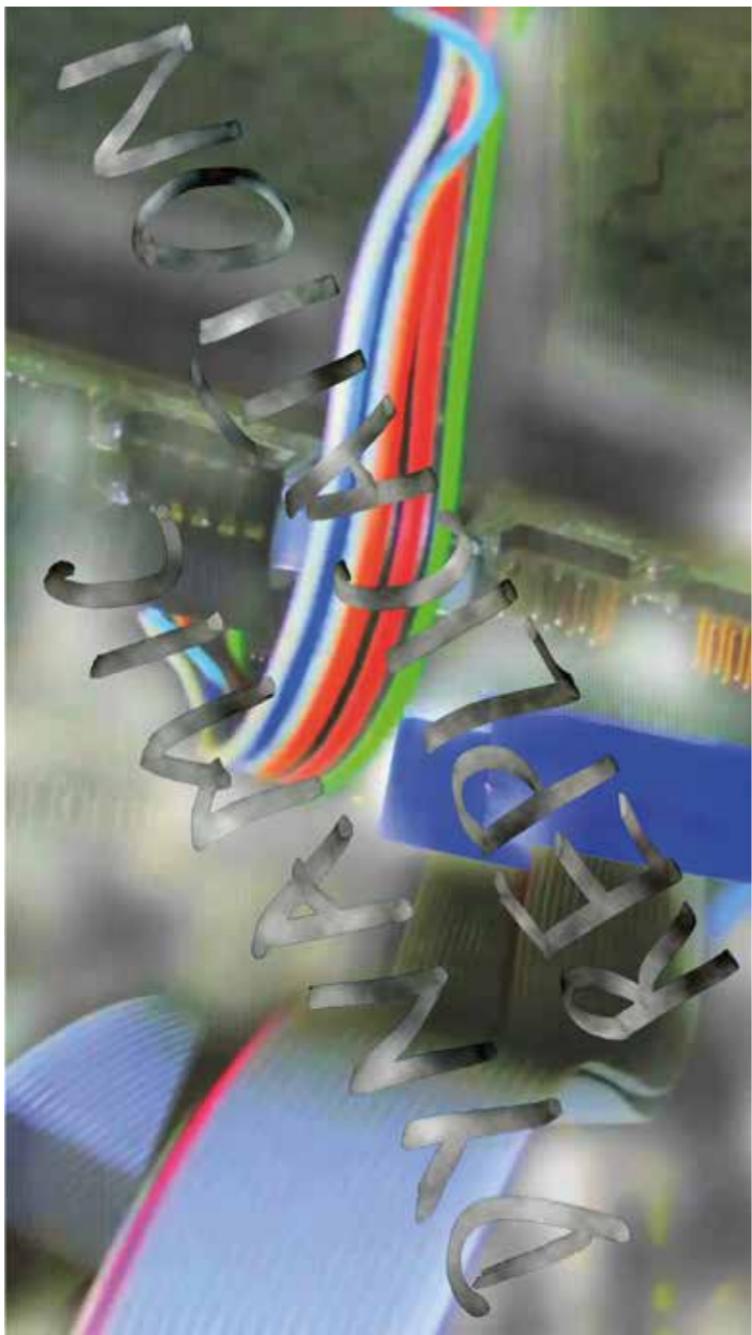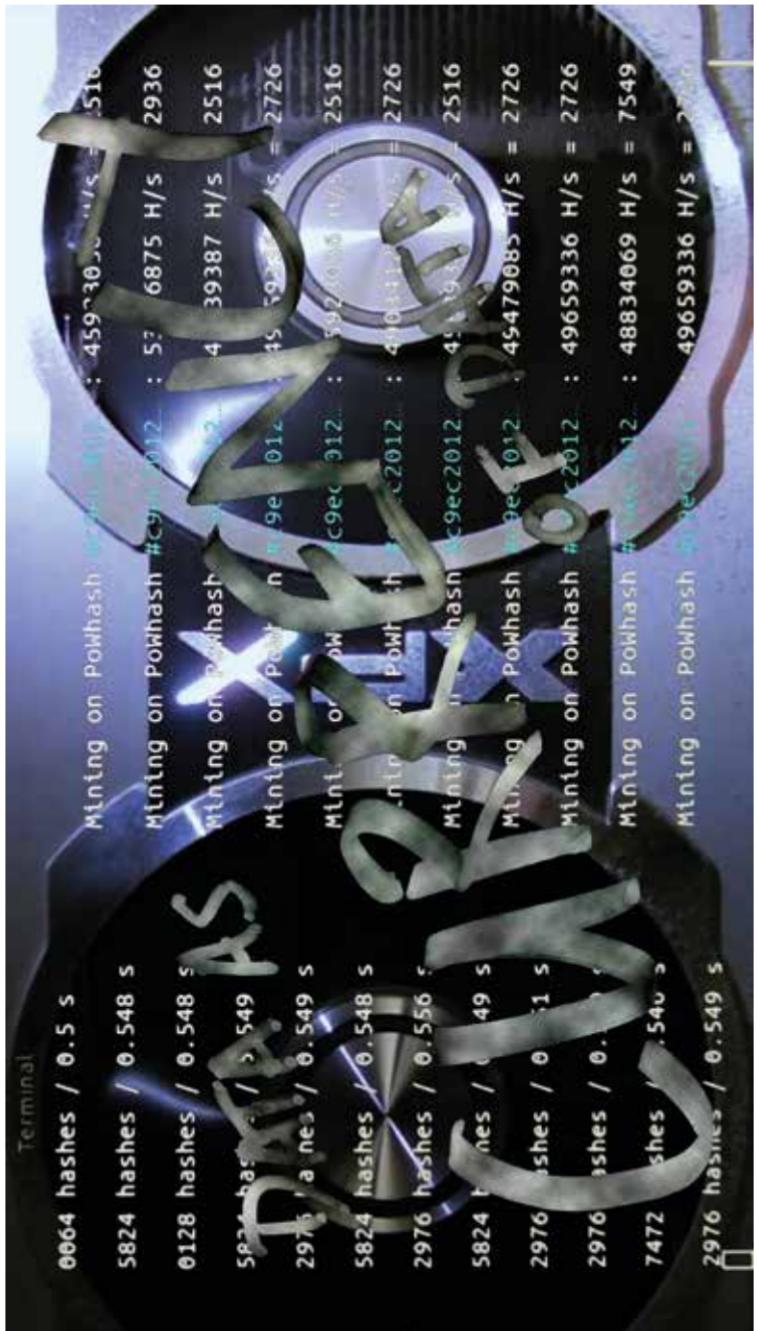
References

Ayache, Elie. The Blank Swan. Chichester: Wiley, 2010.

Borges, Jorge Luis. 'Pierre Menard, Author of the Quixote' in *Collected Fictions*. Translated by Andrew Hurley. New York: Penguin Books, 1999.

Clarke, Ami. *Author of the Blank Swan*. London: Banner Repeater, 2016.

Sturtevant. *Author of the Quixote*. Cologne: Walter Koenig, 2009.

Lee, Patricia. *Sturtevant: Warhol Marilyn* (Afterall). Cambridge, Massachusetts: MIT Press, 2016.

The following pages are drawn from a configuration of the puzzle that came together @ http://x-fx.org and speculate on future values regarding data as currency in the lead up to a new configuration in the project: DLeb.

Audio recorded from the presentations during the Thinking through the Block workshops, September 2016, by Tom Clark, Paul Purgas, Alessandro Ludovico, Ami Clarke, Karen Di Franco, Ruth Catlow, Ben Vickers, Tom Pearson, Malavika Rajnarayan, Prayas Abhinav and Satya Gummuluri of surfatial, can be found at http://x-fx.org.

Blockchain Future States –
An Interview with Simon Denny

SAM SKINNER   Why did you initially become interested in the blockchain?

SIMON DENNY   When I first heard of Bitcoin I actually wasn't all that interested – I just heard about it because friends were buying grey market stuff online with it and using it for alternative currency for that. This was like 2010 or 2011 I think. I dismissed it as inconsequential for me and not all that interesting or important. When I got really more interested in it seriously was in the process of research for an exhibition I did in 2015 at the Serpentine in London, where I was looking to chronicle the history of hacking. I was looking into where cryptography was currently (as some kind of essential sub-genre of hacking culture) and the Ethereum project was very prominent at that point. I then saw the other kinds of systems proposed on top of blockchain, as more than just a money system for drugs, and started to read more. The story being told about the possibilities of radical transparency, a new decentralized web and governance infrastructure really interested me. I have been interested in the impact of the tech business community on governance for a while, looking at this in many projects, and this seemed to be a very important conversation to pay attention to within that context. This is when I decided to make some sort of dedicated research and presentation on the topic.

Figures 1–3, Installation Views, Berlin Biennale 2016
Courtesy of the artist and Berlin Biennale. Photos: Hans-Georg Gaul

SS   How has this body of work evolved, both in terms of specific subjects of interest, for example Bitcoin, Ethereum, DAO's, etc., and how has the material and conceptual form of the work itself developed alongside this?

SD   I first just had to struggle a bit to try and understand what the implications of the technology really were. There is a lot of myth making involved in any story around blockchain. It's a story that starts with the mysterious figure of Satoshi Nakamoto, already a myth, and it's (still) hard to for me to understand exactly which part is narrative and which part is technology. Decoupling this as a non-technical person, one also never has the whole story. For me the process of making my exhibitions was first about finding a way to make the rhetoric possible to follow for an arts audience. This is initially why I wanted to have a kind of 'infographic' video as a part of the artwork, to explain the technology at a very basic level, but also to contextualize the explanation by being partly propaganda-like, including emphasizing some of the economic and ideological assumptions blockchain-like thinking takes as a given. An example of this is that financial incentivizing is key to collective action. I also wanted to underline just how fundamental some of the changes could be societally if the stories the blockchain bulls were telling were true. I had this idea that I could recast real company founders as a set of radical visionaries, breaking down different parts of the blockchain story and assigning the various different strands of possible political futures to each founder. So I looked for three founders that could represent a spectrum of companies – and picked Blythe Masters, from a capital markets perspective, Balaji Srinivasan from a Silicon Valley perspective, and Vitalik Butarin from a bitcoin community meet-up / independent engineer perspective. At the time (2016) this seemed like a fairly divergent spectrum of activity to focus on. Since then it's been interesting to watch those positions become closer, with Ethereum related things entering and even accelerating the capital markets space, and Ethereum becoming its own decentralized app ecosystem and virtual Silicon Valley *etc.*.

To physically make each presentation as an exhibition experience, I took into account the context where I was showing – producing a different tone for each venue. In Berlin the exhibition was staged in a former communist headquarters, that is now a global business school. The room was a disused part of the building, still filled with a substantial and amazing communist mural – and so I made a kind of trade-fair presentation for each company. At the heart of each display, which aesthetically reflected the differences in attitude and ideology of each company, I produced a postage stamp with stamp designer

Linda Kantchev, trying to distil into a visual object associated with nationhood, distribution, security etc. the political propositions of each company. When showing in New York – where a number of banks and blockchain start-ups are based – I instead formulated each outlook into a giant display version of the board game Risk, drawing parallels between a gaming mentality, a political map of the world that features on a Risk board (and can describe alternate geographies / political formations), and this seemed to be something that communicated with the financial community and the art community alike. It was a condensed format that was legible and engaging.

SS   You have described the work as partly 'fan art' where you are trying to offer a way in to understanding this technology. How do you achieve this whilst also maintaining a critical edge? And what does creative rethinking, or more specifically the appropriationist strategies you employ, offer in this regard?

SD   That is one of the central questions of my work, I think. For me it was about finding a tone where I was really getting what the core aims of the community building this technology were, to accurately understand where they're coming from. But also to highlight some of the problematic aspects of what the technology proposes, while still reflecting this intense utopic tone that comes with the culture of the space. From spending some time with some parts of the tech community, many of the people involved have very honorable aims and are really ambitious about making a difference to the world in a positive way. A lot of people I have met in blockchain related spaces are just so smart and talented. But I think we are all – myself included – not always aware of how our actions and choices impact on politics and

ethics. With my projects my aim is to make this a central question, but there are a number of ways one can access that conversation, and spark a discussion in viewers.

I also think about what rhetorical strategy is most effective for opening up questions and discussion around technology and politics like this. I find artwork that seems to have answers, to point to ways of doing things that are solutions, to be often not all that engaging. I find a rhetorical approach that problematizes the material it looks at in order to open up the space for discussion to be less finite, and therefore less inert. So the angle of being a 'fan' has sometimes been a way for me to posit the idea of 'what if' – what if we accept these visions on the terms they are publicized with, with the terms of the community that is presenting the ideas and building the infrastructure, what would the implications of that be – and leave it to the viewer to decide whether that's some thing that we really want or not. To me this is a critical position, but not one that guides a viewer's own thinking as much as some other approaches.

SS   Do you have any ambitions to make work, or can you imagine, using the blockchain itself as a medium, or using it as a means to organize and distribute your artworks or editions? What form might this take?

SD   I'm not sure. I've had ideas along these lines that I've mostly discarded at this point. For me, the most fundamentally disruptive story I've heard about blockchian would be how it could monetize the attention economy. So essentially likes might become real financial value because of a proliferation of tokens and a very liquid exchange environment where micropayments would be no big deal. That is a very disruptive idea, and something that I could imagine becoming a reality. I've met some very smart people working in this kind of space and I think their understanding of what they're doing is very sophisticated. So I have thought about putting time and energy into these kinds of ventures. I have thought about art journalism platforms that are somehow tokenized. But I am also deeply ambivalent about the benefits of blockchian, so am not sure about putting my time and energy into building on it. I have reservations about what decentralization actually means within the projects that I know about which are already being built and funded in this space. I have reservations about what governance really looks like on these platforms, when it comes down to who is actually making important decisions about infrastructure and therefore what is possible. It seems to me that developers, admins and owners of infrastructural hardware have a lot of power that

is not particularly decentralized. I have questions about accountability in a privatized (*i.e.* non-state regulated) environment. I also have questions about the benefit of a further financialization of experience, and an extension of the already quite vast cultural reach of market logic. So I think at this stage I would still rather be an observer, to document what is happening culturally around blockchain, but not to be an architect of it directly. That means I miss the gold rush, but hopefully not the chance to have a meaningful dialogue with those who are actually building these things. I think – or rather I hope – smart people want smart feedback, if it's presented respectfully and in an engaging way. I more see that as my role and what I'm best suited to right now.

SS Within the book we are featuring your series of 'gamer cases' and stamps – can you tell us a little about these and the processes and thinking behind them?

SD These stem from a longer series that I started in 2013, using what I feel is kind of the physical/object based or sculptural language of competitive gaming. Many players involved in gaming like to customize their PCs, there's a genre of this that is called Case Modding – as in modifying computer cases. It's a pretty amazing field; there are lots of super interesting cases, and a whole network of competitions and products made for this market. I used this to make gaming cases that resemble corporate deal toys or like homages to winning companies. I find the paradigm of game-like thinking relates culturally to business and tech business spaces in a pretty native way – many of the prominent actors in this space either are or were gamers themselves, plus I think one could make an argument for the idea that a gaming mentality is akin to the way a lot of tech business people approach building

a business and making a life. The series I made reflecting blockchain-based companies focused on legacy corporates that are adopting blockchain, like JP Morgan and Chase, BNY Mellon, some key DAPPS like Augur and other organizations like the DAO. In each sculpture the aesthetic of the case is supposed to reflect a certain outlook of each company – for example the JP Morgan one is fairly slick and contains a language that is close to bank design, whereas the DAO one is a cyberpunky / cypherpunky DIY leather suitcase containing a PC and connected to an off-the-shelf suitcase-shaped customizable PC case, which is much slicker and has a bunch of DAO rhetoric printed on it.

In creating fictional postage stamps, I'm interested in using that form as a waning technology and a literal image-turned currency to look at blockchain as this new package for contrast and familiarity. Stamps (as a form) at once serve as an actual currency stand-in for a trusted, secure distribution system and also imply national sovereignty and convey the visual codes of a nation state.

Blockchain Risk Board Game Prototype: Capital Markets Digital Asset Edition, 2016
Folde Board: plywood, canvas, foil; Boardgame box: plywood, foil; Figures, cards and dice: Spraypaint on 3D printed figures, coins, plexiglas, digital print on cardboard along; Game rules: UV print on dibond

SS   You've clearly spent a lot of time mining the web and exploring the many different and competing narratives surrounding the blockchain. What do these conflicting voices and the rampant speculation, for example whether it will truly be a new WWW, or just a new banking protocol, say more broadly about these different factions, and our relationship to technology, power, and trust, today?

SD While not being totally sure about this, I have some inclinations. I think the idea of it being a totally new www is very attractive for a number of very smart investors and technologists more broadly. Sometimes I think the desire to be a part of the foundations of 'building the next web' and 'making the facebook of the financial web, or web 3.0', is a story too compelling to this community not to exist. I think some people need this story. I think maybe if blockchain didn't exist, somebody would have to invent it to provide a focal point for a new generation of ambitious founders, talented engineers and disruptive investors. I also think that the narrative of alternative systems, about not trusting the government or 'centralized orgs', about building 'fairer', technologically enabled alternatives to state systems as fundamental as money and governance mechanisms is in tune with a wider distrust of states/politicians/'the man' that is identifiable in many cultural/political directions of the now – such as Brexit and Trump. I think this is an engineer's answer to this societal zeitgeisty feeling, whereas there are other answers for other demographics. I think blockchain's strong links to libertarian, exit-based thinking, and its investment in a story around incentives, like people needing to be financially incentivized in order to act penetrate beyond tech as well. They go hand in hand with the logic that private enterprise is more efficient and smarter than state systems, that individual liberty equates to freedom – all these tendencies show themselves in other parts of society, not just within tech and finance.

Blockchain Future State Fintech Gamer Case Mod Deal Toy: 21 Hype Cycle, 2016
Lasercut Plexiglas and screen-print on Sand 3D print; Screenprint on wooden thomb-stone, lava stones, plexiglas; Casemod: 17.72 x 23.62 x 11.81 inches; Plexiplinth: 19.69 x 22.44 x 14.17 inches

SS   What does the development of, and dialogue around, the blockchain suggest regarding how we are envisioning the future, and the kind of technologies people need, desire, or are promoting?
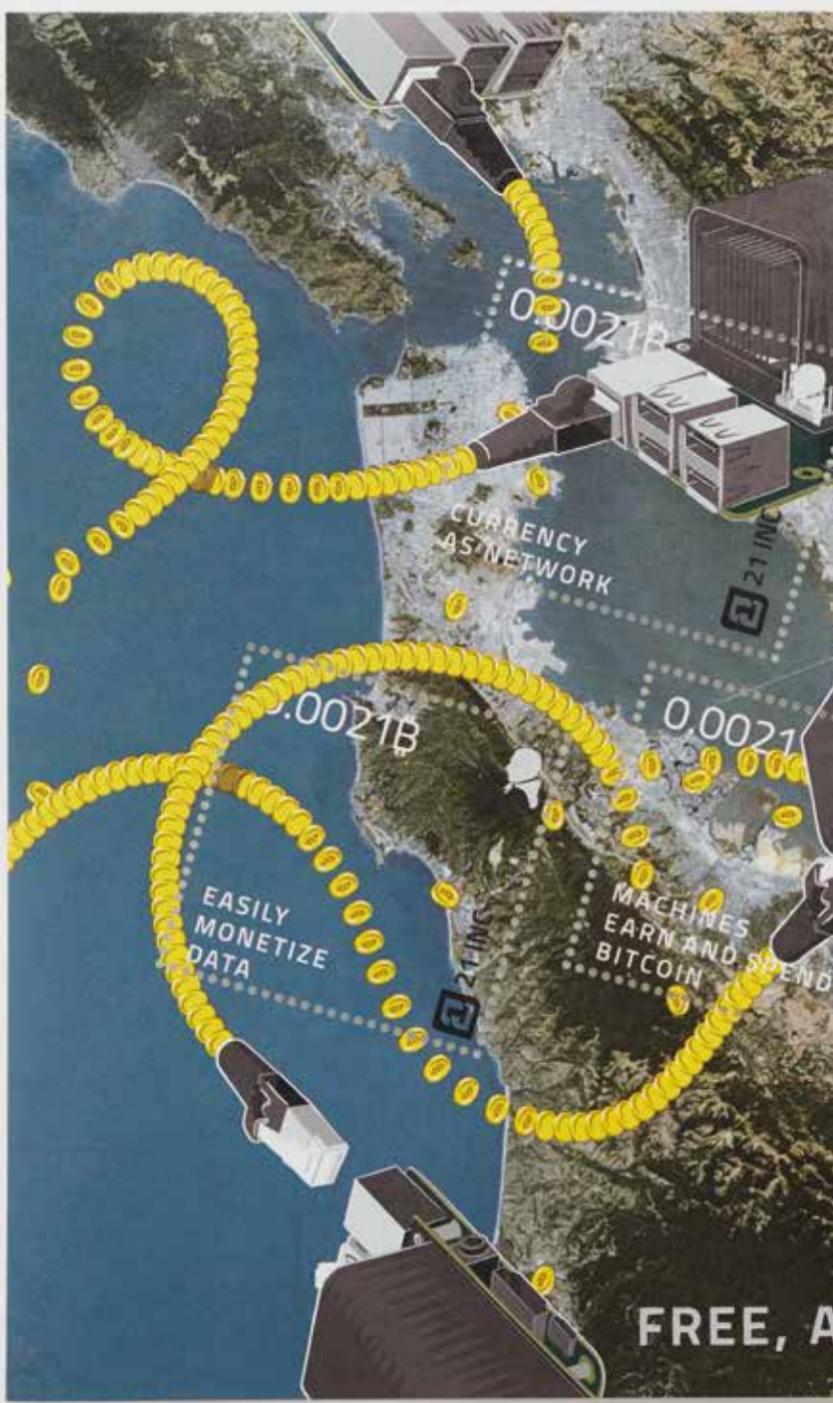
SD   I think I somewhat touched on this in the previous question, but maybe the desire for alternative collectivity, for systems that don't involve 'traditional hierarchies' or 'centralization', and that speaks of a contemporary desire for 'alternative' macro stories, for collective societal narratives that are believable and different from the familiar stories that we seem to have somehow worn out. The collective stories of the 20th century don't wash in the same way that they used to. People don't believe in the 3rd way, they don't believe in corporate systems leading to fair globalism and responsible inclusive growth. Lies are both more and less visible in a world with our web – making an environment where hypocrisy seems to be more rife than it used to be. A technology that (in a seemingly irreconcilable contradiction) both provides an answer to privacy (through cryptography) and transparency (the infallible public ledger) at scale, which in turn magically provides us with new hope for alternative governance mechanisms and an antidote to corruption… I can see why this is appealing as a popular new macro story.
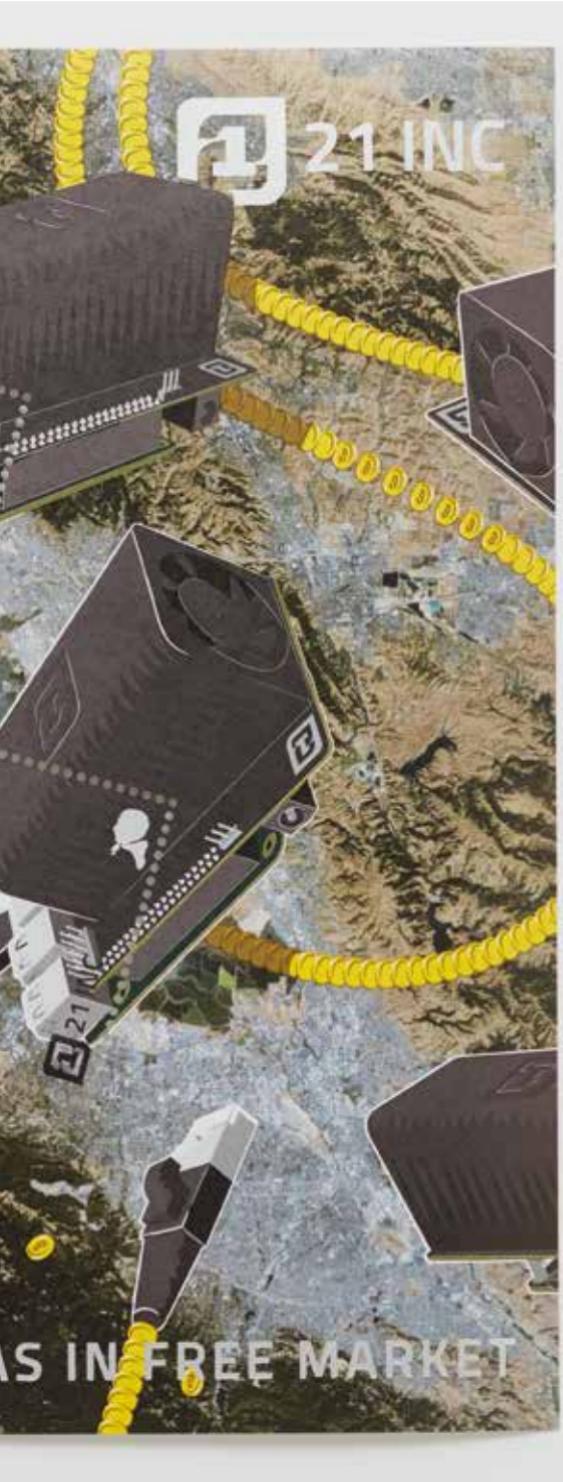
Blockchain Future State Fintech Gamer Case Mod Deal Toy: Decentralized Autonomous Organization (DAO) x Ethereum, **2016**
Custom made steampunk computer case, laser cut mdf letters, screen-print on computer case, powder-coated steel component; Screenprint on wooden thombstone, lava stones, plexiglas; Casemod: 33.46 x 19.29 x 22.83 inches; Plexiplinth: 19.69 x 23.23 x 22.44 inches

SS   Finally, let us imagine for a minute that a truly radical form of the blockchain were to fulfil some aspect of its potential or promise – what might that be and how might art be changed by it?

SD   As I say, I think the most disruptive yet plausible thing that blockchains propose is a radical monetization of the attention economy. I think the way image producers and artists might earn their money, and what kind of art becomes visible and valuable might change as a result of this. Art is a system that seems to be tangentially affected by technological changes, rather than directly affected. The business model for the MoMA canon art world has stayed quite similar, but has accelerated over the last 20 years, since email and travel has changed things, and fairs and jpeg-based sales proliferated. That's I guess the impact of web 1.0. With web 2.0, people do sell work off instagram – for example advisors make a lot of use of instagram, and traditional primary galleries, but to a lesser extent. Artists also make use of instagram but it's less directly for sales – again I am talking about a MoMA-canon kind of art, and artists and galleries that aspire to be a part of this kind of canon. Personalities of artists are shaped through web 2.0 social infrastructure, and curatorial patterns seek and identify work on social networks. For the impact of a possible web 3.0, I think the fact that artists and the art world use the attention economy and often in a self conscious way, means that any changes to the way that works, what platforms it interacts with and how, could again effect the mechanics behind art, again indirectly, but profoundly. If we lived in a world where many people had very liquid personal or project-specific currencies and worked around a tokenized culture of tradable value units that followed where attention went, one might get more crowd-funded art projects, and that could change some business models. One might also see an intensification of artwork that spoke to many people rapidly through images. To me this would have more profound effects on art and its production and reception than for example, a transparent blockchain ledger that either enabled digital work to be guaranteed to be unique (and therefore supposedly more saleable) or authenticity to be guaranteed by a unique traceable hash. These are the two blockchain art models I hear most often posited, and I don't think they are all that profound.

Figures 7–9
Blockchain company post-
age stamp designs: *21Inc,*
Digital Asset, Ethereum
[with Linda Kantchev]
Custom designed postage
stamps. Photos: Nick Ash

All images courtesy of the
artist and Petzel, New York

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FRONTIER

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RNANCE

ethereum

FICTIONS

Flying Under A Neutral Flag

'Tangible or ethereal?'

'Ha, I'm liking your new sales pitch', Monique raised an eyebrow as she walked past the dusty wooden counter topped with glass jars, each full of cacao beans from different places.

'So, what's your choice?'

'Give me something in between', Monique responded.

'OK, good answer. A suspended Theobroma coming up. I was working on this one last night.' Amari mixed liquids, solids and gases from a number of containers including something that looks like a fire extinguisher.

'A blogger who came in yesterday said that this place is a science lab for chocoholics, but we know that chocolate is much more important than that', she said, putting the final touches to the concoction.

She handed Monique a small bowl of iridescent foam. Monique brought a spoonful of the glistening bubbles to her lips. The temperature of her tongue transformed them into a velvety liquid, intense yet without the disruption of sweetness, as the flavours hit the back of her mouth. The bowl continued to bubble as she asked, 'Are you sure this actually contains chocolate?'

'Come on, would I lie to you?'

'Oh no, have I activated your chocolate is the gift of the gods, enabling the Third Eye speech, again?'

'Very droll. Now… spit it out, what's the latest?'

'Thank you, that was incredible', Monique paused for a while and then looking down let out a long exhale. 'There's definitely something wrong. Last night I got a direct message via the whistleblower's private messageboard. It was from someone, a group of people maybe, demanding that I give up control of my node. *The* node.'

Amari looked at her skeptically as she opened another package of mixing utensils, 'you get spam, I get spam, we all get spam, people pretending to be other people, asking for this and that. You've encountered this kind of thing before. What else is new?'

'Yes, but it feels different this time. They say they have support from many other node hosts. Of course they could be bluffing. I don't know who these people are, and until I can figure that out I'm not sure what can be done.'

'Monique, what can you do about it though, really? The system is a protocol, you can't control it through per‐suasion or reason, it works through a technical logic.'

'That might be true but some things, or rather people, can be influenced. There was something strangely inti‐mate about their message that made my skin crawl. It's like these people — whoever they are — have a power and some kind of hold over my fellow node hosts. That's what this is all about.'

'What would Fremont do?'

'I don't know. He would fight them in public maybe. He'd tell them where to get off, probably.'

'Exactly.'

Monique peered at the 100‐year‐old wooden counter, run‐ning her finger over the folds of bark, 'sometimes it's not so simple. Each layer reveals more stories, half disclosed, half hidden.'

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Introduction to ANF

A Neutral Flag (ANF) exists to provide a free and accessible re‐cord of wrongdoings in the public interest. ANF is a decentralized structure enabling citizens from any country in the world to simply and anonymously disclose situations of wrongdoing deemed to be in the public interest, in response to inconsistent and piece‐meal national provisions. Utilizing Distributed Ledger Technology, ANF operates through a system of temporary wallet accounts, physiological interfaces for disclosure, a publicly accessible da‐tabase, and smart contracts facilitating notifications to relevant independent bodies and the organizations, all contributing to a chain of oversight and accountability.

ANF was initially launched ten years ago, prior to several high‐profile cases that called attention to whistleblowing as an impor‐tant means of enabling societal, ethical and economic outcomes at local, national and international levels, in public, private and the third sectors. ANF is particularly valuable for industries where

accountability and responsibility is diffuse or distributed across a number of regulatory bodies.

ANF does not aim to replace other whistleblowing processes or infrastructures. It is a complementary component of the broader whistleblowing ecosystem comprising:

Internal compliance: HR policies and other organizational systems such as internal question channels and hotlines;

External channels: including ombudsmen and independent advice helplines;

Third party services that enable whistleblowers to anonymously raise concerns to key individuals within an organization or structure (the importance of such approaches to organizational wrongdoing is evidenced by the forthcoming anti-bribery management systems standard ISO 37001);

Statutory bodies such as industry regulators and law enforcement agencies;

A growing network of whistleblowing research and advisory organizations around the world, supported by governments and civil society (such as Public Concern at Work and Transparency International);

International organizations that provide legal support for whistleblowers and campaign for the disclosure of wrongdoings (such as the Courage Foundation);

We describe this as a whistleblowing ecosystem as it encompasses a diversity of channels, modes and approaches that are sensitive to local legislation and cultures, collectively contributing to increasing accountability and combating corruption worldwide.

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```
Headphones on.
03072005/01 got played yesterday.
18022006/04 is a good one.
Enveloped in sound.

The music should have beats, but the rhythm can wax and
wane a little, as this helps slow down Monique's reading
speed and sharpens her attention to the details she finds.
```

Monique looked for new disclosures on the whistleblower's system, as she did each day. She wanted to know how these people felt about 'speaking up' and whether they were scared. How did they deal with being intimidated? How did they prepare themselves to disclose? What went through someone's mind at a time like that?

Of course there were many people who posted their disclosures on the system, and then almost immediately went public with the details. A few simple searches would yield the minutiae about them and their cases, but Monique was more interested in the people who want to stay private, those who didn't want the attention, those for whom the price of giving voice to their dissatisfaction would be inevitable pain. Monique wanted to go beyond the formal face of data distributed on the stack. She wanted to hear the stories and see the emotions of the people who blew the whistle, face to face.

For the last three years, Monique had been developing FremontPrint, a stylometric tool able to identify the digital fingerprints of text written by web authors. Based on analyzing 1,000 characters or less, FremontPrint had an accuracy rate increasing from 75–85 percent. The code for FremontPrint was based on another stylometric system for identifying authors of musical compositions, developed by Monique's uncle, Mateo Fremont — the musician and self-proclaimed founder of A Neutral Flag. FremontPrint had been in simulation mode for the last eight months. Sat there in front of the screen, Monique's heart raced as she thought about running the code live for the first time.

```
Load: disclosures for 'today'.
Entries in blue, details in red.
Search: Location, responsible body, nature of disclosure.
Overlay: Publicly available similar searches, web data
scrape.
Run: FremontPrint
Result: Node ownership details
Run
Run
Run
```

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Call for Monuments

The ANF Foundation invites artists and designers from across the globe to submit proposals for new public monuments to commemorate the issue of whistleblowing, to be located anywhere in the world. This call has been formulated in response to the grassroots ANF monuments that have appeared across the continents,

in diverse forms, over the last five years. These monuments will continue the legacy of these activities, functioning as places for reflection on the nature of truth, esteem for the ANF system, and as symbols of good governance.

Participants of the contest should propose a unique art object articulating their vision for ANF's continued relevance and significance. In order to fulfil the purpose of an internationally recognized official ANF monument, it is necessary that the monument addresses the following principles:

Sensitively located – the monument is sited in a publicly accessible yet relatively secluded location;

Aligned with ANF – the monument articulates at least one of the ANF core values: justice, respect for privacy, the search for truth and transparency;

Cultural methodology – the monument engages with local cultural traditions to comment on the history and future of whistleblowing;

A symbol of whistleblowing – whilst the monuments are not meant to function as interfaces for posting data onto the ANF system, their design must take into account their significance for the community of whistleblowers;

Longevity – the monument must adhere to the system's sustainability principles, able to withstand the elements and any public interaction for 25 years. The ANF foundation will make available modest maintenance costs – please outline these costs in your proposal.

Applications to the ANF monuments competition will only be accepted via the online portal.

Three winning projects per calendar year will be selected by an international jury of 50 art and design professionals with an interest in whistleblowing.

Winners each receive an honorarium of 10,000 USD and 15,000 USD production budget to fully realize creation of each monument, from conception to installation.

Deadline: 31st December, every year.

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'Do you mind if I turn the radio on? I want to hear about the sugar crisis', Amari slowly turned the dial of her AM radio.

Excitedly, Monique announced, 'I got some real results. The closest node host is about 45km South West from here, they raised a concern at work about 2 years ago. Stayed in the same job following probable harassment is-sues. They reported a deliberate lowering of standards in the organization that put the health of members of public at risk. No known affiliations to political groups or anything else suspicious. I messaged them and I think it's possible to meet.'

'Are you sure this is a good idea? I know you're scared about what will happen if your evidence is not enough, but if you really feel it's destroying you that much, why don't you just disclose it? Whatever it is?' Amari asked, pragmatic, exasperated but patient.

'I need to know how they dealt with it. I need to know how it feels to do it and live with speaking up about something that could change my world... our world', Monique said, at the same time asking herself whether she could ever risk revealing her secret, a secret she had not shared with anyone, not even Amari.

A male voice on the radio cut through the hiss —

Ten years after the launch of A Neutral Flag, we would like to celebrate the success of the system, and also call for some changes. Given the financial resources wasted on incorrect allegations made against companies, we believe that one of the principles of the system that Mateo Fremont put forward was wrong = the principle of anonymity should be refuted. We have good reason for this. If all this information is in the public interest, then the public should know that it is from a verified, reliable source. This will have great value for the population. The public has the right to know the iden-tity of the persons providing such information. In the social media age where we give out supposedly 'private' information all the time, what do these people have to hide? After all, we now have this wonderful transparent system for reporting wrongdoings, which we can all trust in. We have gathered together a great group of allies in this, and will be pushing to make this historic change to the system before the end of the year.

Abruptly, Amari clicked the radio off: 'OK. Start talk-ing, now. Is this what we were discussing the other day?'

'Um yes, I think so. I also heard that someone has been copying and selling the data on the super protected

part of the stack. There was a message from the admins to all node hosts. They are completely perverting the roots of what we built. This system, which was always based on the principle of 'no secrets for money' is being mined and exploited by these bastards. Those poor people who wanted to stay anonymous, because they were in danger of abuse and harassment or whatever, are now getting screwed twice. Brilliant. Mateo and the gang did a great job.'

Amari turned to the counter, 'I'll put on some music. And some cacao.'

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Automated Notifications

When data posted to the ANF system meets the verification criteria, a smart contract is executed: The organization(s) accountable for the wrongdoing is automatically contacted, as well as the relevant independent body or regulator. The system notes that follow up contact – the nature of which is defined by individual organizational policy – must take place within 30 days of the concern being raised.

Please note: It is not the responsibility of ANF to provide means for a fair and thorough investigation, or respond to concerns of wrongdoing.

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08112006/03 is playing today.
27092006/02 is cued up next.
Ringing.

It's an unknown number, as it was yesterday, again right after Monique had finished checking the day's disclosures. She stopped typing and looked down at the phone as it vibrated on the table, it's screen excitedly lit up.

Turning down the music, Monique answered, 'Hello?'

Silence. Again.

Amari had told her there was no need to be paranoid, but doesn't paranoia stem from truth? Monique put the phone back down on the table and stared into her coffee.

What's going on here?

Now the landline was ringing.

'Yes', she sighed, picking it up.

'Ah, it's good to hear your voice Ms Fremont. You don't mind if I call you Ms Fremont, do you?' It was that voice again, the same one as on the radio, but this time it was calm, almost soporific, 'I just wanted to thank you Ms Fremont', the voice continued.

'Whhat ffor?' Monique pronounced her words slowly, trying not to sound nervous.

'Well, before I get onto that, we want to thank you properly. I know you didn't like the message we sent you the other day, but there was no need for a rude reply. We understand that it's sometimes difficult to let go of the things we have had for a long time, and we want to help you. This attachment, this secrecy, this responsibility, it's all so, hm, what's the word? Oppressive. Heavy. It's such a burden.'

'And you're going to get rid of that… burden, for me?'

'Yes, that's right Monique. No doubt you heard our announcement the other day. This change is inevitable. We have control of 49.8 percent of the nodes, so a hard fork of the system is coming right up. Since you have been such a brilliant facilitator of our cause it would be much better for you to accept it now. It's a little too late for you to upset the system. If you were going to do that, you really should have done it a while ago, but hmm, I suppose it's possible you didn't realize that you were helping us.'

She could feel her skin boiling with anger, 'In what twisted parallel universe would I help you, you manipulative, blackmailing power-hungry control freaks!' she blurted.

The voice tutted derisively, 'Come now Monique, are you so stupid as that? We'll talk more soon. But before that, we wanted to say thank you for FremontPrint.'

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(Selected) Terms and Conditions

ANF is committed to excellent data quality:

All concerns must relate to a body accountable for the wrongdoing, in order that the case can be concluded;

All concerns raised must be deemed in the public interest, so that the system is not used as an alternative method to raise grievances or make libelous statements;

Out of respect for the privacy of individuals, when first raising a concern, one should refrain from including personal and private information about the individuals involved, to prevent these from being automatically published on the ANF public database.

Data posted on ANF is subject to a strict verification process. Inaccurate or insufficient data erodes the quality of data posted on the system as a whole:

All concerns raised must be accompanied by a dated and detailed timeline of events;

Documentary evidence of your concern in the form of recorded media or interactions, should be submitted on the stack alongside your initial data posting (one example is necessary per data posting);

Inability to provide sufficient time-stamped recorded evidence may result in your concern not being appropriately pursued by the relevant bodies.

Be aware that ANF will ensure your identity is concealed, however, responsible organizations and law enforcement agencies may ask you to disclose information that could identify you.

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The wind gently lifted the autumn leaves from the
ground. The light was beginning to change as Monique
touched the metal surface of the horn. Some parts of
it were smooth. She imagined that these were the areas
where other people had touched its sides, thinking about
their own secrets. The sculpture was funded and erected
by a group of artists who disclosed corrupt sponsor
practices of international art festivals. Monique liked
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to visit this place, she liked to look into the seem-
ingly endless, dark apex of the horn until the sun went
down. She always felt empowered by the receptive horn,
which kept the secrets of those who used it ritualisti-
cally, trusting it as the location to disclose their
secrets. Sometimes she would see remnants of the brown
paper packets, markers of the officially distributed
data posting kits.

'I would never do it here', she always thought to her-
self, 'every leaf is probably bugged.' This time, being
there barely made a difference to the feeling of over-
whelming hopelessness she found herself in.

She felt a vibration in her pocket. She usually turned
her phone off when she was at the horn, but today she
was so preoccupied that she had totally forgot.

A quiet voice came over the phone, 'you're a traitor,
but that's OK.'

'You know nothing about me.'

'I know that you believe in the truth. I know you're at
the horn. I know you have a data posting kit in your
bag right now.'

'Why are you doing this?'

'Because it's the right thing to do. Sometimes, you have
to be forceful to make change. It might be painful at
the beginning but in the end it will be much better.'

'You know I'll never give up the node.'

'That's fine. It would have been good to have you on
board but we can still change the system without you.
It's inescapable.'

Monique paused, 'there is something I can do.'

'I don't need to tell you Ms Fremont — the system is a
protocol. No-one, not even you, can stop it.'

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ANF/MOST RECENT DISCLOSURE/TODAY:
MONIQUE FREMONT WAS THE SOLE AUTHOR **OF ALL MUSICAL
COMPOSITIONS PREVIOUSLY ATTRIBUTED TO MATEO FREMONT
BETWEEN 2005—2007.**

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Support Us

*If you like A Neutral Flag, here are a few things you can do:

Please consider hosting a node to keep the ANF network thriving.

Tell your friends about ANF and ask them to host nodes.

We are looking for more sponsors and partners – please donate to support ANF's activities and pass the ANF message on to organizations who share our values.

We are looking for more examples of how ANF has enabled better accountability and more ethical behaviour. If ANF has helped stop wrongdoing that was affecting you, we'd love to hear from you.

History of Political Operating Systems
Interview with Dr. L. Godord

Today, we are talking to Dr. Lysander Godord, knowledge provider within Galt University's KCC college. Dr. Godord is a world renowned expert within the often overlooked field of the history of political operating systems, specifically systems predating the blockchain.

Dr. Godord, thanks for taking the time.
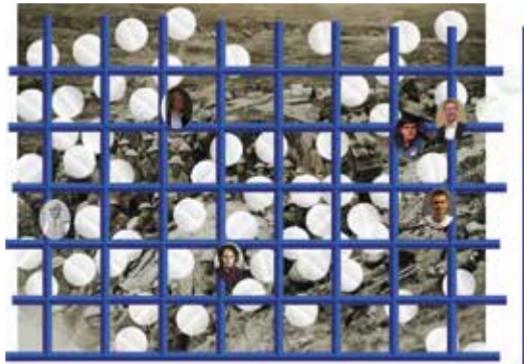
Thanks for having me.

Nowadays, it seems hard to conceive of a topic of lower intellectual utility than that of the world before the blockchain. What drove you to specialize in such an arcane field? What interests you about the history of political operating systems?

There definitely is something like a morbid fascination at play when imagining a world before the blockchain.

How so?

The degree of division is just dizzying – the earth cut up by national borders like a cubist painting, only to be put together again in a Frankensteinean manner through so-called supra-national organizations – League of Nations, NATO, Comecon, UN, and so on. Subscribers unable to decide what kind of governance services they require and want to buy – totally robbed of political participation through choice, while at the same time given the ability to vote policies in and out of existence for free by virtue of gratuitous votes, without any cost or mandate.

Currency in the form of physical tokens, designed for the interior of your pockets, their meaning surrendered to the rule of national banks. Warfare, in the form of high energy projectiles disintegrating human bodies and structures – colossal arms races, while at the same time the contents of states' memory banks lie bare and are plagued by the most abstruse and severe of security flaws.

We see a world of disconnection, wastefulness, irrationality, and un-freedom. At the same time, it remains the predecessor of the operating system we live in. It created the internet, smart contracts, autono-mous organizations, and ultimately the blockchain. It was popu-lated by geniuses such as Rand, Page, Friedman, Nozick, Assange, Zuckerberg. This cacophony can be overwhelming and exhilarating at the same time – a breathtaking glimpse of the predecessors of free-dom. Actually, at times, the lure of these antagonisms can be hard to resist – irrationality can be a drug.

The same antagonistic momentum is tangible on the level of pre-chain behaviours: Again and again, we are faced with behavioural patterns exhibiting the most extreme degrees of irrationality – however, if you look closely, they reveal a certain inner consistency.

Can you provide an example?

Take the phenomenon of 'birth-tourism' as an example: Subscribers within pre-chain societies travelled to specific sites for no other reason than to give birth there.

How do you explain this?

In order to answer this question, you have to understand pre-chain mechanisms for managing governance subscriptions. As it turns out, pre-chain societies employed a totally static system of assigning plans: You were not free to manage a portfolio of governance services, instead, you were assigned a governance plan at birth. This is where the factors of location and inheritance come into play. Which plan you were assigned usually depended on the plan your parents were on, and crucially, it could also depend on the location of your birth.

So, if my genitors had bought a certain portfolio of governance services, health care package, jurisdiction package, emergency response plan – I would be forced to buy the same?

Precisely, providers would just jam these contracts down your throat. You would not only be required to buy these plans – terminating these contracts was virtually impossible. This is why the initial choice of plans was so crucial, this is why people went to such great lengths to choose plans for their biological offspring.

So they actually boarded an airplane in order to choose the location of parturition?

Exactly, their own bodies served as a token for governance subscription management.

This does sound as if legacy systems put a morbid emphasis on questions of location and geography.
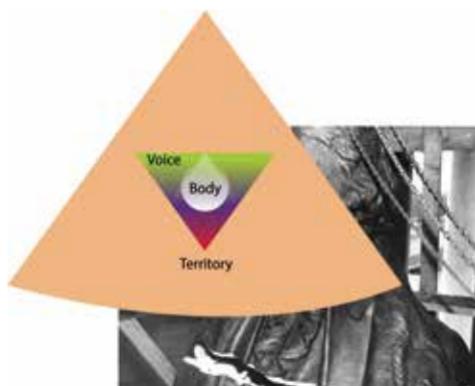
Yes, they tied political markets to location, every governance provider was assigned its own little swath of land. This is where the legacy term 'territory' comes from.

What did it do?

'Territory' was a mechanism for isolating markets, protecting governance providers from competition. Thereby, it reinforced the aforementioned regimen of non-choices to subscribers.

Intriguing. How could an OS like this exist in the first place? Obviously, it did fail eventually – but what slowed the decay of the configuration you describe?

Actually, this state of affairs also provided political structures with some unique properties. Having different states bound to territory, allows for different speeds of development. Some can be poor, some underdeveloped. Some have running water, some do not. People had few chances to opt-out of one service plan. They could try to flee their territory – chances of success were slim – probably they would just be sent back. Trying to subvert the mapping to assigned territory also was dangerous politically. Remember that your only means of political influence, what at that time was called voice, was coupled to the assigned territory and its provider. If you lost that tie, you lost your voice so to speak. To sum things up – just like with other monopolies, this state of affairs facilitated the operation of providers that no sane person would choose voluntarily.

All of this sounds so horribly hopeless – was there any upside to living in a legacy OS?

You'd be able to encounter tigers, polar bears, blue whales IRL [laughs]. Well, there was no real upside, not from a contemporary perspective. However, it's possible to identify a few perks. For one, while choosing governance plans was impossible, a lot of services were gratuitous for subscribers. So again, it was a huge game of chance: If you happened to like your provider, appreciated your plan, this state of affairs might actually be enjoyable. This of course prevented any form of freedom – at least in the modern sense.

So, what is your approach when teaching prechain OSes? How do you introduce students to the world you just described?

I usually start things off by proposing a thought experiment: How would political markets behave if the rules of supply and demand disappeared overnight?

This points us to the question – what is the effect of political markets? If no one needs arbitration any more, that service will disappear – if no one buys health insurance any more, that service will disappear. Under legacy conditions these rules are not in effect. Consequently, prechain OSes were crammed with services no one needs.
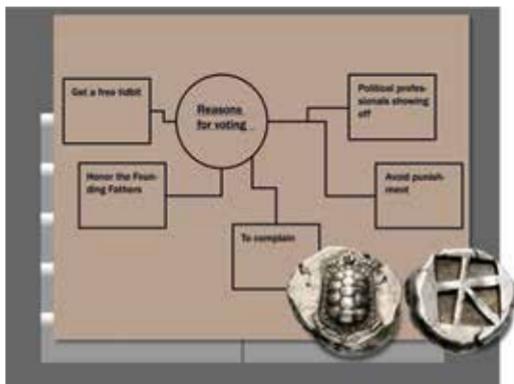
You can picture it like a huge department store filled to the brim with moustache wax, disk punchers, vaginal douches, leucotomes, typewriter ribbons, stuff like that. Things that lost their utility, like religious subscriptions; had none to begin with, like military contraptions; or were based on plain customer deception, like political parties, charities, and foreign assistance programmes.

This is one of the main benefits intellectual subscribers to our knowledge services experience: to become aware of all the advantages of the OS we live in, motivating us to make the most out of any single day: to realize how awesome our lives are.

This definitely sounds like prime academic value! Still, I understand you had some funding issues lately.

I'm afraid that's true. Just like you mentioned in the beginning, many knowledge subscribers have trouble seeing the intellectual utility of a course in the design history of political operating systems. However, there is absolutely no need to buy a full course, should you not have the coins. It's perfectly possible to experience the fascination of legacy systems in a shorter timespan. If you can merely afford 2 minutes – do that. I do provide a lot of inspiring microteachings. Listen to the

history of political operating systems during your morning shower or during your commute, it's definitely worthwhile.

Fascinating stuff. But before this truly becomes a marketing event – could you elaborate a bit on the inner workings of prechain governance providers? Specifically, I'd be interested to hear a little more about the possibilities of political participation under legacy conditions. How were feature requests handled?

Certainly. First of all, we have to remind ourselves how political freedom and political choice were constrained to a very narrow class of individuals: spies, double-agents, diplomats, so-called stateless individuals – everyone else was subject to the described static mechanism of provider assignment. For most people this simply meant you were born into a service and stayed there until your body expired. Regarding actual policy elicitation mechanisms, a sizeable number of prechain providers employed voting mechanisms of some sort. Again, these votes were bound to human bodies – votecoins were assigned through administrative bodies on a per ballot basis.

Consequently, reasons for voting were comparably random. Mainly persons with a lot of free-time, or who were governed by habit, or were connected to the narrow class of political professionals, participated in the process. You could participate in every vote with no additional cost, old people voted a lot out of sheer boredom. Being a political professional or a mere voter mostly was a binary division.
In effect, mechanisms for submitting feature requests were conceptualized in analogy to antiquity. They were based on the idea of voice. The basic model here being individual subscribers voicing their political opinions collectively, achieving collectively binding decisions through discourse.

This does not sound terribly efficient, though.

Precisely, as you can probably imagine providers had to deal with massive scalability issues. This might have just worked in the case of Athenian democracy, it might work with 300 to a couple of thousand individuals.

However, with populations on the scale of millions or billions of subscribers, it is hard to imagine how you would achieve any outcome at all. Not through discourse, that much is certain. How would that even work? It would just be 12 billion people chatting on and on.

And political entrepreneurs did nothing to fix this? Providers were just left broken?

Voice-based dysfunctionality actually was apparent to political thinkers before the blockchain. The ad-hoc bugfix they came up with was representation, a somewhat convoluted concept based on the idea that you give your voice away but somehow still retain it.

Why didn't subscribers demand better terms of service from governance providers?

Well first of all, since providers occupied geographic monopolies, they couldn't. Additionally, founding a political startup, creating your own governance provider was prohibitively expensive.

Would you identify this as the main reason for the demise of prechain OSes?

Not really, this would probably be the inability to establish contracts, at least in the modern sense of the word.

Contract-Management	
Contemporary	Pre chain
Start your own service	Cheat on service provider
Choose from menu	Actions without consequences
Abandon services	Randomness and chaos perceived as freedom
Automatic enforcement of contracts	Erratic, manual enforcement of contract

Why couldn't they establish contracts?

In order to answer this question, we would have to analyse legacy notions of *truth*.

We have become accustomed to viewing the concept of truth to be intimately tied to a regimen of global distribution. It is a given that propositions become truths by being anchored to the chain, by being shared globally. Which actually highlights a crucial difference: in a legacy world, the notions of truth and distribution had not yet been merged as closely as they are now.

Quite on the contrary, truths were stored in highly centralized fashion. They were concentrated within the files of state apparatuses, confined within the holy books of ancient religions, hoarded by national security services, restrained within the memory banks of central banks, hidden and fought over. This actually made it impossible to determine if contractual obligations have been met – you could never be sure if a contract was fulfilled, no effective mechanism could provide an answer. Consequently, in the absence of truth, subscribers were left to bickering – fighting about what was right within their insular little fish ponds of limited cohesive statements. This inability infected every aspect of life – creating confusion, inefficiency, strife. In the end it left the world crippled.

What we see here are the debilitating costs of a non-decentralized system of guaranteeing truth: Propositions could not circulate freely within the prechain world, as they do now. Ultimately, this ensured legacy political OSes' uptime remained limited.

Our own time has run out as well, I'm afraid. Dr. Godord, thank you for providing this intoxicating glimpse of prechain irrationality. Anyone interested in learning more about political OSes before the blockchain, be sure to check out a KCC microteaching by Dr. Lysander Godord.

All That Happened

Prelude

First you walk out of your door with the large irregular container which your neighbours always suspected you of hiding a smelly object in. It won't be easy by any stretch obviously, but you will pick yourself up and do it. You will set aside the taunts, the imagined slights, the implications of outsider-hood, the insinuations of otherness. Trust is a word from another time in the distant past, and you naturally lack any belief in functioning selves and systems. You are an other, there's no escaping that, ten thousand light years away. Not every gravitational pattern is escapable.

The Failure

Sitara was feeling anxious. She walked slowly to the planetarium. The sun had set a few hours back and the light was dim. Only the outlines of objects and people were visible. Today the planetarium was celebrating the presence of three visitors from another land. These visitors were going to demonstrate a new artefact that people here had christened the Large Surface Perspectivescope. This demonstration was going to be witnessed by the entire community. The visitors had chosen this hamlet with its planetarium because it had evolved in a remarkably synchronous way to the practices around their own artefact. There was considerable curiosity and expectation around the demonstration, there was palpable excitement in the air.

The people of the hamlet were curious about the Large Surface Perspectivescope, especially since the existing systems of fair and just administration were beginning to falter. They were only able to view one another through the viewpoints of various accounts that were circulated amongst themselves, and this invariably aroused suspicions of bias. This also caused some of them to lose trust, belief and the motivation to contribute their individual perspectives. The Large Surface Perspectivescope was apparently capable of retaining their individual perspectives and yet present them in a way that seemed neutral and democratic, by introducing an element of distance. When this happened, each viewer would see themselves and the others forming patterns in the night sky, patterns which they weren't even aware of.

Not everyone was open minded. There were several cynics in the room who had come simply to watch the new artefact fail. They had a very deep suspicion of technology and everything that it could do. So they weren't about to drink the kool-aid, they didn't accept evangelical logic mindlessly. They were critical observers at the demonstration. When the demonstration started, around half the audience had held its breath waiting for a wonderful episode to capture their imagination. Another part of the audience was resisting all the drama and logic of presentation and showcase. They were trying not to get distracted by the smoke and mirrors, but strained to remain focused on the actual demonstration of the artefact. The demonstration began.

The Ideal

The Large Surface Perspectivescope was going to be a series of telescopes of different sizes. The planetarium building mostly comprised of large windows. Any member of the planetarium could enter it and connect their own telescope to the chain of telescopes. The chain was a blockchain. And this network of telescopes was modelled in order to organize the constantly growing pool of telescopes, such that none were prioritized over another and the perspective of every telescope was available to every other, if needed.

The model had arisen from gathering observations. The observer observed in their fever dream, in waking, in walking, in sleeping. They observed what shot up and who went down, who held the megaphone, who wielded the baton. They strained their ears for those who whispered, they gaped at giant screens. They saw and saw, they looked around and into the distance, in silence, looked inside and out. They wallowed in what it was they were trying to question, what it was that irritated them, that they wanted to devise a balm for. Thus the model was shaped. The model manifested itself as a human form, they toyed with it – what it must feel like from the inside of it, what did the inside of a human feel like, inside the network of their mind, what the network appears to be on the face of it. There were pieces to this model, it could not be made by one single maker, makers had to come together with their pieces and fit them together; only then could the foundation cement itself.

Once the base is in place, the story can write itself, threads can emerge, narratives can fight it out for supremacy, history goes about layering itself into shape.

In actuality, it was a bulbous polished teak wood (see, the observers had a thing for old boats with their varnished gloss interior bulkheads, perhaps a reflection of the home they spent all their moments in on voyages rushing over open spaces of silent darkness with only woodgrain and stardust for company) base body. Around it was a powder pink plastic pipe ring for swivelling on the horizontal axis, an aqua blue metal pipe thing for adjusting height, so it could go down in case you were a child of eight, and so it could go up to accommodate for the height of your tall wedge heels; another blue metal pipe thing, Pantone blue this one, to nod left and right so your bowtie wouldn't get in the way of the eyepiece as you adjusted it. Several sympathetic metal wires ran parallel along the pipes, tense, fragile guide wires for fine tuning vision, tightening focus. The prisms held it all together, they glittered. But the only reason all these features existed at all was to stage the hooks, the hooks which would engage scopes of all manner, kaleido, micro, tele, peri, oscillo, spectro… depending on where the observers managed to bag the next gig, that is.

The Large Surface Perspectivescope was attempting to solve multiple problems. The problem was multi-dimensional. It can be broken down for easier understanding. Every object in the night sky and not just the celestial bodies which are featured in the atlas, can be seen and magnified by leaving it open to any participant's intervention. This was a significant feature of the problem that it was trying to address. Because of cultural gatekeeping not all media gets equal attention. History is a constructed and manipulated thing and it can't be trusted to be an accurate record of events that happened. Because of this inherent inaccuracy in history and because of the lack of availability of methods, processes and techniques, history cannot be repaired or saved and has to be replaced entirely. The Large Surface Perspectivescope remained a format for the re-imagined narrative of history. It is because history has lost its motivation to even offer any kind of justice, that some kind of remedial measure is sought to be formulated.

Any one who wished to share their perspective of the night sky in the planetarium could do so. There was no gatekeeping or filtering. If nothing else, one could at least enter the planetarium and share one's own view of the night sky.

Which in-built system did the Large Surface Perspectivescope have, to ensure a model for distribution of each telescope's view, in a way such that the system was neither based on any reflection of popularity or any other sentiment except an interest in the content itself? It had

an internal mechanism of acting against any node in the network that was drawing too much attention to itself. The moment a hierarchy of sorts got formed on account of the increased traffic of some view, the Large Surface Perspectivescope would attempt to establish a balance within itself.

Higher traffic represents higher value of some sort and in a block-chain, the notion of value is established by global transactions which are recorded in the ledger. The blockchain exists to ensure that disparity does not emerge in the system, it exists to ensure that the relative value of all transactions remains equal. Unless the value of transactions is equal, a genuinely open marketplace cannot exist. So the blockchain's overall objective is to keep the system without any biases and imbalances otherwise it cannot operate as a ledger. Using the blockchain to remove structural inequalities constantly, the Large Surface Persepectivescope created an ideal system. An ideal system that worked at least for some time.

The Visitors

Manouevering the container will have its own challenges. There are several doors to negotiate, as you move outdoors and indoors with your appendage, there are several degrees of obstruction that will cause you to twist into hoops, vectors of resistance that will contort your face and give movement to your fingers. You will make it through, you have to. The other two are going to join you, you have to do this for them, it has to all fit, it has to all work together somehow. It will.

If you thought getting out of the house was an undertaking, wait until you have to get into the planetarium. They call it the Large Surface Perspectivescope in these parts, is what you've heard. You've also heard that these are tough customers, having been ravaged by decades of exposure to intense neurochemical warfare, catastrophic level swings of neurotransmitters. Their response has been to develop a thick shield against anything that resembles an idea asking for processing. Whatever it is that they ingest has to be an empty capsule wrapped in shiny foil, a bubble bauble. Their processing systems have atrophied, their insides cannot deal with fibre, texture, nutrition, they demand salted grease sweets engineered for swallowing whole, no time to chew. They are a population of jaded glass eyes, screaming for superhits.

At the planetarium, the people of the hamlet, eager visitors to the latest show scrambling for their next hit, arrived to find the Large Surface Perspectivescope housed inside the planetarium's large dome that could open up entirely to the sky. They'd been instructed to bring their telescopes with them, which they gladly did – here was some novelty, asking you yourself to be part of the show! Each telescope could be oriented to a different part of the sky and retrieve images and movements of various bodies. Those views could be accessed by any viewer at any point of time, with a certain transaction. Part of this transaction involved them transposing their identities onto the view they were wanting to look at. It showed viewers a unique view of themselves and their companions, one that no mirror in their world could project. The prisms aided in this transposition and the entire network of telescopes ended up projecting different aspects of its viewers into the distant space. As a result, each viewer was able to get a glimpse of the other from a freshly generated perspective in the sky.

Initially, it was dark. Gradually, a deep blue-grey misty sphere became apparent. The sphere also seemed to flex and expand out of shape. Was there something else that was not visible that made it take shape and change its form along the way? It was still very dark and it was hard to tell what was being imagined and what was actually visible.

'What do you see?' the visitors ask the visitor in the saffron turban.

'A lion. No four.' he said.

'It's an owl' they said.

'No, it's four lions. They're huddled together jostling for space on a pedestal, they're struggling to stand, do they even have a leg to stand on? What are you showing me? I don't want to see instability, I came here to be entertained', he stormed off.

'Wait, you just need a bit of string pulling, a bit of pipe adjustm…'

Well at least he didn't have to pay any entry. Showtime was easy.

'What do you see?' the visitors asked Sitara.

'There's just too much to see here… my head explodes… what must I focus on? Why have I never seen anything like this before? Who am I?' Her head was glued to the eyepiece. She stayed there a long time. They let her, of course.

'What do you see?' the visitors asked the Yogic Seer.

'Death pervades inter-personal timefulness.'

'What?'

'Perception alleviates progressive expansion of quantum chatter. Interdependence transcends total acceptance of Higgs bosons. Self-knowledge leads to karmic space time events. The key to self-right-eous photons harmonizes with bliss.'

'Uh, ok.'

'What do you see?' the visitors asked the little one.

'An eye.'

'Does it glow?'

'No of course it doesn't. It's my eye, silly!'

Adorable. No, really! Some on-the-go adjustments needed with the blue metal pipe thing. 'What do you see now?'

'Woaaw.'

'What, what?'

'Haaaaw.'

'What?!! What is it?!! Let me see!! No, I need to see this first!!'

'Oh just hook yourself up why don't you? It's really easy, we'll show you how!' smiled the visitors.

Wonder still exists?

Lara began to roll around slowly. She wasn't exactly round. Her body was malleable and she could sense and scan all the surfaces that came in contact with her completely. Her body would stretch, bend and expand to gently adapt to its surroundings. She also had different sensors that could generate information about the texture, material, temperature, vibration, movement, colour and nature of the surfaces she touched. As Lara rolled, she lit up, sometimes bright but briefly,

sometimes yellow, but mostly just flickered mildly. She would sometimes leave behind an afterglow.

Lara didn't know that she was being watched. She was not really concerned about such matters because she had enough to keep her alive and glowing. Where was she being watched from and who was watching her? Inside the Large Surface Perspectivescope very far away, prisms were orchestrating a complex pattern of reflective mechanisms to broadcast Lara's movements. Lara however knew that she was just one amongst many others like her.

Lara was fascinating in so many ways. She evoked awe and wonder with her mere appearance and meditative movement. Something was happening in the Large Surface Perspectivescope. The visitors and observers began to lose their grips on their own perspectives causing everything to merge one into another. And this made formations in the sky that lit up very differently from one moment to the next. Why was the community not able to access those aspects of their members that produced the kind of brilliance that lit Lara up so far away? They came to a crucial juncture in their inquiries. If the stars they were discovering were in fact the product of multiple perspectives from the telescopes, then the co-ordinates they were being led to might hold the key to the co-ordinates of stardom within each individual operator of the telescopes. In order to differentiate the co-ordinates in the sky from the co-ordinates in the human operators, they named the latter, Extraordinates. However, the method of tracing the Extraordinates became secondary because the stars in fact revealed that stardom can be traced within any body. This became an important moment of reckoning for those in the Large Surface Perspectivescope. They felt that they had to share this knowledge with their friends who hadn't yet visited the Large Surface Perspectivescope, and invited them to participate too. They wanted as many diverse perspectives to operate the telescopes to enrich the views of the night sky.

The Afterglow

The knowledge that stardom was an inherent property of every body immediately levelled the operational environment inside the Large Surface Perspectivescope because it made all the operators realize their own value, without the need for comparing it with the next operator. They instead turned their focus to the operations at hand, in finding more stars in the night sky; because each new star in the sky only reflected something new and unique in themselves which they were

unaware of. The other aspect that made this levelling possible was the way in which the telescopes within the Large Surface Perspectivescope were networked. Each telescope stored data in identical block structures, registering each user's block as an independent unit within the larger blockchain of telescopic data. Every entry by a different user had an effect on the view of the night sky, and every one of these changes was visible to all operators simultaneously. The Large Surface Perspectivescope grew more active and turned into an organism itself. It was alive, powered by the energy transferred through human touch and dispersed through a network of telescopes. It was alive with a million eyes that never saw things again the way they did once before.

Many individuals emerged and became public figures in their own light in the time that the Large Surface Perspectivescope existed. All ideal frames can only be bubbles. Sure the bubble shimmered about, but it also burst. In the time that it floated, a few figures did emerge. But after it burst, this possibility of emergence stopped. The individual narratives which gained folklore-value on emergence became like the evidence of the possibility of a higher way of being, but one that was not sustainable.

Once a higher ideal is witnessed, a discontent is bred in the general experience. People find it very hard to adjust to life as it used to be. There is an overbearing sense of being cheated and being subjected to injustice. This kind of social mood requires healing. Healing for that community which lived near the planetarium was only possible by the demonstration of an ideal; without an ideal, the community drifted towards a bleak and brooding mindset. This was a very dark place, with no spark of hope at all. The community was destined to self-destruct after it set off on this path. And this self-destruction came, it didn't spare anyone. The planetarium became just a hall with large windows. All the telescopes were buried with the depressed dead bodies.

Some of the last survivors started realising that it was their dependence on hope that was leading to their downfall. They attempted to reorient themselves and delegate their memories of the Large Surface Perspectivescope to the archive of blurred remembrance of dreams. They started denying the possibility of any solution to the skewed information system that they lived in before the Large Surface Perspectivescope was demonstrated at the planetarium. By the way, Sitara died too. She was made of stardust anyway.

Bad Shibe

Illustrations by Lina Theodorou

Wow. It's two days since I rankchecked AreWeThereYet.

Hello phone! What's my rank?

Wow. Much slippage.

There's a noob who's ahead of me in the rankings. Amaze. BangZoom78 has come out of nowhere and is tipping like a true shibe. Truer. Amaze. Such tippage. We tip our fellow shibes to show our appreciation. BangZoom78 must be surrounded by amaze shibes. Very amaze.

Where am I? I was asleep.

Wow. I'm lying on the couch. I like the couch. I like our room. The light coming through the planks over the window is either morning or evening. Wait, if it's that strong it's evening. School soon! I was working at the orchard today. Much carrying. Such labor. So hot. Maximal tiredness. Ohhhhh. That's why I was asleep. And why it's evening.

I look at my phone again. BangZoom78 has graduated to the regionals?! Amaze. I feel a twinge of envy before I remember that we are all going to the moon. I put down my phone and lie on the couch and look at my ducks on the shelf. Many ducks. They are the old plush skeleton ducks that you find at swapmeets. I tell everyshibe I think they're funny but the truth is I feel sorry for them. I know shibes wanted them pre but srsly noshibe is going to want them now except me.

My phone pings. Kitteh! I'm late for school.

OK feet, go. Downstairs. Out the front door. Across the drive. Onto the street. Outside the kennels (fact: pre it was a McMansion but there's many shibes in each room there now) hot air from formerly sun-heated sidewalk hits cooler evening air and shimmies. Science!

Schoolwalking is kitteh. I'd totally tip someshibe for a piggyback. School is blocks and blocks and blocks away. Why is everything made of concrete if it gets so hot? Is the stuff on the streets still concrete if it's a different colour? Why are animals made of meat if they don't want us to eat them? Wow. I just walked to the schooltarps.

Good evening my fellow schoolshibes let me find some floor behind you all. I sit down squeezed against tarp. Teacher has pinned a new poster of some overdressed shibe, maximally pre, to the tarp behind them. I get tipped for asking who they. Wow. The pre shibe's name is funny. They were ruler of a state with streets made of water. My fellow

shibes laugh when I ask why we don't make the streets out of water here. But teacher tips me anyway. Amaze.

Teacher has much to say. They plot a U-shaped graph of occurrences of the word 'shibe' over time. Then they show us a clip from a pre film about two bros in a time-travelling phone box. Next teacher explains what a phone box is. Then they talk about an old cereal that was designed for TV. Then they talk about what TV was. Much history.

Another new poster says 'Tip your teacher!' and we do because we're shibes. I remember teacher's tippage and my earlier slippage (which rhymes) so I tip some more. Teachers gotta eat. Which reminds me, I'm hungry. As I leave class my phone pings above the hubbub of detarping shibes. Tipped for good homework. Wow.

Back on the street, night is ramping up. Eggers are packing up for the evening leaving the sidewalk greasy. The swapmeet is starting under glaring LEDs. Such service to the community. Zero walking from school. Many shibes. Such goods to browse.

My fellow schoolshibes are gathered around cartwheel vendors mobbing for apples and wraps. Wow. Much noms. Is 'noms' kitteh? I look around. Nobody heard me say it. I get thrown a maximally amaze apple and tip large for it when it also tastes good. What was that story with a big red apple in it? And a snake? I'm thrown a wrap. I kerbnom. Wrap is meh. I show its corpse to my schoolshibe sat next to me.

'Do I tip for this?' I ask them.

I get a look.

'Norly.' I retry.

Such looks.

'OK, cksake.' I pout.

I tip but it doesn't feel good. Maybe this is why I'm slipping. For a moment I think of just tipping my schoolshibes nomming next to me to help improve my ranking. But what would I tip them for? Amaze nomming? Sitting amazely? Thar they be, Mr. Phone. Tip them for being an amaze sitter. LOL. Like that would work.

Their phone pings.

Wut?

Oh maybe it thinks I'm tipping an amaze babysitter. That's not funny. Phone, that shibe's performed valuable services to advance the state of the art of staring. Tip them. Tip them like dudebros rushing a cow.

Ping.

Wutf?

My beneficiary deploys a ninja-level combo look my way. I die inside more than a strong individual secure in their identity should. I concentrate furiously on the kerb. Why has this happened?

I mean technically.

Wut? Phone says I totally tipped for 'performing valuable services to advance the state of the art of staring'. My toucan! Nooo!

The swapmeet sprawls across the dustbowls fronting old McMansions and into the alleys around them. Shibes have goods on old folding tables or on mushroom boxes. Piles of food ingredients, clothes, phones. Wow, such economy.

I head through wandering shibes across a dustbowl and wander myself down antiques alley. Old milk crate rigs, piles of fiat currency and other pre memorabilia. No ducks. I has a sad. There's an old shibe I've not seen before at a stall by the fiat sellers. With some ostentatiously pre bundles of paper. Kitteh, eye contact!

'Greetings, young shibe!' the eye contactor salesbros me. He's hiding a sign with numbers on but I don't get to look at it because eye contact.

'Uh...' I respond. Thank you for your service, brain. But salesbros are maximally pre. What do you say to them?

'Do you know what these are?' they ask. They pick up a book from their table and flip its pages at me. Such shuffling. Shuffleshuffleshuffle. The blur stops. Each page has small green rectangles of paper glued on.

I fail to conceal my curiousness. 'Fiat?'

Salesbro grins. 'Close. They're Green Shield Stamps. You would get the book, see, and then you would get the stamps. From supply stores. The stamps had dry glue on the back, you'd lick the back of the stamp...'

My mouth goes 'Ew!' and my face is totally onboard with that.

Salesbro continues, unfuzzled, '...and then stick them into position on each page until you'd filled the whole book. Then you could use them instead of fiat to buy things with.,

'Did they taste gross?' I must know.

'I don't know. Gluey, I guess. But they're really rare now. You could own a piece of history.'

'Pwn?'

'Uh I mean you could hold a piece of history.'

'Is this alt?' I ask. Kinda nervous.

Salesbro doesn't look nervous. I'd look nervous if someshibe I didn't know accused me of having alt.

'No way, young shibe. Just pre.' They keep shuffling the pages at me.

Much awkwardness. 'Uh thanks but I have to go see my parent now.'

Wow, such fail. I'm basically an adult and that was my excuse?

Dustbowl walking back to the sidewalk I tip salesbro for their teachings so I don't slip any further in the rankings. I walk home for the next octoseptillion blocks.

After the heat death of the universe I get back to the kennel. Stairs are kitteh. Mom1 is there, my sib UnoY isn't.

'Heya YS, how was school?' Mom1 inquires of me.

'Amaze. But some salesbro tried to gift me alt at the swap after.'

'Rilly?' asks Mom1 in what they have told me is their concerned tone.

'Yeah do you know what Green Shield Stamps are?'

Mom1 gets a look on their face. Then bounces up and down. Much bouncing. Maximal inverse kinematics. Such excite.

'OMFG my Granna had a book of those! I would totally tip you if you got me those tomorrow!'

I give them a look.

'They aren't alt, they're pre.' they assure me.

'That's what salesbro pitched.'

Mom1 nods, pale blue hair waving.

'Pllllllllease.'

Mom1 whuggles me.

'Pllllllllllllllllease, YS! Be a good shibe!'

I squirm to escape the whuggling. 'OK! Cksake! Leggo!'

My phone pings and Mom1 lets me go. I check my phone. It's raining! Much random

tippage from someshibe! Tomorrow when I wake up I bet I won't even need to check AreWeThereYet. Such tiredness. Wait. Why didn't Mom1's phone ping?

I wake up. Amaze.

It is dusty in the light between the boards.

Phone, how's my AreWeThereYet rank?

Wow, much gainage. I am a shibe. And BangZoom78 is gone from regionals. Wut? They're on nationals! They'll be Top Dog by (checks projections) two days next? Wutf? THEY MUST BE AMAZE!!! But...

And I know this is wrong...

I can't stop thinking. About yesterday. Tipping a shibe for nothing. Nothing real.

What if...

No. Nonono. Nooooooo. No way. I am a bad shibe. I shouldn't think that. I'm just jealous. We are all going to the moon. Phone, alert me when BangZoom78 becomes Top Dog.

There's a blast of catnip smoke and a sudden weight on my legs. Legs tell brain this should hurt. Brain takes their word for it. My sib UnoY is arrive on what they think is the couch.

'Dudebro!' I shout.

'My legs!' I also. Such pain.

Sib takes a drag on their catnip. Then slooooooowly lift their butt. Juuuuuuust enough for me to rescue my legs.

I sit up and try to look dignified. But I have to cough when Sib blows smoke at me. Kitteh.

Sib is wearing a pre 'We Are the 51%' t-shirt I got them at a swapmeet. Idea! Thank you brain. If you tip in our neighbourhood, it probably gets processed by the tangle of wires, computer cards, milk crates, chopsticks and fans that is Sib's maximally amaze rig. They get such tippage for it. Which makes minimal sense. It's like giving a cartwheel vendor an apple. Why would they want an apple? They have apples. Many apples. I want an apple. Apple, pls.

'I tipped a shibe yesterday for some bullshit and they still got the tip.'
I confide.
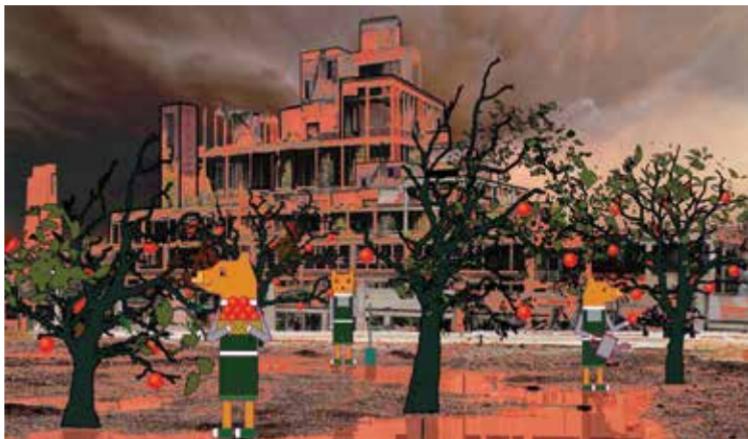
Sib is shocked in no way. 'Yeah dumbass you can tip for anything.'

I pout.

The giggles pounce Sib. 'OK what was it for?'

I show them my phone. 'Yeah, yeah, services to staring. The tipping app is such meh. You don't factually have to give a reason, that's just for AreWeThereYet. I thought they teach you this shit at school? Kso what you tip them for?'

I know the answer to this one. Amaze. 'There's a poster that tells us not to forget to.'

'That's not what I mean. But if there was a poster that told you to smash your phone?'

'Why would...'

'Forget it. Where was I?' Sib realizes their catnip has burned out. They depocket their magnifying glass.

I remember! 'What if there was a poster...'

Sib nods. 'And so but well yeah I really don't think they're teaching you what you need to know at school. AreWeThereYet was meant to be a stop-gap measure when shibes set up tipping rings and bots early on. Giving a reason for tipping and checking it was meant to be proof-of-human. Like primitive neuro. But shibes started gaming that too. It became a reputation economy. They wanted being Top Dog to be like being the president.'

Amaze. 'Amaze!'

I get a look. 'Shibe it's basics. Your school is kitteh. You need to get out more. Much, much more.'

I pout. 'I go to swapmeet.'

Sib sighs. Or inhales. Is it a sigh if it's through catnip? It's maximally a sigh. Wow. 'And then you come home and sit there like you've just been printed. YS you're about the least annoying sib imaginable but that's kinda annoying.'

Wow. Such paradox. I extend the pout. Much silence. Sib blows smoke into the sun-beams.

Question! 'Why don't we need AreWeThereYet any more?'

'It's just eigentippage.'

'Eigentippage?'

'How much you've tipped, how much other shibes have tipped you, how much the shibes who tipped them have tipped etc.'

UnoY inhales catnip. Such inhalation. Much catnip.

'Everyshibe knows how to tip, everyshibe knows what a bot attack looks like, everyshibe is going to the moon. Pups love AreWeThereYet but it's just a game and it has to stay that way.' I start to protest at this but Sib gives me a look. 'It's the underlying currency protocol underneath and the analytics overtop that matter. But that's boring, just part of the system. It's the dial tone of the economy.'

'Like Cap'n Crunch.'

'Wut?'

'Teacher tortoise about phone phreaking. On the old copper wire net. It's funny.'

Sib looks thoughtful but doesn't say anything. I get out more. Sib can be mean but that had interest. I tip them as I downstairs from the kennel. Much heat. I get a wrap from a passing egger. Much taste. Such delicious. I tip them.

Life is amaze.

My phone goes ping. Sib tipped me! Nowait, they refused the tip. Refund fees! Kitteh.

I hate everything.

Wow. Such heat. School isn't for about a googolplex blocks.

There's a white line painted on the sidewalk. It wasn't there yesterday. I walk along, following. It takes me along the street in a long slow curve, then waves from side to side of the sidewalk. Amaze. I walk faster and faster along it, then when it ends up in a spiral I follow that round and round and round and round and fall over. I giggle. Up on the side of the tall building by the sidewalk, in the same white paint, it says 'You got it!'.

I clap my hands. Wow. Phone, tip whoever painted this. Such fun. I must tell my school-shibes about this. Phone, remember where this is. Feet, back to work. That was amaze. Such fun.

A quintoseptillion blocks later I clamber under the tarp of my class. More posters! There's one of an incongruously cute shiba inu. There's one of elliptic curves super-imposed, with their names at the bottom. One of a Claes Oldenburg sculpture of cutlery. And one of how to wash your hands. I know how to wash my hands. Teacher is watching me making hand-washing movements. Such embarrassment.

'Good evening, YS' says Teacher. It's not evening yet?

'Uh hi Teacher.' I reply. 'I like your posters, where do you get them?'

'My sib has a 2D printer. They grow inks and everything.' says Teacher.

'Amaze. So cool!' I exclaim. Teacher smiles.

'I didn't think young shibes still said that. You can stay in here until class but please let

me concentrate while I set up.' says Teacher.

'Said what?' I ask.

'Cool.' says Teacher. What's cool? I look confused then remember I promised not to disturb them. Did I promise? It's an implied contract. So I guess I did. Hello phone.

BangZoom78 is now on the continental rankings. My toucan! They must have arms like one of those Indian superheroes, tipping left and right. Tiptiptiptiptip...

'YS?' says Teacher.

'...tiptiptip—Yes?' I reply.

'Please can you think more quietly. I am glad you are here but I need to set up and it takes some concentration.' says Teacher.

I nod. The continental rankings! Shibes are tipped just for being on them. Which I guess makes that a loop. What's a fruit loop? Mom1 mentioned them once. How do you make fruit into a loop? Mobius fruit? Where would you start eating them? Wow.

My phone pings. Wow. BangZoom78 has made it rain.

'Really?' asks Teacher.

Teacher pulls up AreWeThereYet on the tarp screen. They show the rainfall for Bang-Zoom78's recent generosity. Wow, much tippage. Teacher groups the tips by physical location, which makes a map of this side of the continent. Then they overlay a subset of the results over an old satellite map of our local area. I look up at the tarp. Falling from a satellite would be creepy. Wheeeeeeeeeeee-

'YS...' says teacher.

'-eeeee, yes? Oh.' I respond.

Teacher groups the tips on their display by what looks like time. And then by other criteria I don't know. Isn't it time for class? No, still much waiting. Teacher flashes up the details of lots of tip transaction on the screen, which does look like rain. I feel my face smile. Teacher glances back at me.

'Do you know Bangzoom78?' asks Teacher.

Nodnodnod.

'I mean personally.'

Shakeshakeshake.

Teacher frowns. 'You tipped them earlier.'

Wutf?
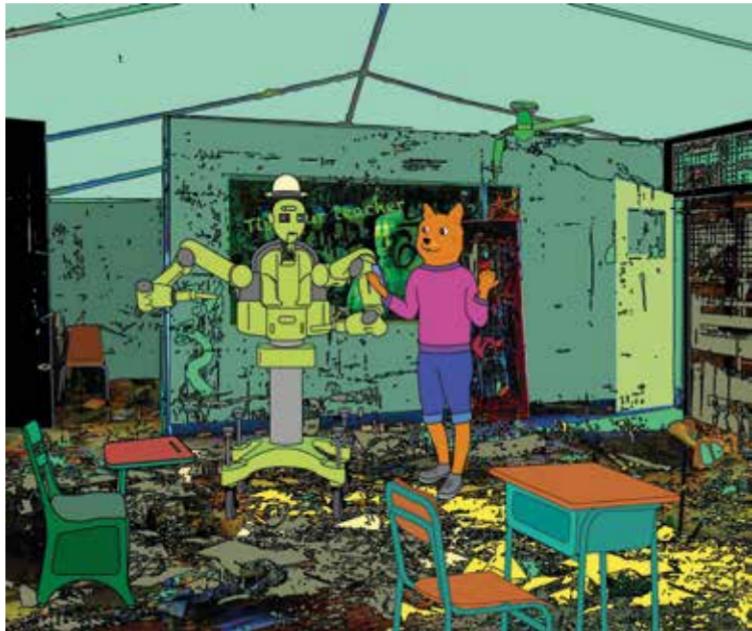
Teacher pulls up the transaction records. 'They have lots of different accounts but under the same name. That's problematic. And they tip each other. A lot. And there's other accounts under the same name...'

Teacher searches for related accounts. The diagram of transactions between them looks like a Spirograph drawing. Spirograph is amaze. Mom1 has one in The Box.

'This looks like an inverse sybil attack. Why hasn't anyshibe checked for this?' asks Teacher.

'Nobody checks. They don't have to.' I repeat what UnoY said earlier.

'But it's so brazen!' vocabs Teacher.

As our schoolshibes arrive the investigation becomes a lesson. School is amaze. Much opportunity. Several other shibes have tipped BangZoom78. None of us remember doing so. It must be MIND CONTROL!

'It's not mind control, YS.' says Teacher, 'Who did you tip in block 9829294?'
'The shibe who drew a line on the street I followed.' I repeat what my brain tells me.

'You liar!' shouts my schoolshibe NoUr, 'you did not!'

Many eyes on NoUr.

'I wasn't tipped for that. Nobody has tipped me for it.'

NuWae puts their hand up. Teacher tells them they told them they don't need to do that.

'I did.' says NuWae.

'No you didn't!'

Eris friends us for a few blocks. Teacher pulls up the transactions again.

'YS did tip the shibe who painted something, but it was a sign not a line.' Teacher rhymes.

NoUr gives me a look. If the ground swallows me up before the next block I will tip it like a tower in Europe.

'But I told my phone to tip the person who drew it!' I yip. Much awkwardness.

'Drew what, YS?' asks Teacher.

'The line and the sign.' I rhyme.

'I didn't paint the sign you kitteh—' NoUr says before Teacher says their name in a way that stops them.

'But I meant to tip the shibe who, I mean I didn't know, I mean I uh — the line was amaze!' Mr. Brain, this be mutiny, I'll see you hang for this!

'NoUr I think YS has been the victim of a context collision attack.' explains Teacher. Meaning I'm not lying. Such relief. Also wut?

Teacher looks at me. 'The sign was added by someshibe else to hijack the tips from NoUr's line. Whoever added it knew that anyshibe who walked the line would see the sign,' Teacher rhymes once more, 'and relied on their proximity to cause people to regard them as a single unit, tipping the one that drew their attention at the end. Or relying on semantic confusion in people's tipping.'

'People?' I ask teacher.

'Shibes.'

'Ohhhhhhhh.'

'Everyshibe's homework is to analyze these transactions. But we need to talk more about the Byzantine Generals now...'

Teacher is amaze. Much knowledge. BangZoom78 is cheating! Such cheating. Wow.

I has conflict. In the pros column, I was right to hate them. In the cons column, it was jealousy not reason. But the market doesn't care about motivation. So nor should I. Wow. I win!

After class everyshibe tips teacher and I tip NoUr double and teacher tips us and it sounds like a flock of phones trying to find mates. Ping! Ping! Ping! (etc.) Swapmeet time!

I walk across the night sidewalk to the swapmeet. Apple, wrap, kerb, nom (Is nom kitteh? Deja vu! Amaze.), tip.

'Wow look what the cat hawked up.' says my sib's voice from behind me.

'Heya UnoY.' I reply without looking up. Such dignity.

My sib pats me on the head. 'Since you ask, we're picking up gold.'

'Gold?' I ask. I'm a cockatoo. Wow, much squawking.

'Yeah, gold. LiCat here makes jewelry with pre metals. Gonna get Mom1 some for their cake day. You want in?'

LiCat gives me a look as they hang on to MogoDan like gravity is about to turn off.

'Uh no I booked a slot in the oven for a factual cake.'

'You can't cook.'

'Mom1 said they'd help?'

I get looks.

'You're getting Mom1 to help you make their own cake?' UnoY accuses.

'They said they'd like to do something with me.' I mumble. Wow, much awkwardness.

'Cute.' says MogoDan. Is that mockery? UnoY and LiCat give MogoDan looks, which I know means probably not.

'Thank you.' I say to MogoDan, like I've practiced. LiCat gives me a look.

'How's school?' asks MogoDan. Before I can answer, LiCat drags them away. Sib follows. I watch them disappear into the crowd.

The salesbro from last night is across the swapmeet, by the alley between two of the McMansions. They must've done well last night. Do they still have the stamp book?

OK feet, go.

'Good evening, young shibe. How may I service you?'

'Heya. Do you still have the stamp book thing you showed me?'

'I do indeed.' flickerflickerflicker. Such flickering. Also: thank you stamps for not being gone! You are my new best friends.

'Pls can I have them?' I request.

'Of course, young shibe, I am glad they are going to a good home. Can I interest you in anything else? I have these...'

They are coloured plastic cards. Many colours.

'Phone credit scratch cards.' Salesbro answers my face, which was saying: 'Wut?'.

'Wut?' I actually.

'You would turn them over, scratch this section here, and that would reveal a simple code representing a certain amount of credit to use a particular corporation's telephone infrastructure.' Salesbro mimes the scratching. Which means actually scratching would devalue them. Thank you, brain!

'Can I have one of each colour pls?' I politely.

I unfold my pre plastic bag and put everything in there as Salesbro hands it to me. Mom1 will love this. I tip Salesbro maximally.

'Thank you young shibe!' says Salesbro, 'Do remember to visit again, I get new stock daily.'

I nod and engage my feet. They take me back into the swapmeet. I get some pre plastic bottles that are too damaged to be useful or collectible, we can feed those into the printer. I also get a pencil sharpener.

Feet, homeward!

Today has made no sense. More than usual. Less than usual? There has been more, but it has all made less sense. A light in the sky! Amaze.

The light is accompanied by the thwockathwockathwoka of a helicopter. Wow. Such rarity. I watch the light disappear behind the McMansions, and the noise fades with it. Helicopter where you go? Being on a helicopter would be amaze. I could never tip enough for that.

For the googolplex blocks it takes to walk home I pretend I'm a helicopter. I use the light on my phone. Thwockathwokathwoka.

Mom1 is home when I get back to the kennel. I gift them.

'Thank you, YS! Amaze!' says Mom1. It's funny when they speak shibe. Usually they're pre. I like that about them. Also their blue hair. I said it makes them look old once. They laughed and said that's what their mom said when they were UnoY's age. I wish everyother-ershibe understood me like Mom1 does. Also more wishes. And chocolate.

My phone pings. It's raining! I check and it's BangZoom78. I refuse the tip. Which costs, but I don't care. My phone bworps to confirm the refusal fee.

Mom1 checks their phone as well. 'Oh wow, there's a weakness in the current tipping system. Some sort of collision problem. There's going to be a hard fork to address it in a few thousand blocks' time. Don't look at me like that, YS,
I learnt this stuff when they didn't teach it at school.'

'Um.'

Mom1 whuggles me. So I didn't actually offend them. Much relief.

'Are you OK on the couch, YS? You're almost too big for it now.' says Mom1.

'I like the couch. It's my friend.' I tell them.

'It's an amaze night, you could do your homework on the roof.' they suggest.

'OK!' I reply. There is a sticky note with some numbers written on it above sib's rig. I note them on my phone. Then I bounce up the stairs onto the roof. Hello stars, you are my new best friends! It's getting colder. But not too cold. Cool. Is this why 'cool' used to mean 'good'? It feels good.

I spend some time finding subpaths in the topology of BangZoom78's transactions. This is fun. Many paths. Such happiness. I look at location, time, and reason. Then I find save point conflicts next to tips to BangZoom78. Wow, many points. It wasn't just me. I geolocate the transactions and order them by time. The transactions follow the termina-tor across the continent each night. I make the transactions glow blue on a black globe. Maximally pre animation.

I check the list of BangZoom78's transactions against the account numbers from my sib's rig. Many of BangZoom78's transactions were processed by it. I tell my phone to just show just the lines in the graph representing transactions between my sib's rig and the other rigs on the network. It looks like a drawing. I zoom out. It's a drawing of the poster dog's face. Wow.

I wake up feeling cold. My back hurts. I am on a roof. It's the roof of the kennels. How did I get here? Oh. Wow. Such sunrise. Many colours. So still.
I hobble on sleepy legs to the edge of the roof to watch the sunrise. I am the only shibe in the world to see this. Amaze.

I look down. UnoY is in the street below. They are wearing their PLA surplus coat. So is their shibe MogoDan. Not UnoY's coat, they have their own. Mom1 will maximally berate my sib for staying out all night. They never tip them. They have plastic bags. They are swapping. It looks like phones. Many phones.

Why would anyshibe need more than one phone?

I flag a drone and sharpen my pencil. With my own pencil sharpener. I shall become a pencil sharpening artisan. Shibes will come from everywhere in post, and I will sharpen pencils for them. They'll tip me like an insider trader.

The drone has paper. I write in my best block capitals: who u?

Then I tell the drone to deliver it to BangZoom78. And I tip it. For the reason of: please tell me. It flutters down into the street, ignoring UnoY and MogoDan. It disappears behind the McMansion opposite.

My phone pings. BangZoom78 is Top Dog. The hard fork is in less than ten thousand blocks. I don't understand what BangZoom78 is doing. But I think my Sib does.
I will ask them later when I go back inside.

I sit on the edge of the roof. Such sunrise. Very calm. Much wonder. The sunrise is my new best friend. Wow.

Defixio Nervorum

no
      one
can tell the difference
 between the ŧool
          &   the
                ʍachine:
precise pathogenesis of [ ] is
                            [ ]known
the paradox lies

                   inside the body
[   ] fits

[ ] a[ ] f tt ng   I be flitting am
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   hauntedhounded an other axonal injury
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there is no such thing
as the untranslatability
            of wounds
the southern continents quiver
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ʍe>a(r)e>in tangle
     impedimentsimplements in a world without silence
                            [ɘɿɘʜ 'ɘɿɘʜ ,ɘɿɘʜ]
no
     one
          who
can [ ]ra[ ]e the other
     is this what the roman empire felt like
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not a single dis
     ease
<am>1<ʍe>
no language lasts long enough in the desert

thisshoudbesixtyfourcharacterlinespoetrytobesharedleonardhasbeen
pleadingforyourfinalsignatureofthetranslationsʍeareincompletehere
ʍecollectdataontheantsbehaviouridonotwanttobeframedbymajorlangua
gestheselfisframedbypidginandtheindifferenceofpigeonsʍeareincomp
leterepleteandfragmentedʍearenowreplacedbydistributionapartofthe
greateradditionthegreaterconfessiontheincalculableimprerceptible
thingscomewhentheyaresupposedtonoinvestmentissecureunlessyouareu
nidentifiablerecognitiondoesnotlastforeverlesionsplaceslanguageb
uffersconsciousnessbufferscitizensrealandunrealwoundsbleedcities
onto film
             sensationcondensation
                        creates prisons
ʍeseek entry via attachment
   yet care is taken apart
                               nohopenohopenohopenohope
                                       none
every poem is an involuntary twitch of the body
that is to say, a reflex
                of the outer layer

intensified when
          a particular sensation is perceived
    being on the wrong side
          of events
a weak signal a disappointment of time
                    an attempted upregulation
      a communicated convulsion
an agonist of inversion
    an articulum of time diminished

this is
                    [an]other language
these are the teeth of illness and the beat of the never ending hours:

on&off&on&off&on&off&on&off&on&off&on&off&on&off&on&off&on&off&on&off&on&off&on&off&on&off&
on&off&on&off&on&off&on&off&on&off&on&off&on&off&on&off&on&off&on&off&on&off&on&off&on&off&
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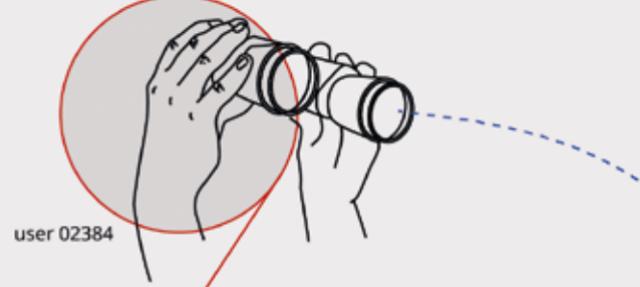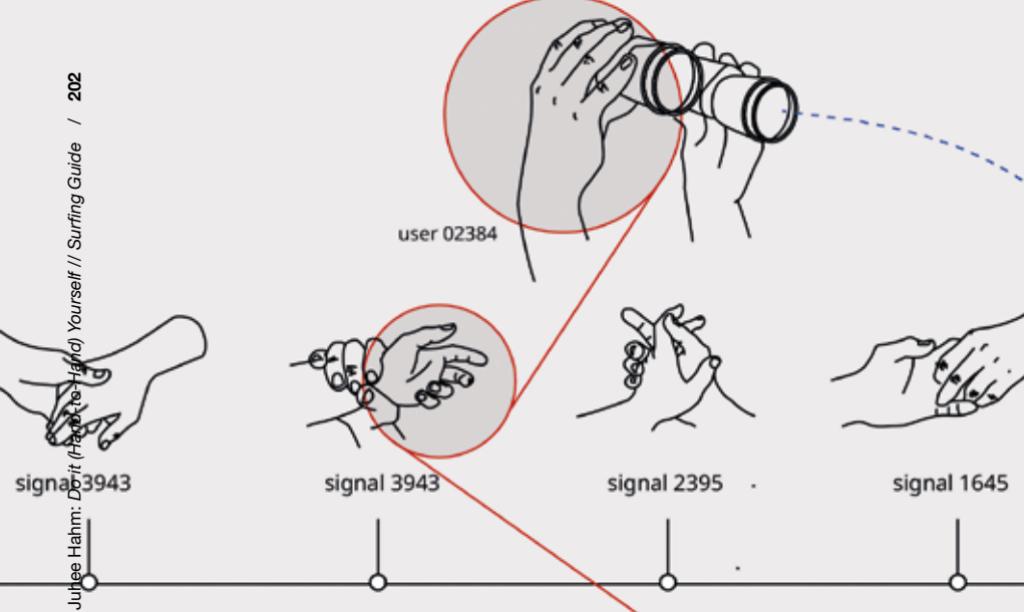
Possibly.

Do it (Hand-to-Hand) Yourself //
Surfing Guide

The Internet used to promise the possibility of enabling a new democracy, but the results have been mixed, and it has also brought forth greater centralization in many regards. Furthermore, its massive scale and exclusive structure is predominantly invisible to users. The blockchain seems to offer the potential to remove much of the centralized structure and bring trust between users through a kind of collective monitoring and care. It appears like an ideal structure, however we need to look at the system at different scales, and question how it also can be distorted and restructured by bigger powers and other forces.

The series presented here begins with a new drawing that is my response to the blockchain. Followed by a curated selection of previous work that engages more tangentially with on and offline spaces and media, which the blockchain sphere seeks to build upon and reinvent.

user 02384

signal 3943

signal 3943

signal 2395

signal 1645
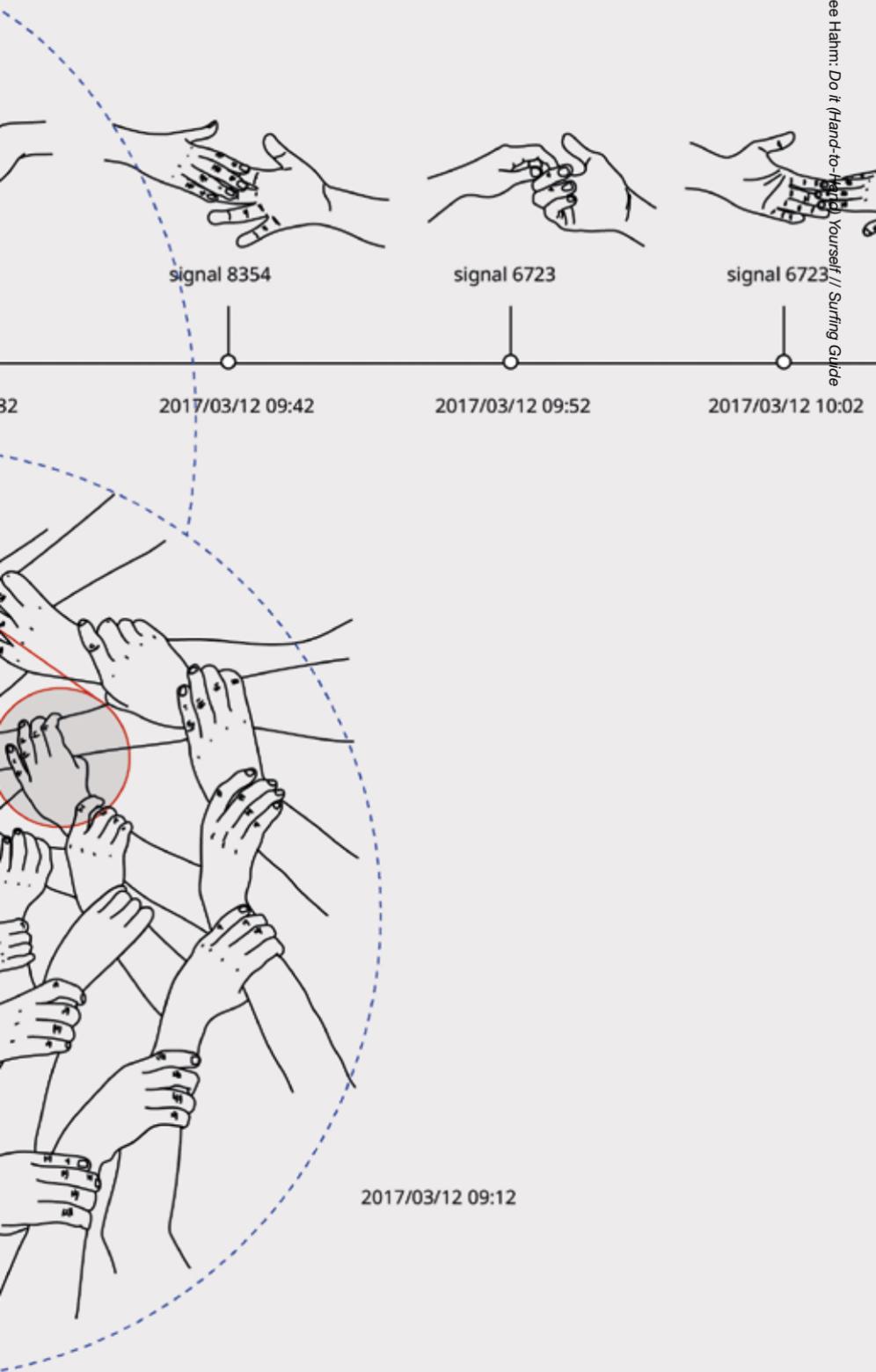
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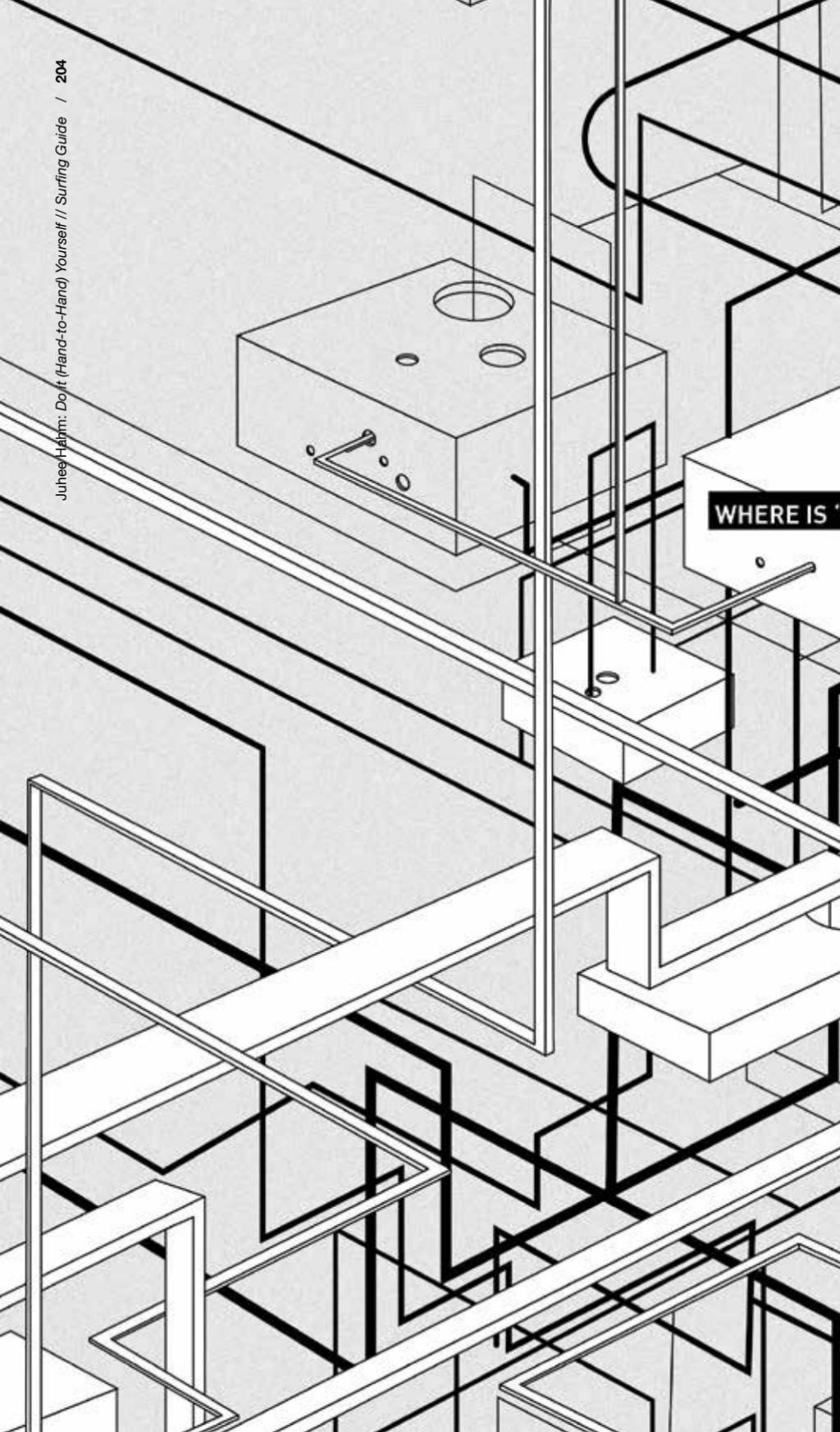
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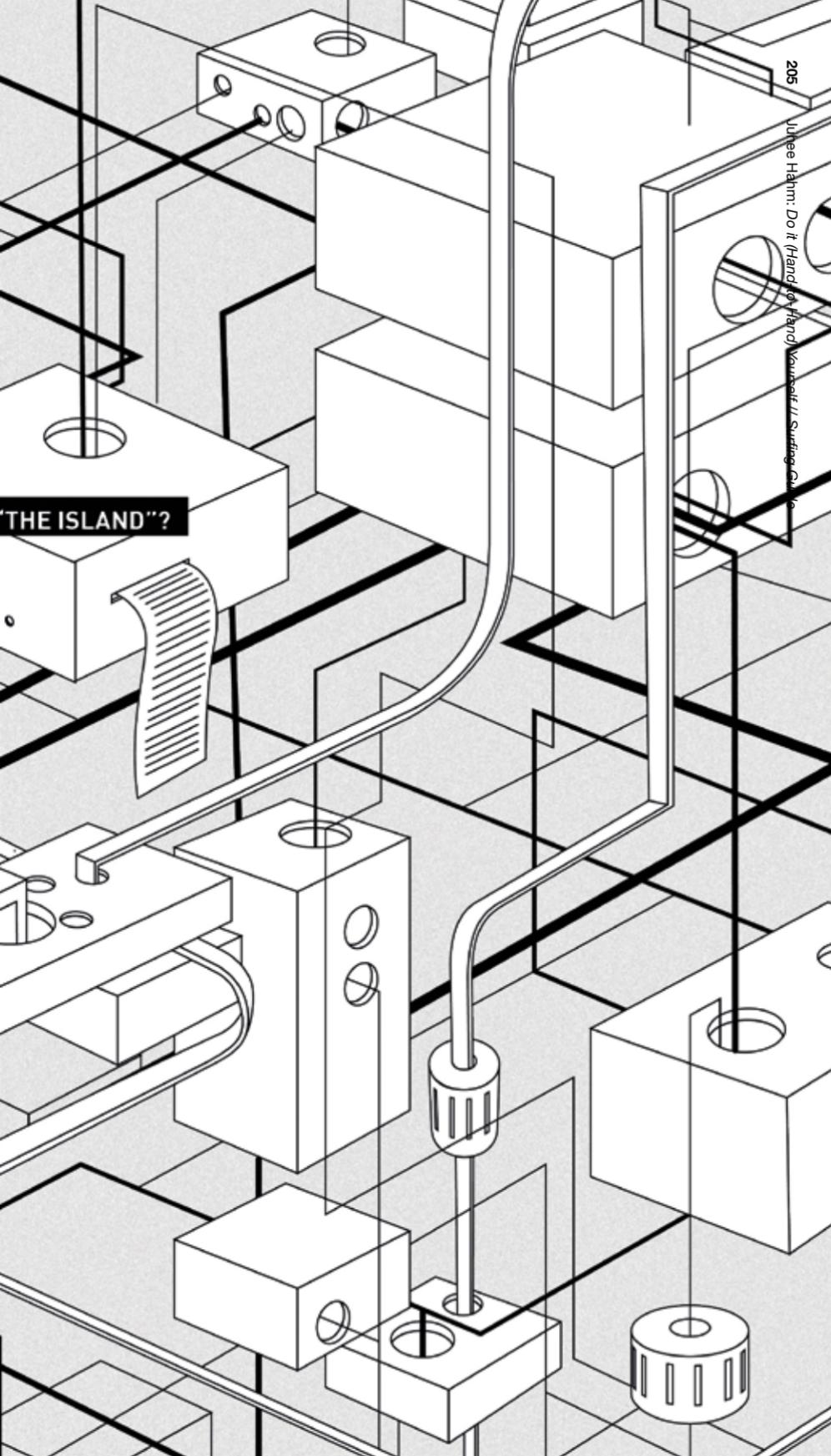
2017/03/12 09:22

2017/03/12 09:

signal 8354

signal 6723

signal 6723

32

2017/03/12 09:42

2017/03/12 09:52

2017/03/12 10:02

2017/03/12 09:12

WHERE IS

"THE ISLAND"?

WHERE IS

"THE SPOT"?

CANAL

CANAL

KEY
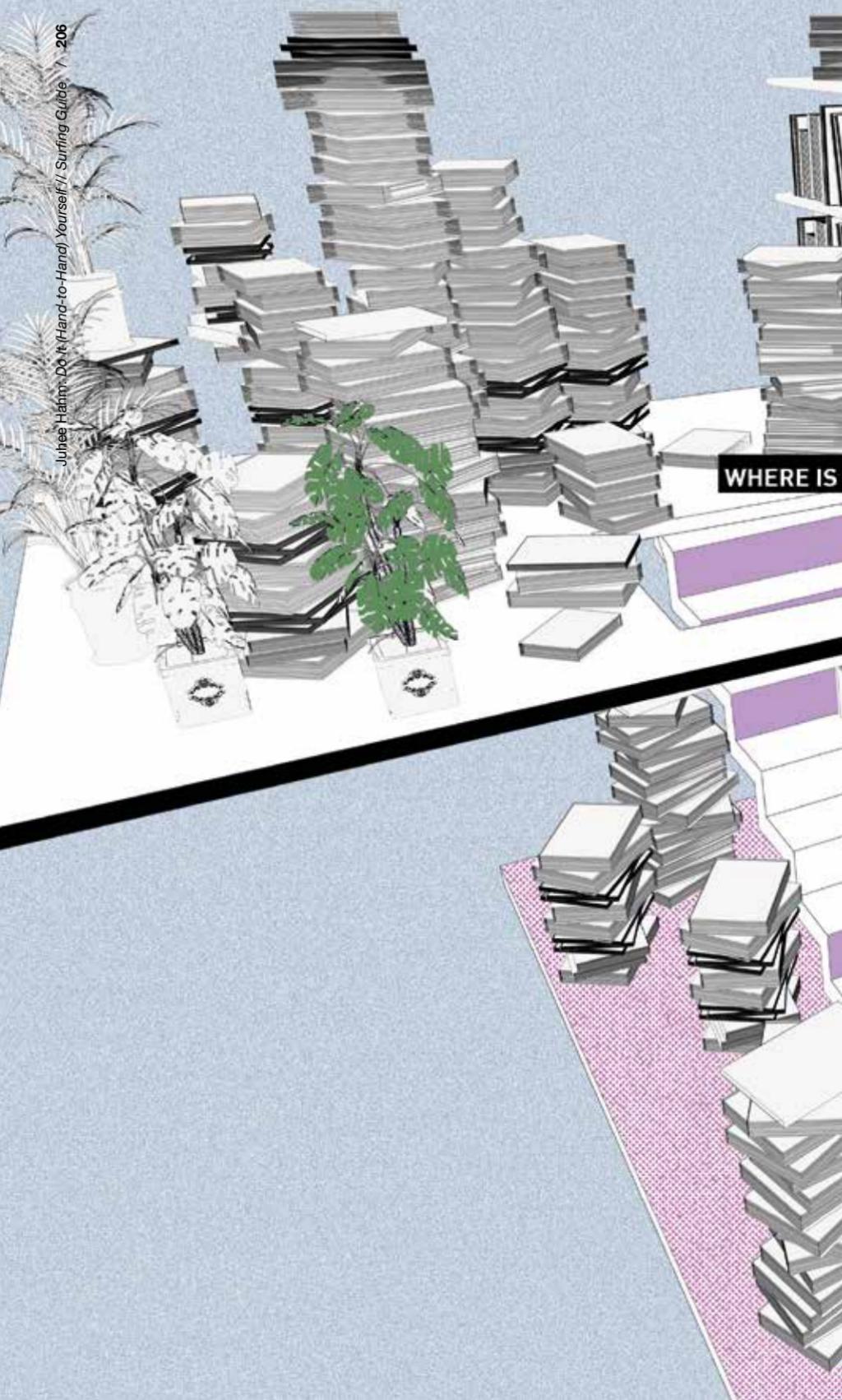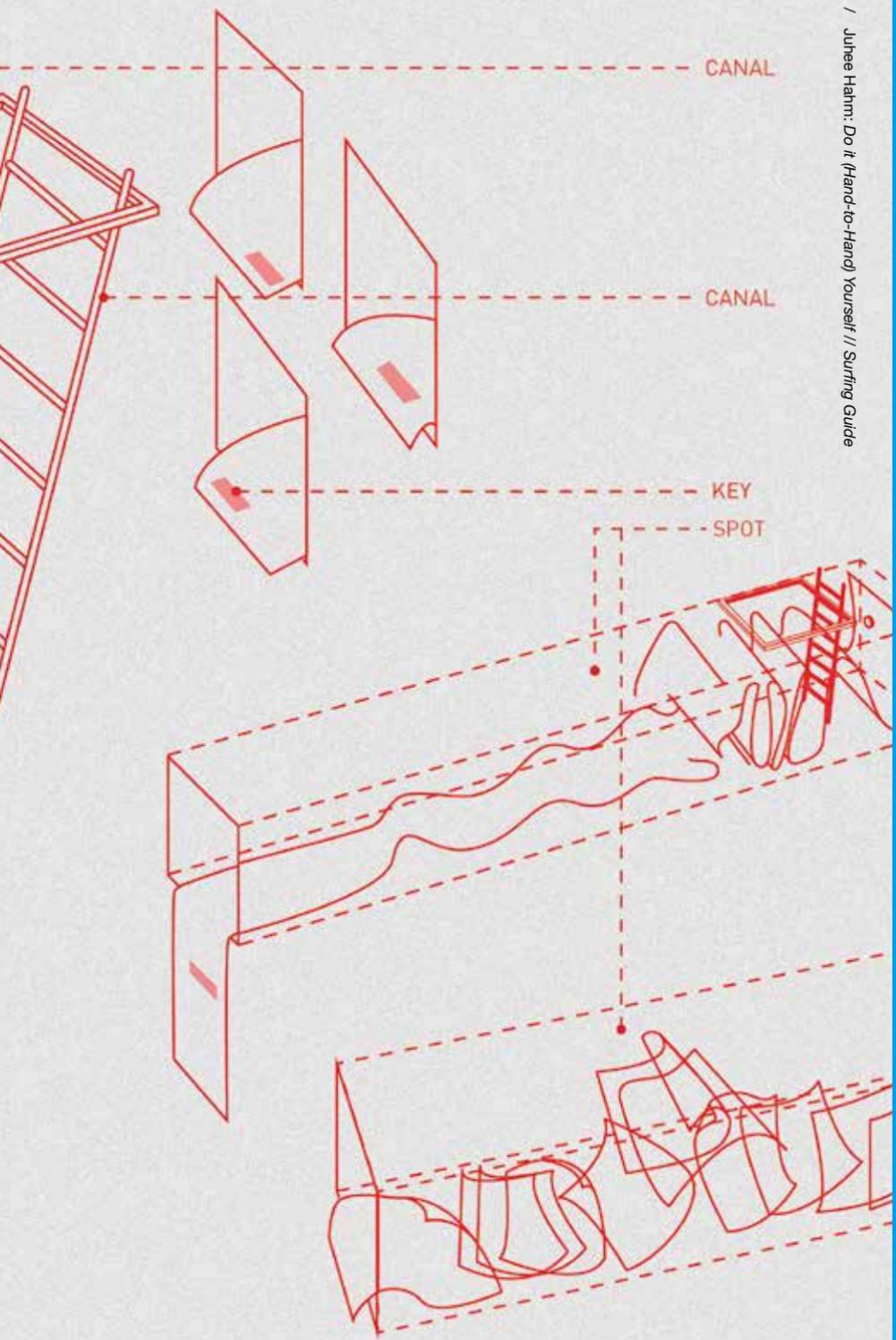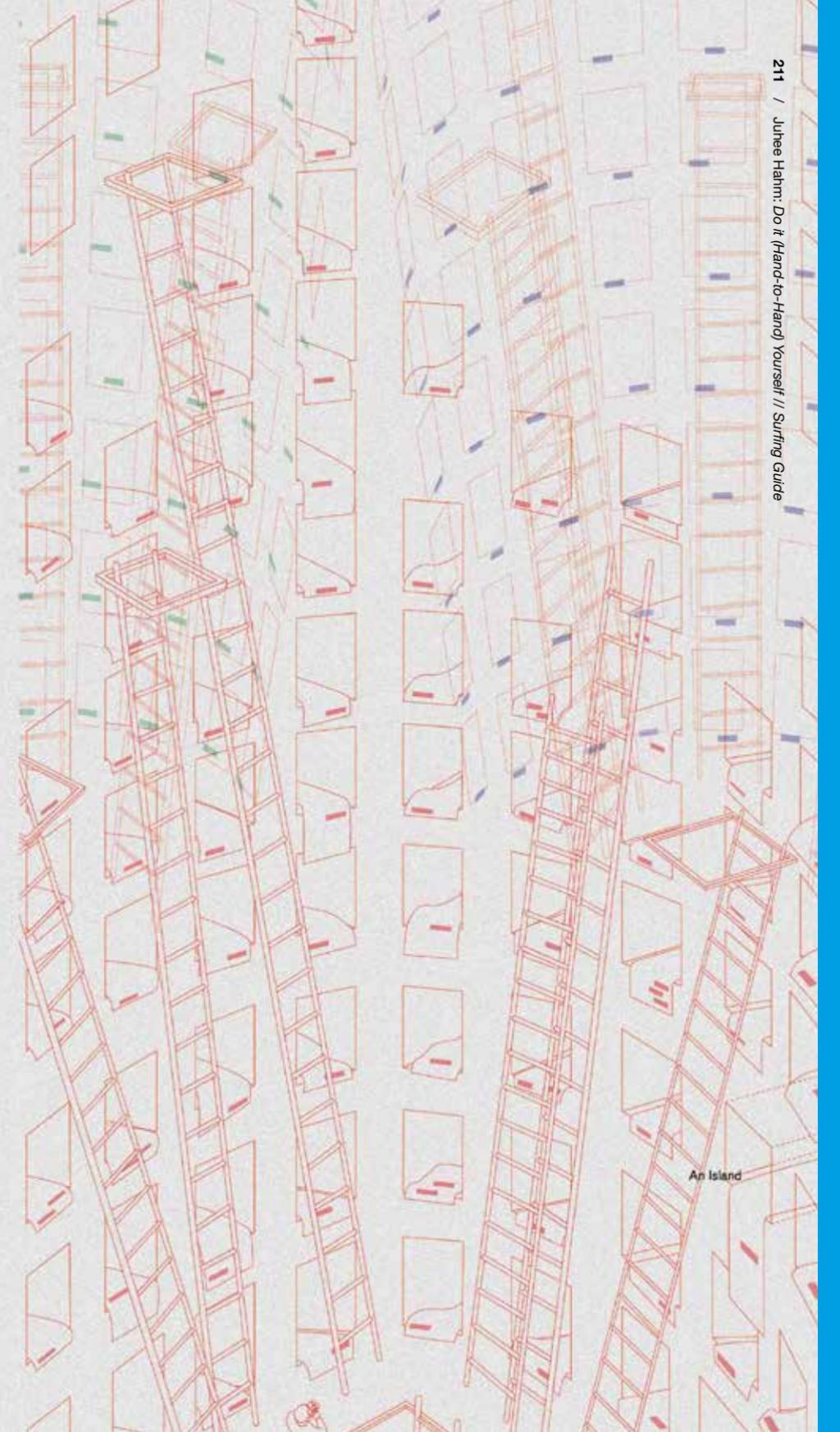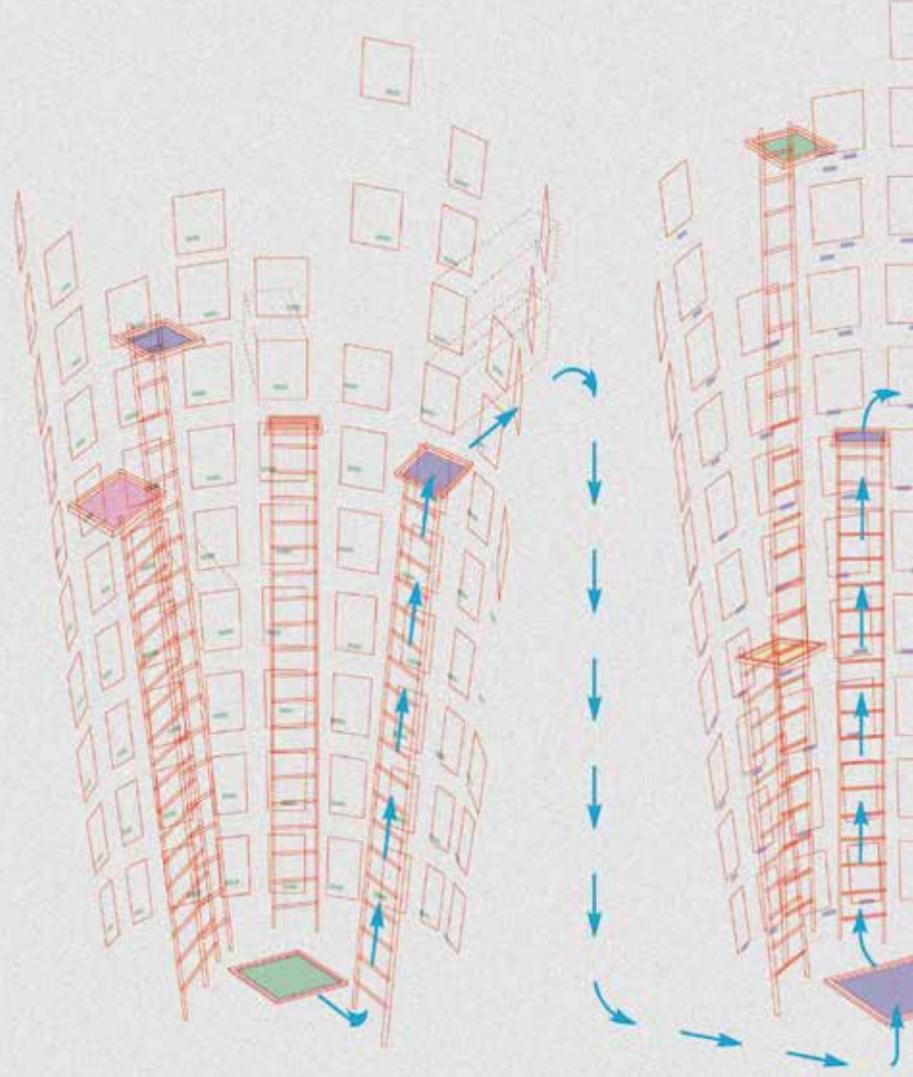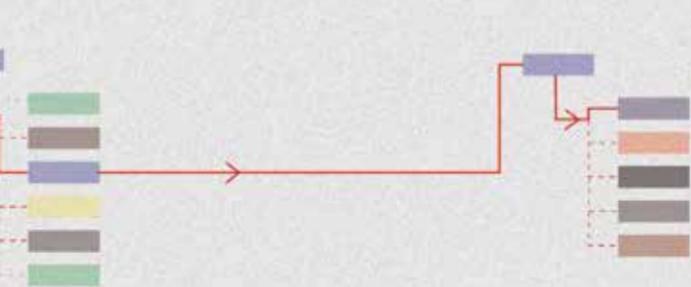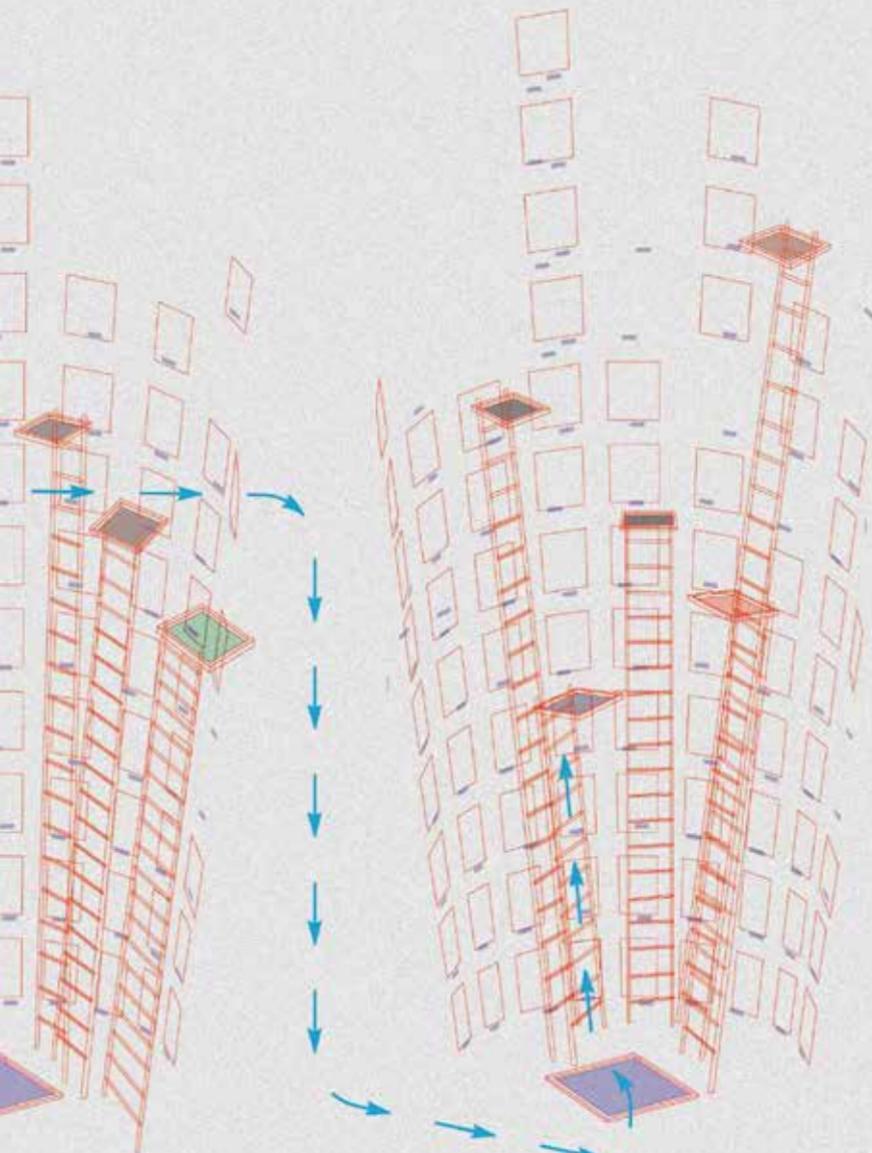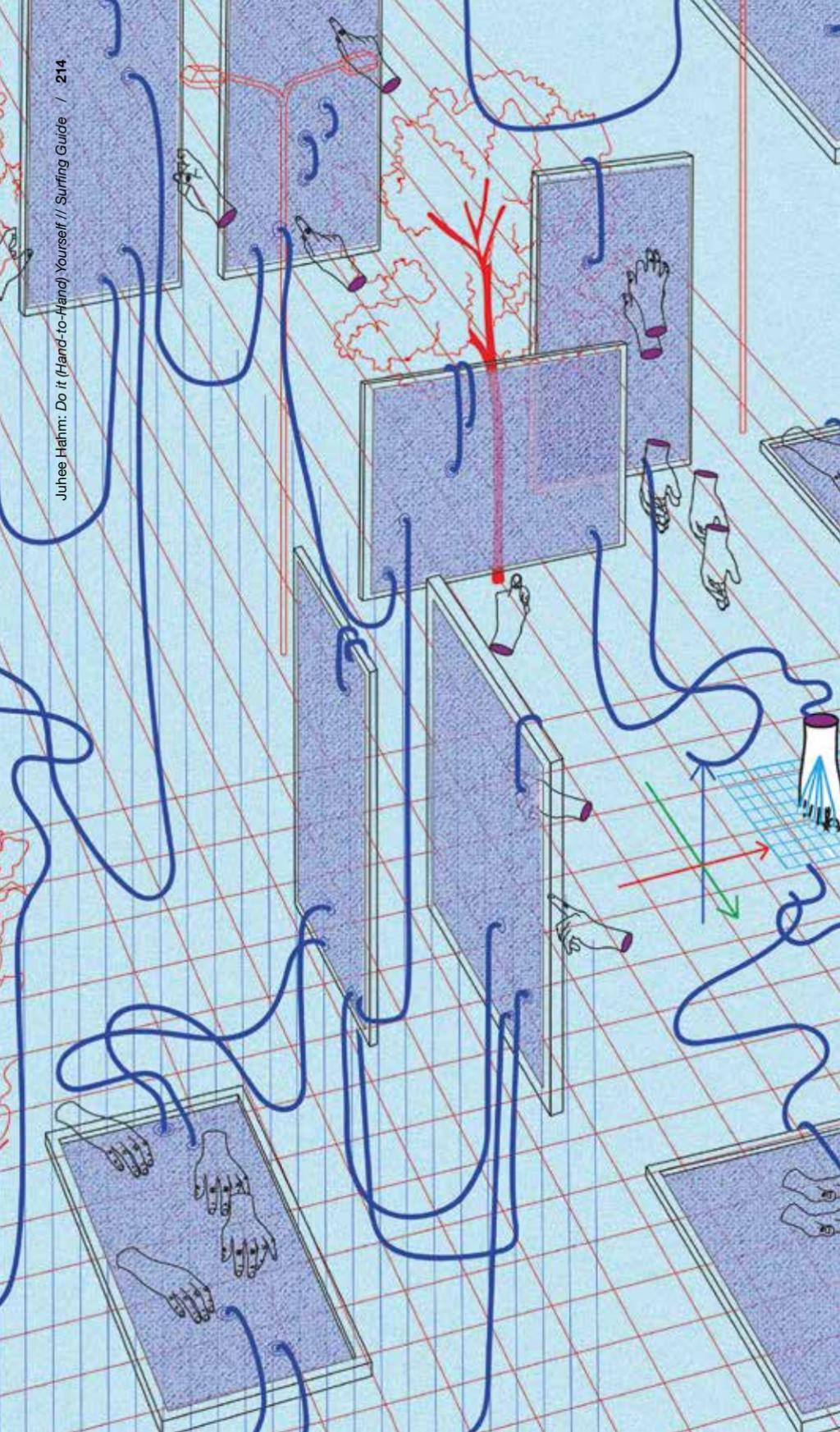
SPOT

When Spots have the same Keys, an Island is formed. Guides are the only ones who know the Canal, between questions, Keys, Islands and Spots. Therefore according to a question, a Guide will take a Surfer to different Islands. When a Surfer arrives on the Island, a Surfer can choose his favourite Spot within the Island. If a Surfer cannot find the right Spot, he can go through the process of asking a new question. Otherwise, a Surfer can jump to other Island by selecting other Keys that are laying next to the Key that a Surfer has. These Keys are related to each other, which are chosen by a Guide, according to other Surfers' trails.
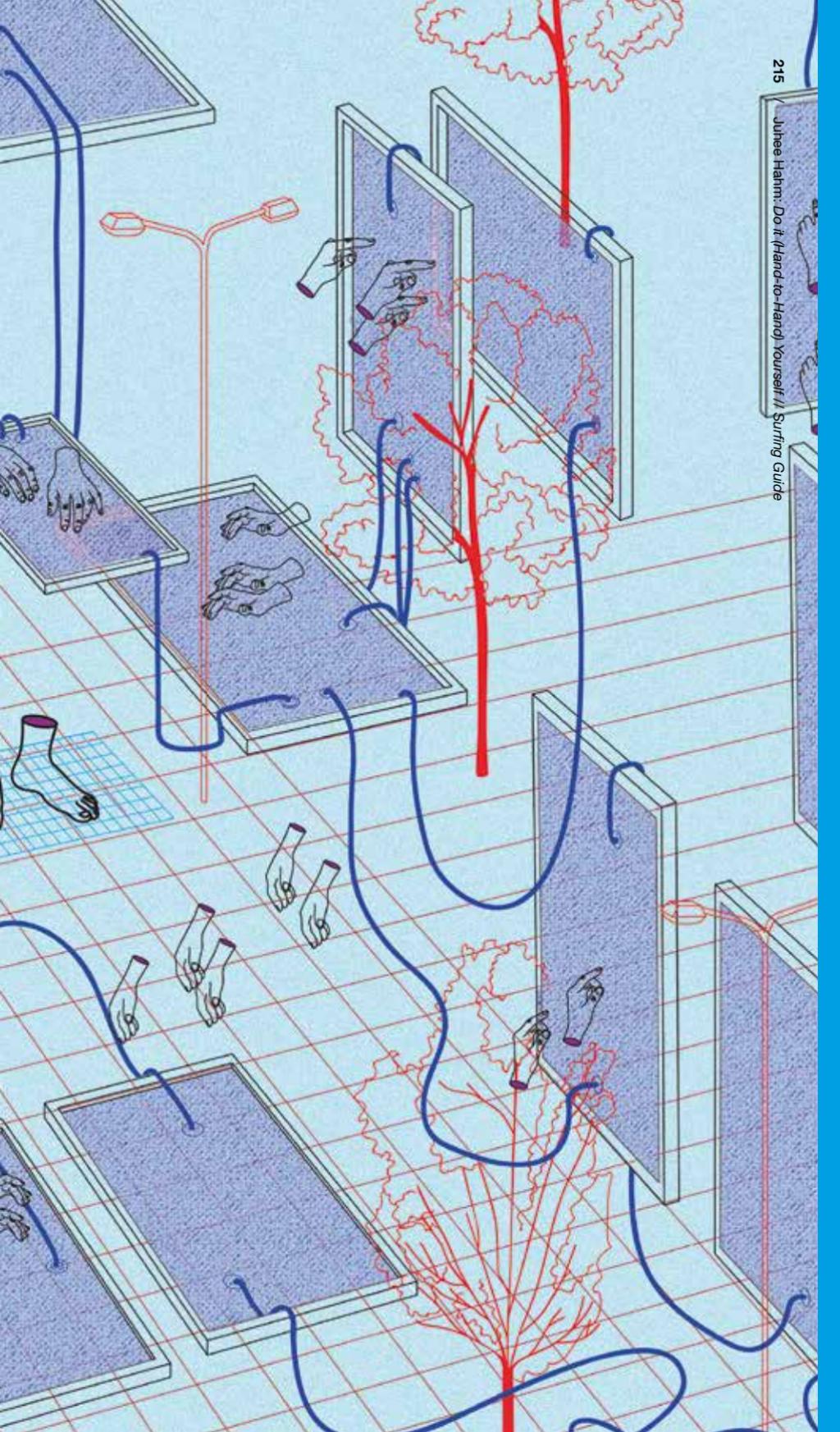
An Island
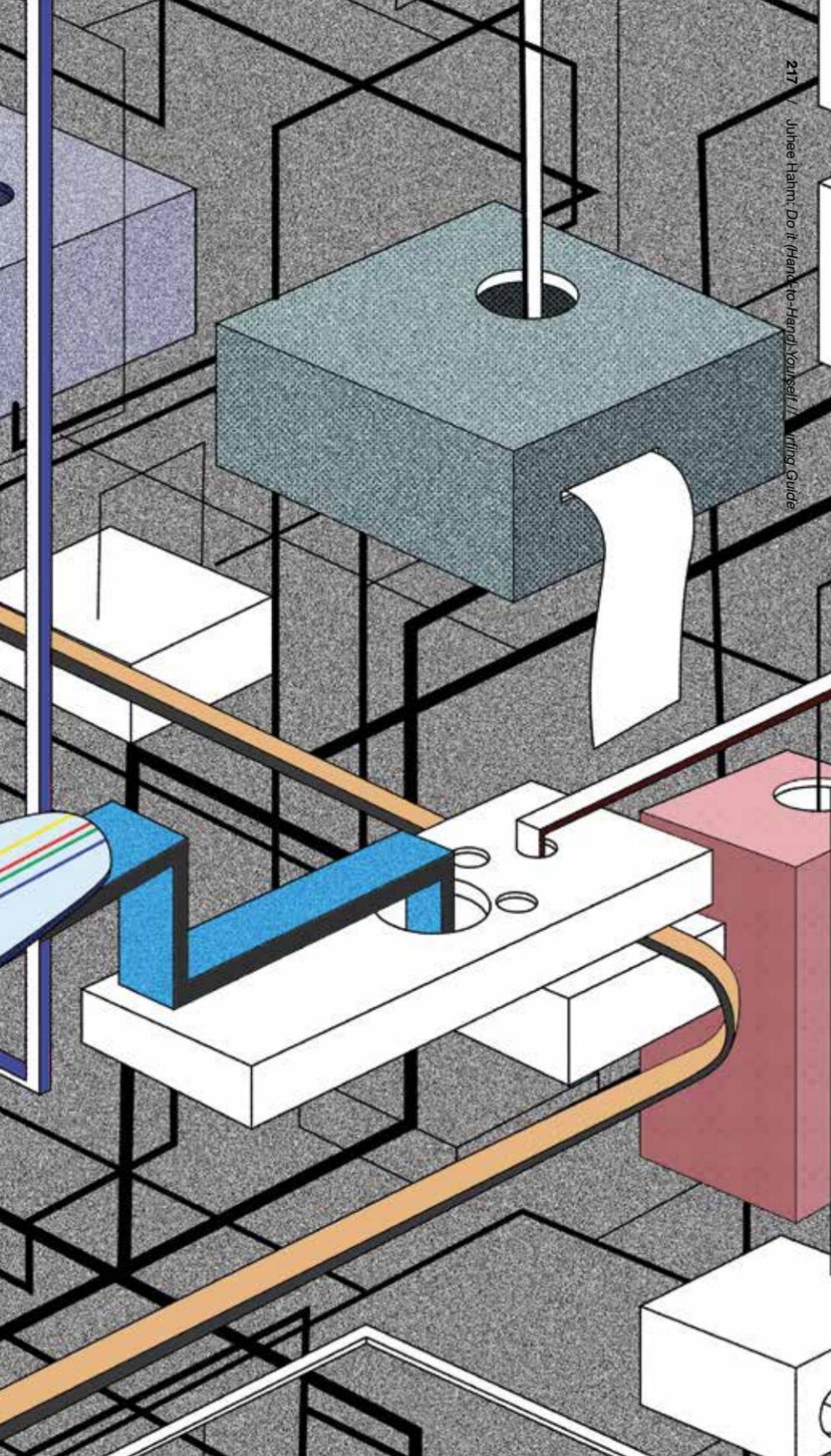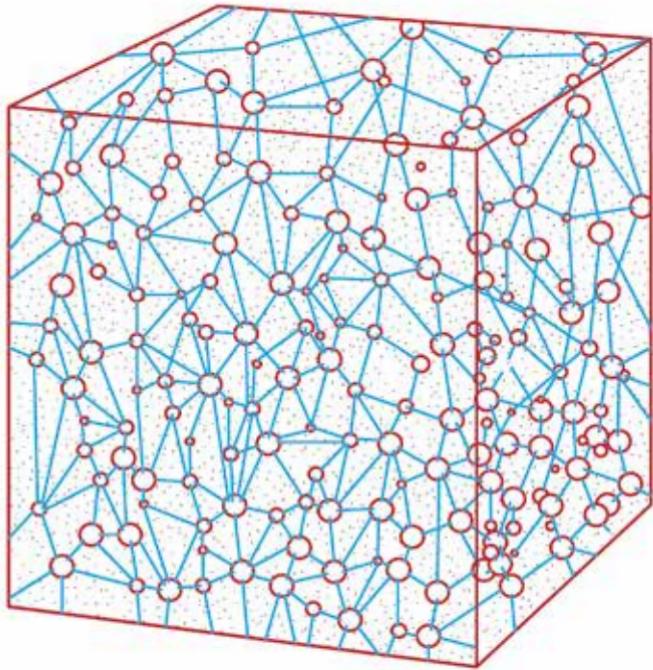
Babel

The whole earth was one language and they said let us make brick
And they had brick for stone, and grey slime had they for morter
Let us build a city and a tower, whose top may reach unto heaven
Let us make us a name lest we be scattered abroad upon the earth
Then the LORD came down to see the city and the tower they built
Behold said he the people is one, and they have all one language
So this they begin to do: so now nothing will be restrained them
Go down, and there so confound their language, that they may not
Understand one another's speech: and let us confound and scatter
Them abroad let us scatter the children of men abroad from hence
On the face of all the earth: and the LORD confounded them there
But the children of men did not leave off from building the city
And the top of the tower reached up unto heaven and nothing they
Imagined to do was restrained them and they had all one language
But did not understand one another's speech and they were spread
Across the whole earth and therefore was the place called Babel.

THEORY

If You Don't Have Bread, Eat Art!: Contemporary Art and Derivative Fascisms

Is art a currency? Investor Stefan Simchowitz thinks so. He wrote with uncompromising clarity about the post-Brexit era: 'Art will effectively continue its structural function as an alternative currency that hedges against inflation and currency depreciation.'[1] Have silver paintings become a proxy gold standard?[2] How did it come to this? During the ongoing crisis, investors were showered with tax money, which then went into freeport collections, tower mansions, and shell companies. Quantitative easing eroded currency stability and depleted common resources, entrenching a precarious service economy with dismal wages, if any, eternal gigs, eternal debt, permanent doubt, and now increasing violence. This destabilization is one reason the value of art looks more stable than the prospects of many national GDPs. In the EU this takes place against a backdrop of mass evictions, austerity, arson attacks, Daesh run amok, and Deutsche scams. Results include child poverty, debt blackmail, rigged economies, and the fascist scapegoating of others for widely self-inflicted failed policies. Art is an 'alternative currency' of this historical moment.[3] It seems to trade against a lot of misery.

Meanwhile, reactionary extremism intensifies in many places. I won't bore you with specifics. There's always another attack, election, coup, or someone who ups the ante in terms of violence, misogyny, snuff, or infamy. Derivative fascisms[4] continue to grow, wherever disenfranchised middle classes fear (and face) global competition – and choose to both punch down and suck up to reactionary oligarchies.[5] Ever more self-tribalised formations pop up that prefer not to abolish neoliberal competition – but instead eliminate competitors personally. Derivative fascisms try to fuse all-out free trade economics with (as one example) white nationalism[6] by promoting survival of the fittest for everyone except themselves. Authoritarian neo-liberalism segues into just authoritarianism.

A permanent fog of war is fanned by permanent fakes on Facebook. Already deregulated ideas of truth are destabilized even further. Emergency rules. Critique is a troll fest. Crisis commodified as entertainment. The age of neo-liberal globalization seems exhausted and a

period of contraction, fragmentation, and autocratic rule has set in.

Alternative Currency

Art markets seem not overly concerned. In times in which financial institutions and even whole political entities may just dissolve into fluffy glitter, investment in art seems somehow more real. Moreover, as alternative currency, art seems to fulfill what Ether and Bitcoin have hitherto only promised.[7] Rather than money issued by a nation and administrated by central banks, art is a networked, decentralized, widespread system of value.[8] It gains stability because it calibrates credit or disgrace across competing institutions or cliques. There are markets, collectors, museums, publications, and the academy asynchronously registering (or mostly failing to do so) exhibitions, scandals, likes and prices. As with cryptocurrencies, there is no central institution to guarantee value; instead there is a jumble of sponsors, censors, bloggers, developers, producers, hipsters, handlers, patrons, privateers, collectors, and way more confusing characters. Value arises from gossip-cum-spin and insider information. Fraudsters and con artists mix helter-skelter with pontificating professors, anxious gallerists, and couch-surfing students. This informal ecology is eminently hackable, but since everyone does it, it sometimes evens out – even though at highly manipulated levels. It is at once highly malleable and inert, sublime, dopey, opaque, bizarre, and blatant: a game in which the most transcendental phenomena are on collectors' waiting lists. Further down the food chain, media art, like Bitcoin, tries to manage the contradictions of digital scarcity by limiting the illimitable. But for all its pretense to technological infallibility, Bitcoin is potentially just as dependent on group power[9] as art-market values are dependent on consent, collusion, and coincidence. What looks like incorruptible tech in practice hinges on people's actions. As to the encryption part in art: art is often encrypted to the point of sometimes being undecryptable. Encryption is routinely applied, even or especially if there is no meaning whatsoever. Art is encryption as such, regardless of the existence of a message with a multitude of conflicting and often useless keys.[10] Its reputational economy is randomly quantified, ranked by bullshit algorithms that convert artists and academics into ranked positions, but it also includes more traditionally clannish social hierarchies. It is a fully ridiculous, crooked, and toothless congregation and yet, like civilization as a whole, art would be a great idea.

In practice though, art industries trigger trickle-up effects which

are then flushed sideways into tax havens. Art's economies divert investments from sustainable job creation, education, and research and externalize social cost and risk. They bleach neighbourhoods, underpay, overrate, and peddle excruciating baloney.

This does not only apply to art's investor and manager classes. The lifestyles of many art workers also support a corporate technological (and antisocial) infrastructure that whisks off profits into fiscal banana republics. Apple, Google, Uber, Airbnb, Ryanair, Facebook, and other hipster providers pay hardly any taxes in Ireland, Jersey, or other semi-secret jurisdictions. They don't contribute to local services like schools or hospitals and their idea of sharing is to make sure they get their share.

But let's face it – in relation to the scale of other industries, the art sector is just a blip. Contemporary art is just a hash for all that's opaque, unintelligible, and unfair, for top-down class war and all-out inequality. It's the tip of an iceberg acting as a spear.

Degenerate Art

Predictably, this leads to resentment and outright anger. Art is increasingly labelled as a decadent, rootless, out-of-touch, cosmopolitan urban elite activity. In one sense, this is a perfectly honest and partly pertinent description.[11] Contemporary art belongs to a time in which everything goes and nothing goes anywhere, a time of stagnant escalation, of serial novelty as deadlock. Many are itching for major changes, some because the system is pointless, harmful, 1 percent-ish, and exclusive, and many more because they finally want in.

On the other hand, talk of 'rootless cosmopolitans' is clearly reminiscent of both Nazi and Stalinist propaganda, who relished in branding dissenting intellectuals as 'parasites' within 'healthy national bodies'. In both regimes this kind of jargon was used to get rid of minority intelligentsias, formal experiments and progressive agendas; not to improve access for locals or improve or broaden the appeal of art. The 'anti-elitist' discourse in culture is at present mainly deployed by conservative elites, who hope to deflect attention from their own economic privileges by relaunching of stereotypes of 'degenerate art'.

So if you are hoping for new opportunities with the authoritarians,

you might find yourself disappointed.

Authoritarian right-wing regimes will not get rid of art-fair VIP lists or make art more relevant or accessible to different groups of people. In no way will they abolish elites or even art. They will only accelerate inequalities, beyond the fiscal-material to the existential-material. This transformation is not about accountability, criteria, access, or transparency. It will not prevent tax fraud, doctored markets, the Daesh antiquities trade, or systemic underpay. It will be more of the same, just much worse: less pay for workers, less exchange, fewer perspectives, less circulation, and even less regulation, if such a thing is even possible. Inconvenient art will fly out the window – anything non-flat, non-huge, or remotely complex or challenging. Intellectual perspectives, expanded canons, non-traditional histories will be axed – anything that requires an investment of time and effort instead of conspicuous money. Public support swapped for Instagram metrics. Art fully floated on some kind of Arsedaq. More fairs, longer yachts for more violent assholes, oil paintings of booty blondes, abstract stock-chart calligraphy. Yummy organic superfoods. Accelerationist designer breeding. Personalized one-on-one performances for tax evaders. Male masters, more male masters, and repeat. Art will take its place next to big-game hunting, armed paragliding, and adventure slumming.

Yay for expensive craft and anything vacuous that works in a chain-hotel lobby. Plastiglomerate marble, welded by corporate characters banging on about natural selection. Kits for biological 'self-improvement.' Crapstraction, algostraction, personalized installations incorporating Krav Maga lessons. Religious nailpaint will slay in all seasons, especially with a Louis Vuitton logo. Hedge-fund mandalas. Modest fashion. Immodest fashion. Nativist mumbo jumbo. Genetically engineered caviar in well-behaved ethnic pottery. Conceptual plastic surgery. Racial plastic surgery. Bespoke ivory gun handles. Murals on border walls. Good luck with this. You will be my mortal enemy.

Just like institutional critique was overtaken by a neo-liberal Right that went ahead and simply abolished art institutions, the critique of contemporary art and claims for an exit from this paradigm are dwarfed by their reactionary counterparts. The reactionary exit – or acceleration of stagnation – is already well underway. Algorithmic and analogue market manipulation, alongside the defunding, dismantling, and hollowing-out of the public and post-public sector, [12] transforms what sometimes worked as a forum for shared ideas, judgment, and experimentation into HNWI interior design. Art will be firewalled within isolationist unlinked canons, which can easily be marketed as national, religious, and fully biased histories.

An Alternative Alternative Currency?

Now what? Where does one go from here?

Let's put the next paragraph into brackets. It just indicates a hypothetical possibility.

If art is an alternative currency, its circulation also outlines an operational infrastructure. Could these structures be repossessed to work differently? How much value would the alternative currency of art lose if its most corrupt aspects were to be regulated or restructured to benefit art's larger communities? How about even a minimum of rules in the market – gallery contracts, resale-time minimums, artist fees,[13] remunerated internships? Introducing blockchain public records for the production, transaction, and locating of artworks in order to reign in tax fraud and money laundering?[14] Declining the most mortifying sponsor and patron relationships instead of artwashing fossil extraction, weapons manufacturing, and banks bailed out with former cultural funding? How about asking for fees on resales similar to those asked on photocopies to pay for art workers' health insurance? Or on any offshore art-related transaction?[15] Could art as alternative currency not only circulate within existing systems but even launch not-yet-existing economies (publics, institutions, markets, parallel art worlds, etc.)? If art is a currency, can it be an undercurrent? But to expect any kind of progressive transformation to happen by itself – just because the infrastructure or technology exists – would be like expecting the internet to create socialism or automation to evenly benefit all humankind. The internet spawned Uber and Amazon, not the Paris Commune. The results may be called 'the sharing economy,' but this mostly means that the poor share with the rich, not vice versa. Should any less unilateral sharing be suggested, the bulk of capital will decamp immediately.[16] One of the first steps towards parallel art sectors would thus be to organize even partial sustainability in the absence of bubble liquidity and barely limited amounts of free labour. Whatever emerges will be a new version of art-affiliated autonomy. In contrast to the modernist autonomy of art schemes, this autonomy is not solitary, unlinked, or isolated. Nor will it come about by some fantasy of progress in-built into technology. On the contrary it can only emerge through both a conscious effort and exchange among diverse entities. It's an autonomy that works through circulation, transformation, and alchemy. The links it could build on exist as weak links (*a.k.a.*, air-kiss links) and reshaping them

would need to happen within a compromised mess of contradictory activities. But simultaneously people can try to sync with the art-related undercommons [17] by building partial networked autonomy via all means necessary. If art is a currency, can it be an undercurrent? Could it work like an Unter, not an Uber? How to do this? People are used to perceiving the art world as sponsored by states, foundations, patrons, and corporations. But the contrary applies at least equally well. Throughout history it has been artists and artworkers, more than any other actors, who have subsidized art production.[18] Most do so by concocting mixed-income schemes in which, simply speaking, some form of wage labour (or other income) funds art-making. But more generally, everyone involved also contributes in all sorts of other ways to art's circulation, thus making it stronger as currency. Even artists who live 'off their work' subsidize the market by way of enormous commissions in relation to other industries. But why should one sponsor VIP prepreviews, bespoke museum extensions without any means to fill them, art-fair arms races, institutional franchises built under penal-colony conditions, and other baffling bubbles? This bloated, entitled, fully superfluous, embarrassing, and most of all politically toxic overhead is subsidized by means of free labor and life time, but also by paying attention to blingstraction and circulating its spinoffs, thus creating reach and legitimacy. Even the majority of artists that cannot afford to say no to any offer of income could save time not doing this.[19] Refusing sponsorship of this sort might be the first step towards shaking the unsustainable and mortifying dependency on speculative operations that indirectly increase authoritarian violence and division. Spend free time assisting colleagues,[20] not working for free for bank foundations. Don't 'share' corporate crap on monopolist platforms. Ask yourself: Do you want global capitalism with a fascist face? Do you want to artwash more insane weather, insane leaders, poisonous and rising water, crumbling infrastructure, and brand-new walls? How can people genuinely share what they need? [21] How much speed is necessary? How can artistic (and art-related) autonomy evolve from haughty sovereignty to modest networked devolution? [22] How can platform cooperatives contribute to this? Can art institutions follow the lead of new municipalist networks and alliances of 'rebel cities'? [23] In the face of derivative fascisms, can local forms of life be reimagined beyond blood, soil, nation, and corporation, as networks of neighbourhoods, publics, layered audiences? [24] Can art keep local imaginaries curious, open-minded, and spirited? How to make tangible the idea that belonging is in becoming – not in having been? [25] What is art's scale, perspective, and challenge in de-growing constituencies? Can one transform art's currency into art's confluence? How can arts encryption work to debunk jargons of authentic immediacy through

necessary abstraction? Replace speculation with overflow?[26]

Art's organizing role in the value-process – long overlooked, downplayed, worshipped, or fucked – is at last becoming clear enough to approach, if not rationally, then perhaps realistically. Art as alternative currency shows that art sectors already constitute a maze of overlapping systems in which good-old gossip, greed, lofty ideals, inebriation, and ruthless competition form countless networked cliques. The core of its value is generated less by transaction than by endless negotiation, via gossip, criticism, hearsay, haggling, heckling, peer reviews, small talk, and shade. The result is a solid tangle of feudal loyalties and glowing enmity, rejected love and fervent envy, pooling striving, longing, and vital energies. In short, the value is not in the product but in the network; not in gaming or predicting the market[27] but in creating exchange.[28] Most importantly, art is one of the few exchanges that derivative fascists don't control – yet.

But as a reserve system for dumb, mean, and greedy money, art's social value (auto)destructs and turns into a shell operation that ultimately just shields more empty shells and amplifies fragmentation and division. Similarly, arts venues are already shifting into bonded warehouses and overdesigned bank vaults inside gilded, gated compounds designed by seemingly the same three architects worldwide.

It's easy to imagine what the motto for art as the reserve currency of a fully rigged system might be. Just envision a posh PR lieutenant policing the entrance of a big art fair, gingerly declaring to anyone pushed aside, displaced, exploited, and ignored: 'If you don't have bread, just eat art!'

Thank you to Sven Lütticken, Anton Vidokle, and Stephen Squibb for very helpful comments.

Notes

1   Rain Embuscado, 'The Art World Responds to Brexit,' *Artnet News*, June 24, 2016.

2   Apparently this specific market crashed in the meantime. Art markets in general are still rather stable.

3   The idea of art as currency is also explored in fascinating detail by David Joselit in *After Art*. Princeton, NJ: Princeton University Press, 2012, but at a different historic moment, the moment of the expansion of neo-liberal globalization. Now, at the end of this historic moment, art as currency seems even more powerful.

4   The term 'derivative fascisms' means a jumble of widespread extreme right-wing movements that relate to twentieth-century fascisms in terms of future options, but not by any means as equivalents, as in: creating and marketing future options for fascism. There is no point in asking whether they are really fascisms or not because fascism is the underlying entity, which may or may not have anything to do with its derivatives.

5   I use the term 'middle class' in a more expanded sense – in the sense of a global middle class (which may well include both working and out-of-work classes in formerly industrialised countries) undercut by outsourcing and expanded competition. However, economic reasons are not the only explanation for the new popularity of derivative fascisms. How is it that in Germany, ninety refugee camps were attacked last year by arson alone (total attacks numbered 901 that year), while at the same time the country is doing very well economically? Indeed, the unemployment rate in Germany has fallen to its lowest level in twenty-four years. Why is Austria 53 percent likely to elect a neo-fascist president, when it's own unemployment rate hasn't surpassed 6 percent at any point since the mid-Nineties? How does one explain the constant and growing presence of extreme-right-wing organizations in these two countries that have profited massively from recent crises – Austria, from the so-called Eastern expansion, a pillage streak that moved the pensions of local retirees to the art collections of the Austrian financial industry; and Germany, which made a windfall from the European debt crisis and funneled centuries of Southern European peoples' futures into subsidies for domestic car industries cheating on carbon emissions? It's true that inequality has risen in both countries. But in Portugal, economic inequality is way higher, and unemployment is twice as high (not to mention state debt and related austerity policies), yet this country does not have a significant right-wing party or movement, partly due to its recent history. Look at Spain or Italy, both hit by the debt crisis; no new fascist party on the ascent. Even in Greece, hardest hit by crippling austerity, votes for the fascist Golden Dawn are going down, not up. The more than 50.000 refugees stranded there by the closing down of the so-called Balkan route have been mostly generously welcomed; certainly not with 90 arson attacks. In contrast derivative fascisms are strongest either in comparatively rich European countries (France, some Scandinavian countries, Austria) or countries that are refusing to take in refugees like Hungary or trying to minimize numbers like Poland. The economy is most certainly an important reason for the acceleration of fascism. But it is also most certainly not the only reason for the boom in fascist derivatives. In light of hard facts, the correlation between economic hardship and fascist popularity is very much complicated. The latter also requires a part of the population that will, if it feels threatened or just slighted, blackmail the whole of society, vote fascist, destabilize, or kill.

6   Or extreme conservative religious group identity.

7   To make this very clear: art is not a cryptocurrency. I am trying to point out some structural similarities between art systems and cryptocurrencies, not to suggest art as currency works in the same way. Nevertheless, the possibility of art becoming a cryptocurrency is raised in a very informative text by J. Chris Anderson, 'Why Art Could Become Currency in a Cryptocurrency World,' *The New Stack*, May 31, 2015.

8   In contrast to cryptocurrencies, in art there is not the slightest pretense to decentralized transparency, nor the pretense to an automated incorruptible set of functions. Art as currency gains its relative stability precisely because of nontransparency, and because of its overwhelming reliance on human relations.

9   See http://bitcoinmining.com/bitcoin-mining-centralization

10   This leaves art projects that deal with alternative currencies (or financial options or contracts) on a double scene. They can become representational and sometimes somewhat misleading because they show something other than they actually already do themselves.

11   I very much agree with Ben Davis's excellent text 'After Brexit, Art Must Break Out of Its Bubble,' *Artnet News*, June 28, 2016.

12   By 'post-public' I mean semi-public corporate ventures like biennials and many institutions and museums.

13   W.A.G.E., Precarious Workers Brigade, etc., are doing a stellar job on this issue, as are new artist unions and other organizations working on related issues, including Liberate Tate, Gulf Labor, *etc.*

14   The use of blockchain technology in art circulation, criticism, and documentation opens up a huge can of worms relating to the quantification of different art phenomena, the manipulation of consensus, submission to the tyranny of averages, etc. Arguably, art's appeal (and value) derives at least in part from the fact that it does not always reproduce the so-called 'wisdom of crowds' or other popularity-driven functions. There is enough great art about this (see, for example, Vitaly Komar and Alex Melamid, 'The Most Wanted Paintings on the Web,' http://awp.diaart.org/km/intro) to understand how it would be both funny and devastating for all art to be like this or made on demand according to futures and prediction markets. That said, it would be extremely useful to record the

provenance and to a certain extent the authenticity of artworks, and to establish public registries of works and their whereabouts in order to prevent money laundering through art. And in the longer run, this kind of record-keeping could perhaps also support more ambitious projects. Of course, this also creates the potential for the total tracking and secondary data analysis of art works, thus assimilating them on another level into social marketing and metasurveillance.

15   Also of course see Walid Raad's seminal text on the Artists Pension as an example of how this goes as wrongly as possible, http://e-flux.com/journal/48/60038/walkthrough-part-i.

16   And the currency function will be diminished by decreasing circulation, thus possibly eliminating art's function as currency altogether, reverting artworks to commodities or products.

17   Adapting a set of propositions advanced by Fred Moten and Stefano Harvey in *The Undercommons: Fugitive Planning and Black Study*. Brooklyn: Minor Compositions, 2013.

18   Pointed out by Anton Vidokle in 'Art without Market, Art without Education: Political Economy of Art,' *e-flux Journal* 43, March 2013.

19   I am fully aware that it is a major luxury for most artists to be able to say no to anything; but even in this case one could simply rethink one's participation in circulation.

20   One of many excellent examples is Neue Nachbarschaft in Berlin, where Berliners – both longtime residents and newcomers – come together for art courses and lessons in German or music.

21   See the Platform Cooperativism website http://platform.coop/about. The idea is to use technology to connect workers and service-providers to users through platforms that are worker-owned or organized cooperatives. Blockchains are used in many of the already existing examples. A lot of art projects incorporate different versions of blockchain elements. See, for example, Sami Emory, 'BitchCoin Is a New Cryptocurrency for Art,' The Creator's Project, February 10, 2015, http://creators.vice.com/en_us/article/qkwvad/bitchcoin-is-a-cryptocurrency-for-art; and Steven Sacks et al. in conversation, 'Monegraph and the Status of the Art Object,' dis magazine, 2015, http://dismagazine.com/discussion/73342/monegraph-and-the-status-of-the-art-object. An excellent critical reflection on art projects dealing with blockchains can be found in Sven Lütticken, 'The Coming Exception,' *New Left Review* 99 (May–June 2016).

22   This question requires a long paragraph reexploring the idea of 'delinking' under conditions of simultaneously networked and fragmenting global systems — an idea which has been explored by Samir Amin, Immanuel Wallerstein, Andre Gunder Frank, and Giovanni Arrighi, among others. A more fully developed version of this text will rely heavily on Karatani Kojin's idea of 'autonomous modes of exchange.' In his book *The Structure of World History: From Modes of Production to Modes of Exchange* (2014), Karatani foregrounds circulation as a mode of production and highlights cooperativism and associationism as sites of creative organization. Art systems combine most modes of circulation mentioned by Karatani: pre-agricultural clan-based modes; modes based on plunder, expropriation, and statehood; and capitalist modes. Art also contains seeds of a potential future mode of circulation based on sharing, the dissolution of enclosures, locally actualized diverse constituencies, and the creation of parallel economies using LETS and other pre-blockchain alternative currencies. On the one hand, this means utter corruption; on the other, a parallel form of exchange. On a related note, see Aria Dean's excellent recent text 'Poor Meme, Rich Meme,' which maps vectors of a Black circulationism projected by shared motion, history, movement, and multiplicity, http://reallifemag.com/poor-meme-rich-meme.

23   I suppose big art institutions could see themselves as cities.

24   How do we defend municipalities under attack, like the twenty-four deposed municipalities administrated by the pro-Kuridish Democratic Regions Party (DBP) in southeast Turkey, including Nusaybin, Cizre, Sur, and Suruç, some of which have declared self-rule and operate on a model of assembly-based autonomy?

25   A proposition advanced by Brian Massumi in 'Conjunction, Disjunction, Gift,' *transversal*, January 2011, http://eipcp.net/transversal/0811/massumi/en.

26   Confluence instead of coalition, a way to let movements move. Overflow: loss of control over dynamic developments. See the new issue of the journal t on these and other notions http://transversal.at/transversal/0916.

27   By trying to gauge artists' lifespans or investing according to the number of the kids female artists have.

I this from Elie Ayache's fascinating treatise *The Blank Swan: 'robability*. Hoboken, NJ: Wiley, 2010.

immutability mantra

All of our technological systems are haunted by the imprint of dreams and nightmares now lost in time. The reckless drive of human civilizations to continually innovate – from deep time to the present – has led to the invention of the strange and the miraculous, be it the seamless astrotheological mathematics that constitute ancient Egypt's Mirror of Heaven; the rumblings of immortality in the early-twentieth-century Russian philosophy known as Cosmism, which became the catalyst for space exploration; or Chile's Project Cybersyn in the 1970s: an advanced cybernetic system capable of automating away government. Hybrid socio-technical systems such as these, capable of reshaping grand narratives, are by their very nature few and far between. The lessons we can learn, insight to be gained and parallels we can draw tend to fluctuate dramatically over time, of the aforementioned perhaps most relevant to now is Cybersyn.

In 1970 Dr. Salvador Allende, a Chilean physician and politician, was elected to power. He was the first Marxist president to preside in Latin America. As one might expect, upon election Allende was quick to embark on a process of vast nationalization and collectivization of state infrastructure, in addition to proposed defaults on debts owed to international creditors and foreign governments. This inevitably upset, in quick succession, a number of deeply entrenched special interests and foreign bodies; so much so that in 1973, after a period of severe economic warfare perpetrated by president Nixon, Allende was deposed by a military coup backed by the CIA. This led to the establishment of the military junta's control of Chile and the brutal 40-year rule of General Augusto Pinochet. This is a very sad and dark period of human history which has many lessons for what is now unfolding in the extreme present.[1]

Some lessons though are more unique and specific than others, buried in amongst the brief period of Allende's presidency is a visionary initiative that grounds activities unfolding now into a legible version of reality. Namely an initiative orchestrated between 1971 – 1973: Project Cybersyn, a distributed decision support system deployed to aid in the management of the national economy of Chile. The system itself was made up of 'four sub projects: an economic simulator, custom software to check factory performance, a futuristic operations

room and a national network of telex machines that were attached to one mainframe computer.'[2] Each telex was positioned at factories throughout the country so to monitor production in near real time. The architect of this system was Stafford Beers, a British consultant specializing in management cybernetics and protégé of Warren McCulloch. Cybersyn was intended as a cornerstone to Chile's socialist project: an advanced system capable of running the economy with the touch of a button, effectively automating-away vast tracts of bureaucracy, embodying a uniquely 'Chilean Way to Socialism'.[3]

As the legacy of one system haunts another – Cybersyn is being remade, in the form of Ethereum 'the world computer', a system launched in August 2015. Dreamt up by the young blockchain pioneer Vitalik Buterin in order to establish a 'distributed blockchain based platform focused on planetary scale computation, smart contracts and decentralized autonomous organizations.'[4] Heralded by many in the know as Bitcoin 2.0, Ethereum follows many of the same tropes and technical innovations as Bitcoin but with significant upgrades made to its weapons grade cryptographic foundations. In the same way Satoshi Nakamoto's invention irrevocably disintermediated current models of central banking – replacing the human decision making with code – Buterin Ethereum's founder has unleashed the ability for anyone anywhere to deploy their own decentralized applications, along with their own accompanying internal currency: whether it be the wholesale redesign of identity systems, anonymized marketplaces, prediction markets (*a.k.a.* 'assassination markets') or provenance tracking platforms. Despite it being early days it is unquestionably the latent possibilities that reside in Ethereum's unknown unknowns (particularly in regard to the intersection with advanced developments in artificial intelligence) and our unstable future that provides the most fertile ground for insurgent innovation.

Whilst it is easy to undermine and mock the rhetoric accompanying these systems,[5] it is perhaps less interesting than charting the mind bending phenomena it has begun to unleash onto the world. Totally unregulated and experimental in the extreme, Ethereum represents the true pirate utopia, equivalent to those of the corsair enclaves of the 16th century. It is a governance sandbox for our time. The descriptive language of materialists attempting to make sense of its implications can offer us only a fleeting and whimsical diagram of its potential future impact. There being no better example of this than the trophy feature of Ethereum's platform, the DAO or Decentralized Autonomous Organization, now crowned on ethereum.org's homepage with the angelic title Democratic Autonomous Organization, previously

referred to as a DAC in the original white paper; Decentralized Autonomous Corporation. The DAO essentially represents an organizational constitution that executes exclusively in code, and as we know languages have a habit of shaping reality. Emphasized perhaps best by the fervour with which programmers operating in this space refer to the code, as if it were Scripture itself drawn down directly from the word of God.

It was on the 30th of April 2016 that the first public DAO was launched on Ethereum. Its stated mission was 'to blaze a new path in business organization for the betterment of its members, existing simultaneously nowhere and everywhere and operating solely with the steadfast iron will of unstoppable code.'[6] Intended as something akin to a decentralized stateless venture capital fund, The DAO welcomed investment from anyone anywhere with a cryptographic wallet stuffed full of number strings. No one expected it to happen, but in the space of less than a month The DAO became the largest crowd-funding exercise in history, raising over $160 million – an amount held in Ethereum's currency Ether, contained in just over a 100 lines of code on a decentralized planetary scale computer.

The Dao is empty (like a bowl),
Its usefulness can never be exhausted.
The Dao is bottomless (like a valley),
Perhaps the ancestor of all things.
Invisible or formless, it appears non-existing
But actually it exists.
I don't know whose child it is at all.
It seems to have even preceded the Lord.

– *Tao Te Ching, 4th Century BC*

Then on June 17th an attack was performed on The DAO, exploiting a weakness in its code. In real time, members of the Ethereum community watched as an anonymous hacker, dubbed 'the attacker' performed a 'recursive call' to The DAO that slowly drained it of funds.[7] In the space of a few hours Ethereum lost around 40 percent of its total market capitalization,[8] roughly $750 million, exchanges were halted and the cavalry of the Ethereum Foundation led by Buterin moved to stem the flow of Ether, before it could become as bottomless as the valley. Crisis averted, except that simultaneous to the attack a shorting bet had been placed against the price of Ether, presumably netting the attacker around $9 million.

With The DAO's funds frozen for the next 21 days, the weeks that followed saw the development team and the wider Ethereum community discuss in public how to resolve the issue(s). Rough consensus seemed to gesture towards a technical fix, rather than an acceptance of the hack as a nascent eventuality of such immature technology. In order to recover the funds though and return them to their pre-attack owners it would require making an adjustment to the immutable blockchain system which constitutes Ethereum, and enables the tracking of all transactions. Given the decentralized nature of the platform, this would require support from the community, in particular the miners who contribute the distributed computing power needed to keep the network online, and an update to the software; one that everyone could be confident would securely patch the issue.

Miraculously this was achieved. On the 21st of July 2016, everyone that mattered had agreed and the entire Ethereum system forked; within 24 hours all funds previously held in limbo had been returned. This left the original iteration of Ethereum's blockchain to wither and die, whilst the forked version set out towards a brighter, unblemished future – except it didn't die.

Suddenly a breakaway renegade faction within the community was resuscitating the discarded fork, breathing computing power back into its code. Claiming its birthright as the original, one true progenitor; 'Ethereum Classic', websites, forums and tools were copied and deployed to support it. Even Poloniex, a major trading exchange, listed the currency. Suddenly everyone that owned the cryptocurrency Ether on the forked Ethereum blockchain prior to the fork also had the equivalent amount in ETC on the 'Ethereum Classic' blockchain – and in the troll-infested caverns of Reddit the ideological fault lines were drawn on the immutability mantra of 'code is law'.

It is, I acknowledge, difficult to follow what is going on, but don't imagine that it was any different for everyone following online. Let's pause for a minute;

What's exciting about these developments is not the possibility of a frictionless, trustless, accelerationist future for society or the 20000 percent + profit gains for anyone that invested early on, or even the possibility that sometime soon Skynet will finally be online. Instead the thrill comes in observing the unexpected unfolding at breakneck speed, with relative low risk for the rest of the planet, not in theory but in practice and with this the cold, hard collision with reality that comes from hundreds of thousands of individuals with a stake, tying

their ideology to the flagpole of a technology that started out as 'neutral'. Make no mistake, this is the governance grinding stone 101 that will inform the political projects of the 'Nerd Reich'. Unlike Project Cybersyn or the Russian space program, this infrastructural undertaking is not geared towards the development of a coherent political project, at least not one spoken out loud, and like Occupy it has no list of demands. Instead it evolves in real time, guided almost exclusively by the prefigurative politics of those who choose to participate.

And so now is probably a good time to highlight the current state of play in the blockchain universe. In the short space of less than a year Ethereum's market capitalization has grown from $1.2 billion to around $20+ billion give or take 15 percent on any particular day – whilst this gives the foundation responsible for its development total autonomy and development runway for at least half a century, the real stakes are in the consolidation of pacts between transnational corporations. In the establishment of the EEA (Enterprise Ethereum Alliance) comprising over 150+ organizations including banks such as J.P. Morgan, Santander, National Bank of Canada, Royal Bank of Scotland, and UBS; global consulting firms Deloitte and Accenture; tech giants Microsoft, Cisco Systems and Intel – each working in close collaboration to construct blockchain-based initiatives which represents nothing less than a Bretton Woods for our time.

Notes

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2 Medina, Eden. *Chile's 'Project Cybersyn'.* 2009.
http://informatics.indiana.edu/edenm/publications/MedinaIULive.pdf

3 Garcia Jr, Greg. 9/11/73: *The 'Chilean Way' to Socialism Hits a Dead End.* Thesis. 2012.
http://digitalcommons.wou.edu/cgi/viewcontent.cgi?article=1011&context=his

4 From the original Ethereum website c.2016 but no longer present: http://ethereum.org.

5 Example of such rhetoric; 'code is law', and those that critique it, see for example:
Hern, Alex. 'Blockchain: the answer to life, the universe and everything?'
http://theguardian.com/world/2016/jul/07/blockchain-answer-life-universe-everything-bitcoin-technology

6 http://daohub.org

7 Basic explainer: http://coindesk.com/understanding-dao-hack-journalists
Detailed technical explanation: http://hackingdistributed.com/2016/06/18/analysis-of-the-dao-exploit

8 'Market Capitalization' typically refers to 'an estimation of the value of a business that is obtained by multiplying the number of shares outstanding by the current price of a share' as guided by the market. In the case of cryptocurrencies, it refers to the total value of the currency in circulation; in Ethereum's case Ether.

Blockchain Poetics

Bitcoin[1] and the blockchain technology that originated with it inspire high political passions. For the libertarians and anarcho-capitalists who wrote and initially promoted this technology, it is a model of an ideal social order. For the socialists and critical theorists who have been wrong-footed by its popularity it is literal fascism[2] in technological form. Neither group is happy with the blockchain's recuperation by global financial capital as the new transport layer for banking transactions. However, the experience of the blockchain and how it relates to contemporary society is more complex than can be drawn in reductive ideological strokes and should inform politics, philosophy and art more than it does. This essay discusses this complex phenomenology of the blockchain.

Where, What, Who, How

Bitcoin is the fulfilment of the cypherpunk dream of stateless money. The cypherpunk worldview was given early expression in the *Cyphernomicon* document written in 1994 by Timothy C. May[3] incorporating previous contributions to cypherpunk email lists. That document reaches its crescendo with the idea of crypto-anarchy, using encrypted communication and electronic money to smash the state, which is identified as an unjust and coercive enemy of individual freedom by cypherpunks. Crypto-anarchy's desire for contract law and money without a central state resembles anarcho-capitalism, a political ideology which is mentioned several times in the *Cyphernomicon* and even identified as the form that crypto-anarchy will take.

Anarcho-capitalism[4] is against government, but for money and private property. This is at odds with more traditional forms of anarchism which regard private property as a product of the power of the state. Anarcho-capitalism ultimately implies that the coercive power of the state can be recreated using private security services, paid for using the property owner's capital. Socialist anarchists and anarcho-capitalists tend not to take each other seriously, each regarding the other's worldview as incoherent.

Both as a tool to resist or destroy the state and as a necessity to recreate some of its functions in its absence, the creation of peer-to-peer

electronic money was a key cypherpunk and anarcho-capitalist objective. Representing money as electronic data has a problem, though; money needs to be scarce but data can be copied without restriction. If I send you an email saying 'I hereby give you ten credit units', you can copy that as you like and thereby spend it as many times as you like.

Preventing the same electronic money being spent multiple times is the 'double spend problem', or what cryptocurrency enthusiasts describe as the 'Byzantine Generals' Problem'.[5] The problem that the apocryphal Byzantine generals face in agreeing a plan to attack a city, while communicating via possibly treacherous communications channels, resembles the problem of forgery and authenticity in money and art, in terms of establishing that signifiers have the history that they claim to. What is at risk is the blocking or ironizing of intended meaning, or of someone else capturing the surplus value of code.[6] Previous electronic money systems relied on 'trusted third parties', servers or other hardware controlled by someone other than the individuals involved in a given transaction – usually banks. In the 1999 cypherpunk novel *Cryptonomicon* by Neal Stephenson[7] the protagonists use gold held in trust and a central database in order to administrate this third-party function, a solution later disastrously attempted in real life by eGold.[8]

Satoshi Nakamoto, the pseudonymous creator of Bitcoin, created a solution to the double spend problem and thereby to the desire for stateless electronic money in 2009. Bitcoin's 'blockchain' is the first algorithm of *post-modern* computing[9] in that it departs from the assumptions of security and consistency that were foundational to computing models developed through the twentieth century. The blockchain algorithm is designed to create consensus in an untrustworthy and possibly hostile computing environment, and in doing so uses economic incentives to solve a problem in computer science.

Myth, Virtue, Pathologies

Myths have the power to direct society's desires and achievements. In the figure of Satoshi Nakamoto (or rather his powerful absence), Bitcoin has an incorruptible and exemplary foundation myth. Satoshi, whoever or whatever they may have been, gave the world Bitcoin and the blockchain as a gift,[10] built a group of disciples who understood the direction that Bitcoin should be developed in, then disappeared.

The society founded on this myth quickly developed culture and language to reflect its ideals: 'Free the markets, free the world,' (a reference to Bitcoin's anarcho-capitalist implications), 'to the moon' (a reference to the explosive growth of Bitcoin's fiat currency value), and 'hodl'[11] (a misspelling of 'hold) are just some examples of the jargon and shibboleths reflecting attitudes and behaviours that have emerged from Bitcoin's rise. This tendency reached its in-joke zenith with Dogecoin, which very consciously grew its economic value by growing its community through shared culture.

The mythologized virtues of Satoshi and the blockchain – their incorruptibility, freedom, and fairness – stand in contrast to the vices and corruptions of the 'weary giants of flesh and steel',[12] banks and state apparatus, that cyberspace libertarians have historically positioned themselves against. The very first block in Bitcoin's blockchain, known as the 'Genesis Block', contains a message to prove the date of its creation – a quote from The Times[13] about a state banking bail-out, a story that contrasts vividly with Bitcoin's removal of trusted third parties.

But myth can also misdirect, and language also reflects a culture's fears and disappointments. Bitcoin's success spawned hundreds of other 'altcoin' cryptocurrencies, many of them ineptly managed or naked scams – pejoratively referred to as 'shitcoins', or 'pump and dump' currencies. The purchasers of these worthless tokens speak as though they are 'investors' who will become rich as surely as if they had started mining Bitcoin in 2009. 'The Madness of Crowds'[14] described in the era of 19th century economic bubbles are nothing compared to the conviction of the shitcoin hodler. The power of language can also be seen in the way that FinTech workers who are recuperating the blockchain for the trusted third parties of existing financial institutions can hide behind revolutionary rhetoric and feel-good talk (and often real experiences) of community.

Perhaps worse than the frenetic and wrong-headed speculation around altcoins, the rhetoric of the certainty and enforceability of transactions promised by the blockchain repeatedly tempts people to misapply its protocols to new kinds of quasi-property: from recording the use of firearms,[15] to the giving of sexual consent.[16] Entitlement, coercion and over-simplification haunt too many proposed blockchain use-cases outside of simple currency. As Dogecoin's community of 'shibes'[17] might say, this is 'very not wow'.

Security, Work, Power, Proof

As suggested above, the economic value of the Bitcoin blockchain is established through its security against double-spending. To secure transactions, Bitcoin uses Public Key Cryptography (PKC), a system originally invented in secrecy by the UK government in the early 1970s, and later in the decade in the USA.[18] PKC uses the properties of very large, very random numbers to create a mathematical space that communications can be hidden in. The cypherpunks naturally loved PKC, and used it to secure email and other communications long before its application to electronic currency. Cypherpunk applications of encryption have their precedents – the relationship between cryptography and money goes back to the use of mediaeval bank codebooks in Europe, the relationship between cryptography and politics goes back to antiquity.[19] But the era of Bitcoin and WikiLeaks is a cypherpunk era, and its deployment of PKC is different by degrees of scale

To secure blocks, Bitcoin uses a 'proof-of-work' scheme adopted from a proposed email anti-spam system called 'Hashcash'. To claim the 'block reward' of new bitcoins, you must compete to be the first to complete a computationally (and therefore economically) expensive to solve but cheap to confirm puzzle, and thereby be the first person to broadcast the value associated with this 'new block' of transactions to the blockchain network. Since the puzzle takes the form of finding a cryptographic hash with a particular value, the computational power used to do this is called 'hashing power'. The most secure chain of blocks is the longest chain, the chain with the most hashing power behind it.

Economics, Incentives, Rationality

Monetarily, Bitcoin is like Air Miles, Green Shield Stamps, Linden Dollars or mobile phone credit, it is just another complementary currency with equivalent value in pounds sterling or United States dollars but which can only be spent within a specific system. Unlike those examples, it also functions as a critique of / problematization of / defamiliarization of traditional currencies. Bitcoin proponents contrast it to state-created 'fiat' money, on the basis that it is not issued or enforced by the state. Despite this, fiat resembles Bitcoin in the mechanical minting process of cash (Bitcoin is a *coin* after all), and

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in the creation of money out of thin air in the columns of databases running on energy-hungry mainframes by banks. Likewise, Bitcoin resembles fiat currency in the capital requirements for mining and the material instantiation of its systems in mining rigs and hardware wallet devices. Furthermore, the fixed supply of Bitcoin means that, like gold, its scarcity should guarantee that its value will appreciate over time. This is intended to lead to deflationary economics, which makes it very appealing to its early adopters and to adherents of Austrian School economics.[20] The core difference then of Bitcoin is that it duplicates existing market-currency models without the need for centralized banks or state operators. You don't have to spend several months profiling the wrong person for a literary magazine [21] to realize that Nakamoto's implementation of Bitcoin has a libertarian political aspect.

Within the Bitcoin community there are economic and political arguments about low-value transactions 'spamming' the blockchain, about non-monetary transactions 'bloating' it, about the fungibility of bitcoins stolen or spent on dubious items and services by criminals, and about whether 'censorship' to address these will increase or decrease the value of Bitcoin as a result. At the algorithmic level, the difficulty of solving the proof-of-work puzzle for each block is adjusted by the system every two weeks to ensure the regular, reliable, value-protecting creation of the blockchain.

As we have seen, this value comes from the security of the Bitcoin system. This security is paid for in Bitcoin, providing economic incentives to maintain the security of the system using the system itself. These incentives create a closed loop, in theory at least. They are easy to misunderstand or to get wrong. For example, if we assume that miners and account holders do not have opposed interests in transaction fees (miners benefit from high fees, users from low ones) we may fail to balance them correctly. Or if we remove competition for block mining rewards without introducing a different incentive for building and storing blocks then we may reduce the security of the system by attracting and retaining fewer miners, leaving the system more open to a 51 percent attack.

These mistakes can be made for technical reasons (seeking to reduce costs or transaction times) or ideological reasons (seeking to avoid competitive social relations or to tie a system to a national jurisdiction). Failing to consider how Bitcoin's built-in economic incentives result from and align with Bitcoin's ideological underpinnings, whatever one may think of them, can lead to a failure to address the diverse and conflicting motivations and incentives that press on a monetary

system from society in a game theoretically sound way. This isn't just a problem for altcoins. If Bitcoin itself gets these incentives wrong, for technical or political reasons, then it too will see adoption drop off.

Cryptocurrencies assume that local economic rationality (profit-maximizing behaviour expressed through the game of mining and using the coin, local to the Bitcoin user-base itself) is sufficient for their security. Examples of cryptocurrencies being broken for profit, such as the 51 percent attack on Feathercoin (in which an attacker was able to create a fork and steal block rewards)[22] or the denial of service attacks on Ethereum, show that global economic rationality (profit-maximizing behaviour that knows it can make more money outside the coin, bringing outside forces to bear) can trump this assumption. The activity of trolling cryptocurrencies, for example the way in which users reprised the use of the ETC Ethereum fork against the wishes of its progenitors, is likewise an example of global *social* rationality. Some of the loudest proponents of the ETC fork phrased their actions in terms of Ethereum's social contract – a contract that they regarded the original Ethereum system as having betrayed. For them maintaining the supposedly discarded branch of the fork was the only rational and moral response. Another example of this kind of global social trolling activity within a supposedly self-contained digital system can be seen in the fact that the movie with the lowest score on IMDB is not the one that has offended the largest audience with its polished Bollywood aesthetics, but rather one that has done so by referring to the Bangladesh Liberation War as the 'Indo-Pak' war.[23] Capitalizing on this social-ethics of networked activity, Dogecoin's differentiator in relation to other blockchain currencies, is predicated firstly on its social value (the fun-time, jargon-filled culture of its community of users), and only secondarily on its technical-economic innovation (slightly faster block times). Despite the primacy of game theory in contemporary economics, this influence of cultural and social factors on blockchain currencies shows that there is always more than one game – and we do not always know which game we are playing.

Order (temporal, social, political)

The security of the blockchain provides a strong temporal order for the information (the transactions) that it contains. Time's arrow points along the blockchain with a certainty and finality that the relativistic physical universe cannot rival. Ignoring the Unix timestamps that give a mapping from blockchain time to the number of seconds since January 1st 1970, the roughly ten-minute duration of each block marks the

passing of time, the ever-increasing expenditure of hashing power, and the resulting increasing certainty of facts encoded in the blockchain. Proof becomes fact over time in the metronomic succession of blocks. Real-world events from celebrations to software updates are already timed to specific blocks. When everyone tells the time with blocks we will have switched from fiat time and its trusted third parties, atomic clocks timed to the revolutions of the earth, to blockchain time timed to the accumulation of certainty through hashing power.

As well as a strong internal temporal order, there is a strong social order implicit in Bitcoin – one that deliberately excludes 'politics' conceived of as the distorting intervention of the state in authentic social relationships between peers (or at least their transactions). There is no 'theft' via tax, or devaluation via inflation, on the blockchain – no involuntary payment for the state's wars and its surveillance and oppression. Instead there is a continuum of fair trades and accumulations based on voluntary relationships between economic peers.

The instantiation of this order in Bitcoin, or at least strong support for it, makes Bitcoin a tool for justice as seen from the libertarian point of view. It decentralizes power – taking agency away from state apparatus and distributing it to users according to a homogenously ordered system of relations. As a result, re-centralization, whether of the state or of blockchain mining hashing power in 'mining pools' which can carry out 51 percent attacks or block protocol upgrades, is seen as bad in and of itself. The blockchain is created by peers running a *consensus* algorithm, not a ruling algorithm. It embodies the political right of exit, a fork away from the state inevitably followed by further forks as communities rise up around cryptocurrencies and disagree over their directions.

This absence-of-politics-as-politics puts any would-be critic in the position of having to defend coercion and an interventionist state, or of having to demonstrate the ways in which Bitcoin is itself a form of state. As we have noted, anarcho-capitalism appear incoherent to socialist anarchists as it presupposes that the notion of private property can be upheld without the state to guard it. Bitcoin and the blockchain purport to allow precisely that. From Nakamoto onwards, Bitcoin is defined by such guiding absences – no state, no bank, no boardroom, no real-world tokens.

Code, Law, Society

For many cryptocurrency enthusiasts, Lawrence Lessig's LambdaMOO[24]-era observation that, on the Internet, 'code is law'[25] has become a normative ideal rather than a critical observation (to Lessig's dismay). Without code (and massed computing power) there is no Bitcoin network, and no blockchain. But human beings arguing about which code should be run, which code better reflects Satoshi's intention or has less human intervention in its operation, debases the principle of code-is-law, reducing it to human choice in the name of inhuman perfection. The code of Bitcoin has been modified or copied into hundreds of different coins. Individual codebases may be law on their own individual blockchains, but code-is-law in the space of cryptocurrencies is polycentric. You can always fork – and what is law in one fork is simply a meaningless string of bits in another.

The laws that cryptocurrency codes implement are almost always those of capital, of property. From financial restrictions, through shares and deeds, into contracts and 'intellectual property'. But this is a law set free from its bourgeois state shackles – and checks and balances. There is a tension between the jurisdictional claims of code-as-law and the law of the land. Just because you are creating stocks and shares on the blockchain doesn't mean that the law regarding stocks and shares in the real world doesn't also apply. And there is another tension that cryptocurrencies inherit from anarcho-capitalism. If money, contracts and property require the coercive power of the state to maintain them, is it the form (how something is maintained) or the function (maintenance itself) of the state that is being objected to? Reproducing the coercive role of the state in a decentralized yet less constrained manner does not create a more just society. In response, blockchain-based systems are being created for organizing voting structures, whether for corporations, co-operatives or new or existing governments – bringing the democratic ideals of contemporary society to bear on this new, emergent legal framework (or possibly distorting both beyond recognition).

When society is represented as code, failures of code become failures in society. 'The DAO hack', in which a previously undiscovered bug in a cryptocurrency smart contract allowed hackers to steal one hundred and fifty million dollars' worth of tokens representing voting rights, turned a democratic venture capital fund into a crisis for the community around it. Resolving it involved intensive work on both code (a 'hard fork' modification of the underlying Ethereum system) and social measures (getting community support for the fork).[26]

Identity, Representation

On the blockchain, the peers that engage in transactions are represented by addresses based on their PKC public keys. Bitcoin addresses are deliberately meaningless strings of letters and numbers. Although some users have a 'vanity address', which adds a degree of human-readable structure to the start of the key, *e.g.* **1BoatSLRHtKNngkdXEeobR76 b53LETtpyT**. This is probably the only way that media-jamming-style spoofing of identity can take place on a blockchain without hacking it.

Using a PKC key as identity marker simultaneously hides a peer's real life identity and identifies their blockchain identity with mathematical certainty as a matter of public record. This is a dialectic of absolute secrecy and absolute identity. Saying 'I am my private key' is a reified and deliberately impoverished notion of individual identity. It frees individuals to not *have to* trust each other in their economic transactions, and so they *can* trust each other in their social interactions as a result.

On the blockchain, data from the outside world is identified or represented by its cryptographic hash. A cryptographic hash is a short but nonetheless almost certainly unique representation of a much longer piece of data. Cryptographic hashes are very sensitive to change in data, a single character different in the input will result in completely different output. For example, the SHA256 cryptographic hash of my genome (a piece of data with a meaning very different from a quantity of Bitcoin and which would take many blocks to include in Bitcoin's early 2017 one megabyte blocks) is **BADA4CF5328394F73 3CD278C33509E79B839CC0B0838658503B116D6CA9CA14B**, the hash of your genome will be completely different even in the unlikely event that we have only a single codon different between us. Placing data or the hash of data in the blockchain provides a time stamp on it that proves it existed at least after the date of mining of the block that contains it – someone or something with my genome has existed since at least Bitcoin block #286917.[27] There are also tricks to include other data in the blockchain in transaction outputs or addresses, and texts, images, code and music have all been included in those ways.

Epistemology, Ontology, Cosmology

Within the blockchain there is only codified truth: the truth of which address has sent transactions to which other address, the truth of what value or data (hashes or other representations of information) was included in those transactions. The truth of the blockchain is

underpinned by a consensus reached by computers competing for economic rewards. Because of the way each block in the Blockchain is constructed, to change the truth of the blockchain would require more computing power than at least half the Bitcoin network for an amount of time equal to the time since a particular fact entered the blockchain. This quickly becomes prohibitively expensive. In contrast with the imposed or negotiated truths of contemporary states or academia this is an extraordinarily strong basis for certainty in facts, however limited those facts may be.

Through the blockchain we know facts, in so far as the data contained by the blockchain represents facts, with a confidence proportional to the accumulated security of the blocks that contain them. This is equal to the amount of computing power expended over time by miners performing the proof-of-work algorithm. We know who, or at least which address, has stated each fact on the blockchain with cryptographic certainty. We know that and when they stated it with a certainty born of the economics of years of planetary-scale computer power. We very quickly know with a certainty that it would take more than the computing power of the entire planet to undo.

This isn't trust, it is trust's obviation, a transactional finality born of network consensus. This finality is only on the chain, though. If the blockchain forks there will be two certainties, two chains of not-needing-to-trust, and a conflict between them. Even then the network's computing power will eventually settle on one of them as the true state of the world, building the longest chain on it once more. This process works towards an immutable, final truth established with greater certainty than all the world's encyclopedias.

Viewed from within the space of the blockchain, identities are constructed using only the finest artisanal entropy[28] sliced into chunks and used to anchor facts in a geological-time-defying[29] immense crypto-space, a software approximation of a Growing Block Universe, where the past and present exist, but the future does not, rather it is grown into.[30] Similarly, stepping outside of his engagement with the kind of right wing anti-politics that we have discussed above, philosopher Nick Land has argued that the blockchain represents a post-Kantian, post-relativistic order – not just a new kind of temporal order but the invention of absolute time itself.[31] It is easy to criticize such an absolutization of the idea of the blockchain, but iterating

through those objections and our answers to them in turn can be useful in gaining a deeper critical appreciation of the blockchain.

Outro

The blockchain is a site of socioeconomic alterity and an imaginary that has not yet been entirely recuperated by the economic order that it sought to transcend. Nor is it yet a culturally pervasive enabling metaphor, as fire, ceramics, steam or computers were for previous cultures.[32] There are signs that it can become one – for example philosopher and economic theorist Melanie Swan imagines the blockchain ultimately both reaching out to encompass an interplanetary economy and inwards to encompass our own thoughts to provide a back-up and record of consciousness itself.[33] But perhaps in this brief moment of potential it nonetheless reflects, contrasts with and animates the global socio-political order as a dark mirror to diffract our post-economic-crisis society. It contains, or is a screen for, hopes for social authenticity and common wealth both recognizable from wider society and yet uniquely inflected ideologically, expressed in software protocols, token sales, algorithmic organizations, and tips. It is also haunted by fantasies of passive income and of enforcing particular ideas of justice. The more we engage with this, the closer we get to realizing the blockchain's value as a critical resource as the Internet was for net.art, or earlier systems of communication and exchange were for the conceptual art movement.

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Love on the Block

Bitoin Transacton = 10ef0ecc2c2a1315bf9800b3ac6e87d3cbc87b9de0cfa9b789143e-aee1d6b239
Hex = 6a2257652c204f73636172204164616d204461726d6177616e20616e642059656e6e692c
Ascii = We, Oscar Adam Darmawan and Yenni,
$ 1,874.17 - $ 1,873.98
Transaction fee = $ 0.19
(236 bytes)
86655 Confirmations
1MAPQjWKMjmSQrrYrsDff79ZfSd5z326gW
18nokhVDSj3d6W97bnaCqZMCzqoNedqzTj

Bitcoin Transaction = 5b5a06638a59f715d5241c34174fff18b9fc97d739ec9ebb5d-8418f651e31e70
Hex = 6a2570726f6d69736520746f2074616b652073686172656420726573706f6e7369 62696c697479
Ascii = promise to take shared responsibility
$ 792.42 - $ 792.24
Transaction fee = $ 0.19
(239 bytes)
86655 Confirmations
17JexFbyTqKyUHhtr8PDredFWuz1CeTKmT
1B4eh2NtR7HunfqxYehsfT9Na9atCT7g9z

Bitcoin Transaction = 0062f69f3159b5e5ab308e0aa0dba5119f7db82b021c50a0a54e543f7 dc96027
Hex = 6a1f666f72206f7572206d617272696167652e2057652070726f6d69736520746f
Ascii = for our marriage. We promise to
$ 269.03 - $ 268.85
Transaction fee = $ 0.19
(234 bytes)
86655 Confirmations
1NsVToszTu4NfYT23uBHLAxp21dzL2FSvz
1AdaAwC4W3evrmkjFxNbCM5XoSgK42A74J

Bitcoin Transaction = 39f9ec244f77c0b9cffeade4b92cfd16334c4e040fe58bc96b51b-fd958f03f4d
Hex = 6a236465766f7465206f757273656c76657320616e6420626520666169746866 756c20696e
Ascii = devote ourselves and be faithful in
$ 124.86 - $ 124.67
Transaction fee = $ 0.19
(237 bytes)
86655 Confirmations
1EeVDRnLYzug817W5R3rf2V7UpcKtuv9Jn
1DBgbwN1fRCpxfbVGJZyPx5zEajyANarxN

Bitcoin Transaction = f041c4b0589875c45febf921c719b2aef52de18a38d26b59f-0ca31e695238a70
Hex = 6a1965766572792077617920746f206f6e6520616e6f746865722e
Ascii = every way to one another.
$ 124.65 - $ 124.47
Transaction fee = $ 0.19
(228 bytes)
86654 Confirmations
1M8HHfE6eQpky833Uh8Kh77JquUS4a6pCk
19ZZvZwFA2MRaNaaWCFBi64S1b8svT645

Bitcoin Transaction = 5ff791ac0c4e4f04cceefe178e9a25ae2f0eb00f30d5eb4cd73aae-a0d345f541
Hex = 6a1d57652077696c6c20736861726520746869732073f6c656d6e20766f77
Ascii = We will share this solemn vow
$ 708.93 - $ 708.75
Transaction fee = $ 0.19

(231 bytes)
86653 Confirmations
17ePTBvtX6msSC6jqPbgacyvo6r5QttWkM
16Cz5s37SwhThspFfQZCE8ttYpmVRx6miJ

Bitcoin Transaction = c20f6b396208cadc951a33cd1ee7ce4a8b8c7cc1bfffcc22eb9156eb0af-68dae
Hex = 6a24776974682065766572726c617374696e67206c6f766520696e206f7572206865617274732c
Ascii = with everlasting love in our hearts,
$ 79.97 - $ 79.78
Transaction fee = $0.19
(238 bytes)
86653 Confirmations
1FoJPn8mHZTeiPhLpzxWe29ds5MWhEPvXG
1C6MFsat54HeD51uzjbVSbL6YdsQWVJh3D

Bitcoin Transaction = 1be8855420bf4cbb4b0e23a74e42f6c04195d78ab149fb0a5f67d-f216739e2a9
Hex = 6a1566726f6d2074686973207665727920206d6f6d656e74
Ascii = from this very moment
$111.97 - $111.78
Transaction fee = $0.19
(223 bytes)
86652 Confirmations
1DYcB34vPPSD1Ex93FEV73TWpizHB7yKjP
12X8o3ZKWXAqF1J111fLiaxH9PCnMNzzFm

Bitcoin Transaction = 017202287321d49bdd4a793d5a1a112d3fd853df193b-97b0578797a759f1552f
Hex = 6a18756e74696c206f7572206479696e6720627265617468732e
Ascii = until our dying breaths.
$124.65 - $124.47
Transaction fee = $0.19
(226bytes)
86653 Confirmations
1EV4qtBCUAVGmd99uFJoNDetQVYWq39jcE
198Yi4E4M4TtTWDVGtmx54aP11kt6Hb1FN

Recorded in 10ef0e, 5b5a06, 0062f6, 39f9ec, f041c4, 5ff791, c20f6b, 1be885, 017202
on 26 September 2015 12:28:21 (UTC+7)
(Price in US Dollars correct on April 2017)
http://bitcoinwedding.com

'For better or worse, till death do us part, because the blockchain is forever.' – *Wedding Vows of David Mondrus and Joyce Bayo*[1]

For many, using Bitcoin to officiate a marriage sounds as romantic as a first date outside a high street bank, but the various ways in which people are developing Bitcoin, blockchain and cryptography to encapsulate love and administrate civic arrangements, such as marriage, reveal a deeper devotion towards blockchain technology as the new church and state. Since the first Bitcoin marriage ceremony in 2014, couples have continued to express their love on the blockchain and adapt the marital contract from encrypting vows into Bitcoin payments to designing 'smart contracts' that combine networked devices with coded contracts stored on the blockchain. Whilst some initial wedding ceremonies were performed by a small number of extreme Bitcoin fanatics there has since been further experimentation occurring within a wider movement in the crypto-community – one that

aims to proliferate the viability of the blockchain as a governance technology that replaces central authorities. Looking at Bitcoin weddings, we see not just individuals invested in the notions of permanence and viability implicit in the blockchain, but a spiritual commitment to the blockchain ideal – a faith that it will not only transform legal arrangements, but inaugurate a technologically absolutist model of governance that defies and circumvents traditional organizations of power. Bitcoin weddings are the start of a sermon that aims to persuade society of the blockchain as an alternative system for the administration of society. They are symbolic of a wider-culture within crypto communities that go beyond political ambition to reveal a spiritual dimension to cryptographic protocol where belief, faith and performed acts of software sovereignty become lived commitments to technological fundamentalism.

'What do libertarians find the most romantic in marriage? The contract.' – *Reddit user engelk*[2]

The first recorded example of a Bitcoin wedding ceremony was between Joyce Bayo and David Mondrus in Disneyworld Florida, where the couple stood in front of the alt-altar of a Bitcoin ATM machine. The pair used the ATM to pay one another with the attached comment: 'For better or worse, till death do us part, because the blockchain is forever'. Bitcoin is used in this case to cement a belief in the permanence of the Blockchain ledger, however anyone unfamiliar with the underlying technology would be forgiven for asking why the couple didn't just use their credit cards and alter their vows to 'For better or worse, till death do us part, because Visa is forever'. Swapping the alter for a Bitcoin ATM signifies a growing ambition to use encryption, cryptography and the Blockchain database to pursue the notion of using financial transactions as more than payments but also as contractual agreements. Oscar and Yenni from Indonesia performed their marriage in a similar way, but encoded much lengthier vows as hex strings into a series of transactions. Each transaction contains a hex string that when converted into ASCII (American Standard Code for Information Interchange) reveals their personalized, encrypted vows. Oscar transferred over $2,000 to eighteen arbitrary accounts in order to encode the vows over a series of Bitcoin payments into a number of blocks. With each block taking on average 10 minutes to clear the process of validating the vows would have taken longer than David and Joyce's one off payment and perhaps distributing one's vows over multiple payments shows a longer lasting love. The grooms in both marriages (David Mondrus and Oscar Darmawan) are well known

Bitcoin investors and publicity stunts such as this are often engineered to serve their financial interests. In this sense both weddings were successful and circulated widely on crypto-currency news sites and Oscar was awarded a certificate for holding the first Indonesian Bitcoin wedding.[3] David Mondrus is the CEO of a Bitcoin jewellery store, so the wedding appears to be a staged opportunity to promote the QR Code rings he had on sale at the time (unfortunately 'red box jewels' no longer seems to be online).[4]

The BTC ring, http://thebtcring.com, 2015

For these grooms the Bitcoin wedding serves as a novel way to inflate the market price of your favourite crypto-currency, however these symbolic acts also reveal personal devotion towards Bitcoin and turns the belief in blockchain's permanence toward a spiritual dimension. By turning 'proof-of-work', the cryptographic process for validating Bitcoin transactions, into 'proof of love', what other feelings, relations and social bonds can be re-configured as blockchain transactions? The marriage is one of the more popular civic arrangements to become cryptographically re-configured and encrypting one's vows is just the beginning of a series of experiments with programming contracts, which will also include property rights and even automating divorce.

Oscar & Yenni Wedding Invitation, http://bitcoinwedding.com, 2015

I have participated in the design of a blockchain based wedding application with The Design Informatics department from University of Edinburgh where we designed prototypes based on a geo-locative crypto-currency called 'GeoCoin'.[5]

'GeoCoin' is a platform that connects GPS data to digital wallets for crypto-currencies, enabling users to design financial or economic arrangements based on location and movement. We developed a smart contract that would enable people to create temporary shared bank accounts between one another whose spending would be bound by their location data. Like marriage, it joined individuals to share finances based on their physical proximity. This application was named *Handfastr* after the informal practice of 'handfasting' in the middle ages – a temporary marital arrangement that was valid without having to be solemnized by a priest or the church.[6] *Handfastr* uses GPS data to enforce a smart contract – a self-executing script stored on the blockchain – so that when two or more people are together in the same physical space they can access and spend money from the same digital wallet. The difference between blockchain based smart contracts such as *Handfastr* and the Bitcoin wedding ceremonies previously mentioned is that while a Bitcoin ceremony happens once with a financial transaction (or series of transactions), a smart contract is a piece of code containing rules and conditions that can be executed over a period of time. Think of a Bitcoin wedding as a ceremony, and the smart contract as the marriage that emerges, requiring laws to untangle and annul it.

Handfastr, Corina Angheloiu, Max Dovey, James Stewart, 2016

Programmers have also begun experimenting with how smart contracts could be used to process – even anticipate – the conditions

for a divorce or separation of couples. The opportunity to code legal procedures that involve the splitting of property, ownership and access rights is a logical application of these tools for blockchain based programmers' eager to demonstrate the viable efficiency of networked governance. A common attitude is that blockchain technology liberates individuals from the centralized powers such as the church and state, however, experiments in smart contract systems such as this should be critically reflected upon and we should ask what kind of arrangements do we want to turn into autonomous governing system(s).

Weddings and divorces are just one of many civic and legal procedures that are being engineered into blockchain contracts and it is interesting to consider this development as part of a political trajectory that originated from an obscure cypherpunk mailing list. *In The Politics of Bitcoin: Software as Right-Wing Extremism* David Golumbia highlights the extreme libertarian free market attitudes that have driven cryptology and technology to enable greater individual freedoms. [7] The ambitions within this community no longer merely lie within unregulated currencies, and the shift towards Bitcoin weddings and blockchain governance has given rise to a notion of 'crypto-sovereignty' where blockchain software, protocol and encryption provide founding ideals with which to form and experiment with exclusionary sovereign states. Blockchain platforms such as Ethereum – a platform that allows people to write and develop code onto a custom blockchain that can host and execute smart contracts and Decentralized Autonomous Organizations (DAOs) – encourages programmers to envision how decentralized ledgers can be used to create consensus based systems and experiments in creating non-hierarchical organizations. I would argue that while the libertarian crusade to undermine institutional powers such as the state and church remains the dominant political ideology that motivates a large extent of blockchain culture, there is a committed devotion forming within certain sub communities towards different software that informs ambitious visions of crypto-sovereignty, borderless nationalism and blockchain fundamentalism.

'My goal is to take_under government. Let them invite us in and do a few things. Eventually government replaces itself on the blockchain.' – *Comment from BirdsPointOfView in response to thread: 'Using Ethereum to create a digital political party?'*[8]

Ethereum is a blockchain based platform that explicitly encourages developers to build experiments in voting systems, legal applications and democratic organizations which are broadly defined as 'governance 2.0.' applications. For example, Ethereum's landing page displays a

visual guide on how to 'build a democracy on the blockchain' and many applications use the platform to demonstrate alternative governance structures that use non-hierarchical voting to reach a consensus. [2] The consequence of facilitating the creation of 'unstoppable applications' has been that a large portion of the Ethereum community now harbours ambitious visions of how blockchain, DAOs and smart contracts can replace traditional state governments.

Ethereum founder Vitalik Buterin maintains the belief that Ethereum will one day be a 'world computer' that could potentially manage citizens through decentralized applications, or in turn via a combination of de facto coded law and self-executing software connected to Internet of Things (IoT) devices. While many experiments to 'take under' government remain speculative thought experiments within the Ethereum Reddit community, *Bitnation* has undertaken the most prolific experiment into crypto-sovereignty with what it calls a 'Decentralized Borderless Voluntary Nation' through situated embassies, Bitcoin ID citizenships and a 'blockchain powered jurisdiction'. [10] In an attempt to transcode all existing law into coded self executing contracts, Bitnation have also tried their hand at smart contract weddings. Called *Smart Love*, the contract turns the commitment of 'legacy weddings' into 3 defined protocols:

❑ **Proof-of-Commitment to sustain an enduring relationship**

❑ **Proof-of-Acceptance of the union by friends and family, and the community at large**

❑ **Proof-of-Support of each other, including shared risks and shared rewards[11]**

The *Smart Love* experiment is yet another example of experimentation that questions the boundaries of how common and civic laws can be adapted into coded smart contracts. The application's interface incorporates the deployment of smart contracts within a chat messaging client that would allow for emoji and other symbols to activate coded contracts between different parties. The integration into messaging applications obfuscates coded contracts into communication technology and hopes to turn messaging interactions and emoji into activations of 'common law'. The authority of this 'common law' will only be created through the adoption of mass users and until then, even the developers admit that it remains purely symbolic (for now). [12] The question remains weather the current marketing strategy of 'democratizing power' will be effective in convincing others to

participate in 'de-centralized borderless nations' in favour of sovereign nation states. While DIY experiments such as Bitnation are still in their infancy, there is very little that deters the ambition within the blockchain community of the potential for crypto-sovereignty and de-centralized governance.

The confidence within the blockchain community to eventually 'take under' government bodies combines both libertarian political sentiment with a spiritual belief in the blockchain's ungoverned autonomy. This belief came under scrutiny in June 2016 when over $50 million was leaked from a DAO with over 10,000 members. The Ethereum foundation found themselves in a difficult position – to intervene and hard fork (rolling back all transactions to a point in time that preceded the alleged hack), or to continue and permit the transactions associated to the hack and lose a lot of investors and a lot of money. The majority of them voted to intervene, undermining the founding philosophy of blockchain as an un-regulated autonomous entity, consequently splitting the community based on differing blockchain ideas and philosophy. What emerged – and what is important to the subject of this chapter – was a small alliance of die-hards that expressed their devotion towards Ethereum's roots as non-regulated – refusing to acknowledge the new fork as it was the product of (human) intervention. This alliance continued to trade on the blocks that had been affected by the hack, forming a devoted group of blockchain purists that divorced themselves from Ethereum and are known as the 'Ethereum Classic' community:

Let it be known to the entire world that on July 20th, 2016, at block 1,920,000, we as a community of sovereign individuals stood united by a common vision to continue the original Ethereum blockchain that is truly free from censorship, fraud or third party interference. In realizing that the blockchain represents absolute truth, we stand by it, supporting its immutability and its future. We do not make this declaration lightly, nor without forethought to the consequences of our actions. – *The deceleration of Independence, Ethereum Classic* [13]

The Deceleration of Independence is interesting in many ways. Firstly, it reveals conflict between the communities' differing crypto philosophies, and illustrates that when things don't go to plan, it is useful for someone to be able to step in and fix the 'unstoppable application'. Secondly, it highlights the proto-patriotic language that represents an emerging sovereignty within the blockchain community and an extreme devotion with which some individuals make towards different blockchain legions.

At first sight, Bitcoin weddings may appear as novelty acts of public devotion but as I have indicated, they pave the way for such further pseudo-religious and proto-patriotic acts such as the 'statement of independence'. These language acts of crypto-sovereignty do not occur in isolation and emerge at a time when blockchain technology is not only being adopted by the financial sector but NGOs and government bodies. Bitnation's experiments into creating decentralized borderless nations has resonated with the Estonian government to such an extent that they are now working together on providing borderless citizenship with the e-residency program. [14] This demonstrates how the initially novel, strange or more extreme fantasies within the crypto-community emerge and get integrated within governments on an (inter)national scale. In order to prevent, or even critically reflect on such projects, it is important to articulate and engage with the political and spiritual motivations that drive the proliferation of such applications to begin with. Failing to do so will end up with us falling for blockchain's 'revolutionary potential' [15] without engaging with some of the radical sub cultures and extreme fundamental views that initiate and proliferate projects such as e-citizenship, marriage contracts and statements of independence. This will lead to the creative and imaginative potential getting captured and pre-determined within a dominant crypto hegemony and it will become even harder to experiment and design in this space without encountering a spiritual or extreme fundamentalism towards different crypto-cultures. How far away are we from blockchain funerals, blockchain birth registries, blockchain medical records? It is already possible to encode your DNA genome onto the blockchain [16] perhaps encouraging further experimentation into how bio immortality could lead to further spiritual beliefs in the permanence of blockchain and a ledger afterlife. Analyzing patriotic acts of sovereignty, faith and wedlock should help us critique and counter the propositions made by some of the more extreme members within the blockchain community and become aware of the spiritual beliefs that fundamentally drive the transition of blockchain from banks and business to church and state.

Notes

1   'Couple Make History with World's First Bitcoin Wedding.' *PanAm Post*, **7 Oct. 2014, panampost.com/belen-marty/2014/10/07/couple-make-history-with-worlds-first-bitcoin-wedding. Accessed 16.04.2017.**

2   'Couple to use Blockchain to contract marriage. I'm honored to be officiating.' *Reddit*. **N.p., n.d. 04 Apr. 2017, https://www.reddit.com/r/Bitcoin/comments/2hffwd/couple_to_use_blockchain_to_contract_marriage_im**

3   Rahmat and Ori. 'Indonesian Record Museum (MURI) bestowed a Special Award At CEO Bitcoin.co.id.' *Steemit*. **N.p., 05 July 2016, http://steemit.com/bitcoin/@rahmat/2gwcng-indonesian-record-museum-muri-bestowed-a-special-award-at-ceo-bitcoin-co-id. Accessed 09.04.2017.**

4   *Account Suspended*. N.p., n.d., http://redboxjewels.com. Accessed 12.04.2017.

5   'Temporary Marriages in a Blockchain City.' *MoneyLab: Failing Better*. N.p., n.d., http://networkcultures.org/moneylab/2016/04/29/temporary-marriages-in-a-blockchain-city. Accessed 30.04.2017.

6   'History of marriage in Great Britain and Ireland.' *Wikipedia*. Wikimedia Foundation, https://en.wikipedia.org/wiki/History_of_marriage_in_Great_Britain_and_Ireland. Accessed 30.04.2017.

7   Golumbia, David. *The politics of Bitcoin: software as right-wing extremism*. Minneapolis: University of Minnesota Press, 2016.

8   'Using Ethereum to create a digital political party?' Reddit. N.p., n.d. http://reddit.com/r/ethereum/comments/55dxnq/using_ethereum_to_create_a_digital_political_party/. Accessed 16.04.2017.

9   For an up-to-date list of the most recent check: http://dapps.ethercasts.com

10   'Governance 2.0.' BITNATION. 21 Mar. 2017. http://bitnation.co. Accessed 30.04.2017.

11   Smart Love *BITNATION* Blog Smart Love Comments. N.p., n.d. 4 Mar. 2017. http://blog.bitnation.co/smart-love

12   *Ibid.*

13   *The Ethereum Classic Declaration of Independence*. N.p.: The Ethereum Classic Community, 2017. http://ethereumclassic.github.io/assets/ETC_Declaration_of_Independence.pdf. Accessed 07.04.2017.

14   Governance 2.0. BITNATION, BITNATION, 21 Mar. 2017, http://bitnation.co/blog/pressrelease-estonia-bitnation-public-notary-partnership. Accessed 16.08.2017.

15   Tapscott, Don, and Alex Tapscott. *Blockchain revolution: how the technology behind Bitcoin is changing money, business and the world*. London: Portfolio Penguin, 2016.

16   'Make a Backup of Yourself Using Bitcoin.' *Genecoin*. N.p., n.d. http://genecoin.me/index. Accessed 14.04.2017.

Collections Management on the Blockchain: A Return to the Principles of the Museum

My first job for a museum was invigilator and cloakroom attendant. The micro-level process of care and responsibility for property was on the one hand performed for invaluable artworks and on the other hand visitors' everyday possessions. Although my interaction with the assets varied from distanced observation to casual fondling of personal items, my presence as a human protector of 'stuff' was experienced as the same transaction, one of mundane 'security theatre'.[1] The blockchain is often described as a move from a model of security based on embodied trust to smart contracts executed via a trustless network. However, when envisaging the post-human museum, the need for culturally codified bodies persists. Today the role of museum invigilator operates not only as perceived security for the artwork, but also as an opportunity for the public to engage with the artwork by means of a human dialogical interaction.

My casual sub-contracted shifts as an invigilator were agreed with little notice and included an unpaid twenty-minute break and one hour for lunch. The staff room used by invigilators, security guards and cloak room attendants, referred to as the 'mess room' was an underground bunker hidden beneath the grandeur of the public galleries. Years later I found myself in the same museum, an invited independent contractor, this time elevated to the third floor star-architect designed cafe reserved for office staff. Conjuring images of a Dickensian working class, the mess room has always stuck with me as indicative of the ideals of the Victorian museum. Subsidized by nineteenth century industrialists, many of the main municipal galleries in towns and cities throughout the UK can be traced through this history. Beneath the retro-fitted ideal of the open-source, dialogical museum, Victorian ideals remain ingrained through the management of bodies and objects.

According to the Western ideal, the final resting place for an artwork is the museum. Whilst my peers and I directly feed content into this monolithic container, the blockchain, appears as a future facilitator to our decentralized, sub-contracted relationship with the institution. The conventions of museum collections management are based

upon Enlightenment modes of categorization and care. Furthermore, these modes are steeped in mechanisms of databases and contracts – mechanisms fundamental to the blockchain. The majority of art asset management projects currently on the blockchain are reproducing Enlightenment paradigms of the museum that define what is visible by how space and time is organized according to a rigorously stratified set of cultural codes and categories. Foucault describes the classification of bodies where 'Convicts must be isolated or at least distributed according to the penal gravity of their act, but above all according to age, mental attitude, the technique of correction to be used, the stages of their transformation' in order to perform the institutional regime of progressive socialization (Foucault, 269). The creed of governance by means of surveillance, as exemplified in Bentham's 'panopticon' prison architecture is regarded by Foucault as fundamental to the principles of many other institutions, including the *supervision* of elementary education (147). For a host of postmodern thinkers, the 'disciplinary museum', that categorizes objects according to a chronology of progress, follows Foucault's 'disciplinary society' (Bennett, Crimp, Hooper-Greenhill).

The ownership of both born-digital and physical assets is formulated according to a linear projection of time and within the design of a surveilled space. The blockchain continues this emphasis on a linear relation between time and ownership, with each block validated via a UTC (Coordinated Universal Time) time-stamp.[2] In this text I will focus on the question of how value is measured and used as a category for organization, according to institutional validation and reputation. Unpicking why born-digital 'intellectual property' (IP) is a red-herring – instead, the more revealing mode of value-circulation on the blockchain returns emphasis to the physical asset within the Enlightenment museum, bound to a network of fleshy bodies imbued with trust.

The Victorian public museum has been understood according to Foucault's narrative of the birth of institutions operating the 'discipline society' in the nineteenth century and expanded by Deleuze's 'Societies of Control' in the twentieth century. Foucault's followers describe how the Victorian display of cultural artefacts, produced an exhibitionary panopticon, where 'the arrangement of relations between the public and exhibits so that, while everyone could see, there were also vantage points from which everyone could be seen, thus combining the functions of spectacle and surveillance' (Bennett 78). Here a parallel can be drawn with the distributed architecture of the blockchain where trust is implicated by the transparency of transactions. In both cases clear sightlines function to produce self-regulating bodies.

The genesis of the Western museum is found in the 'Cabinet of Curiosity' of the early Renaissance. Items were collected from voyages of discovery and brought back to the apothecaries of aristocratic patrons, where they formed both an impressive display and a 'working collection' for the early practitioners of what we today call 'science' (Hooper-Greenhill 22). The colonial function of this collection was embedded through the physical and intellectual gatekeeping of access to these objects of 'knowledge'. For Tony Bennet, the first *World Exhibition* at Crystal Palace in 1851 demonstrates how the decision to move displays of princely objects from the private domain of the apothecary to a public spectacle transformed the potentially revolutionary masses into well behaved citizens. The narrative of the World Exhibition, closely tied to upholding the British Empire, benefits from Simone Brown's more recent work *Dark Matter* concerning how surveillance technologies are informed by the policing of black life (110 – 111). Brown traces the pan-optical architectures of the slave ship as continued in the racializing schemas of digital surveillance experienced today. Facial recognition studies looking at racial bias have shown that algorithms are trained to a prototypical whiteness and are therefore better at identifying gender for Caucasoids over Africans.

The birth of the museum provides a further example of colonial jurisdiction. Francesca Vanke's description of the world exhibition shows that the 'Levant' or 'Oriental' states (Egypt, Tunisia and Turkey) as well as Brazil and China, were given space, in order that they could be observed – for the twin purpose of evidencing a comparative to the more 'progressive' western industries, and the seemingly paradoxical hope that their 'authenticity of identity could be understood, analyzed, and in someway 'caught' by example, as if by a mysterious process of osmosis' (Vanke 200). A public ledger of data provides proof of 'authenticity' and serves to evidence claims to individual authorship and ownership, meaning asset management of art on the blockchain threatens to continue this colonial imperative.

The techno-progressive blockchain 'pioneers' Ethereum openly espouse a colonial attitude. The first live release of Ethereum, called *Frontier* included ironic imagery of the wild west and invited developers to play the role of the explorer: '…you are entering uncharted territory and you are invited to test the grounds and explore. There is a lot of danger, there may still be undiscovered traps, there may be ravaging bands of pirates waiting to attack you, but there also is vast room for opportunities.'[3]

The dangers of Silicon Valley fin-techs advancing into countries with weak economies has been outlined in a white paper for the UN by journalist, campaigner and former derivatives broker Brett Scott. Describing the activities of Bitcoin entrepreneurs in a chapter titled 'Techno-Colonial Solutionism from Above?', Scott argues that the potential benefits of blockchain as a disruptive technology should be understood as having geographically and economically asymmetrical affects, dependent on the resilience of the existing institutions in each particular context. In countries with weak institutions there are greater risks, including the potential for exploitation where 'escaping weak local institutions might help individual people, but does little to empower the broader social majority who remain reliant on the existing systems. Those who are most likely to seek escape are, perhaps, social elites with high education, access to technology and capital to protect' (8). One can apply the same logic to the most successful blockchain start-ups operating across the markets and institutions of art. Vastari and Ascribe, for example, are working with artists producing born-digital work who already derive value according to subscription from established museums and galleries. Meanwhile, the broad base of artists producing born-digital work are limited in their ability to build social and financial solidarity online. As both a result and a consequence of disenfranchised artists relying upon imperialist online platforms, currently they are unlikely to benefit from non-institutional power distribution on the blockchain.

A value system of reputation embedded in blockchain databases and contracts could, reinforce this still existing colonial impulse for the public management of cultural assets. Emily Rosamond has been developing 'a theory of reputation as the network extensivity of the subject.' In the era of Web 2.0 social media, Rosamond claims 'our subjectivity both belongs to us, reputation reflects what we might feel we are actually worth, what our potential in the social world might actually be (might actually feel like) and on the other hand it belongs to the structure of the platform itself'. The phrase 'Reputation Economy' was coined by CEO of a reputation management firm Michael Fertik, who in 2015 published 'The Reputation Economy: How to Optimize Your Digital Footprint in a World Where Your Reputation Is Your Most Valuable Asset'. Drawing upon Fertik's work, Rosamond's more inclusive schema, claims the 'Reputation Economy' can be considered beyond the confines of the quantified and digital. Shakespeare, who bought the key values of the Renaissance to theatre is notably pertinent for Rosamond. She refers to Cassio, Othello's officer who loses his military position when he enters into a drunken brawl, as

revealing a continuity in our conception of reputation with that of the Renaissance. Reputation, Rosamond suggests, is formed by a convergence of an externalized representation of self, a fidelity to an *internal* sense of self, and relies heavily on subscription from *public* state institutions. From the apothecaries built in the age of crusades, to the Victorian public exhibition, and finally databases on the blockchain, one can identify various levels of Rosamond's conception of reputation across systems of management for cultural assets throughout history. The Renaissance 'Cabinet of Curiosity' organized objects for the 'display of princely and aristocratic power and advancement of reputations and careers' (Bennett 73). Although the imperial collections in question that promoted aristocrats were not publicly visible, the perceived strength of the acquisitions did have implications for levels of influence across a ruling class who governed subjects. For both the Victorian exhibition and also the blockchain, the publicness of content (data and exhibited cultural assets) directly serves a recursive process of self-governance. Transparency holds to account the fidelity of the internal to the external selves as a mechanism of self-discipline.

On the blockchain, reputation management has the potential to build upon already established Web 2.0 systems such as star ratings on eBay and likes on Facebook as outlined by Fertik and extended by Rosamond. Decentralized blockchain management tool Backfeed, allows users to hedge bets based upon reputation via 'rewards granted to contributors and their corresponding influence in the community calculated automatically by the workings of the protocol (Proof of Value)'. Diversity is accommodated, with a feature that allows forking of alternative consensus. This diversity feature, is key to Backfeed's endeavour of value redistribution and seeks to counteract the persistent problem of bias caused by network effect, where reputation is based upon cumulative subscription. The success of this adaption depends upon working against the dominant characteristic of the model of positive feedback loops. Even with the diversity feature in place, the automated evaluation of reputation, linked to the transparency of calculated activity, continues a regime of self-discipline, thereby reproducing the history of subjects under surveillance within the public museum. However, on the blockchain 'Reputation measures how much the community trusts you, and is calculated on your previous transactions and interactions with the community' (Dennis and Owen 131). Rather than passing authority to the monolithic state, the transaction characterized as located both for and with a community of independent actors.

Douglas Crimp's influential 1980 *October* essay 'On the Museum's

Ruins' staked the claim that the 'the history of museology is a history of all the various attempts to deny the heterogeneity' (50). Following Foucault's 'disciplinary society' Crimp describes an archaic value system within the museum that allows for only one narrative and crushes the proverbial community of trusted actors operating today on the blockchain. According to Beth Lord, Crimp's postmodern Foucauldian reading of the museum as an instrument of the disciplinary society is both a denial of the potential of the museum and an over-simplification of Foucault's ideas. Summoning another Foucauldian notion, that museums and libraries are 'heterotopias of indefinitely accumulating time', Lord argues that the museum can and does perform as 'a positive force – …for dismantling the very notions of historical continuity and coherence that Foucault holds in contempt' (Lord 2). *Heterotopias* are relational places with layered temporalities and non-hegemonic otherness, exemplified by Foucault not only in the museum, but also cemeteries, gardens, theme parks and cinemas. Toward the second half of the twentieth century this conception of relationally was readily appropriated by artists and the municipal museum followed this artistic turn. In parallel with the rise of networked communication, the trajectory of content and reputation led by a community of users on Web 2.0 reflects the experience-led museum of the 2000s which is filled to the brim with *relational* content and where meaning is constructed in collaboration with the audience. Asynchronous displays of objects whose value and even mere presence is open to interpretation, divert audiences toward the claim that meaning and value is produced through interaction. Much like 'Platform Capitalism' of Web 2.0 that I will discuss later, the contents and value of contemporary artworks contained in the museum are only outsourced to visiting users' surveilled bodies, which themselves are transmuted into display and exhibition (Srnicek). Whilst the *ownership* of value is drawn into the artwork and feeds back into a centralized silo of artist and institution, the formulations of reputation that make the artist visible to the institution in the first place are ancient and unquantifiable forms of cultural practice that further alienates the audience from the value they are engaged in producing.

The Snowden leaks of June 2013 marked the beginning of an era of increased legibility concerning the role of big data. Invitations from platforms to contribute content are now widely understood by users as marketing tools that discipline subjects, indistinguishable from surveillance. Laurel Ptak's *Wages for Facebook* draws a parallel between the 1970s radical feminist manifesto 'Wages for Housework' and unwaged labour online. Following this unpicking of informal labour

as clearly formalized by platforms by means of capital expropriation, the inscription of IP to track artistic work can be – and frequently is – seen as a project of wrestling control from these platforms in order to redistribute wealth to the *digital workers*. Despite the argument for a historical continuity made previously, there are projects harnessing reputation management toward redistribution of remuneration for labour. Self-managed brands reign in the midst of a collapse in the differentiations between public / private, commercial / not-for-profit, institutional / DIY spheres of influence. In the current informal economy of reputation management, there is cause to be suspicious of the term *independent* supplementing the role of *curator*. Instead there emerges a need to observe vulnerability and co-dependence among institutions and actors. Infrastructures of care and attention to build reputation require enacting by bodies, but these actors are rarely visible when operating informally. Still in their foundational stages, blockchain projects such as Imogen Heap's *Mycelia* and Adrian Onco's *Ampliative Art* seek to build models that address the flow of value according to a constant negotiation between *independence* and *dependency*.

Ampliative Art is a project proposed for the blockchain that promises to enable artists receiving ad-hoc free labour 'to remunerate, distribute, recognize and project their works' to this informal network of labourers, along with the more frequently rewarded institutions and brands. Whilst a potentially fascinating exercise in value mapping and political act of redistribution, the en masse network effect of mapping in *Ampliative Art* could lead to a positive feedback loop or 'bandwagon effect' whereby care and labour is provided on the basis of reputation. Here, the danger of 'passing' data relating to informal labour could see reputation expressed through quantified projected remuneration – speculation. There are complex incentive structures for enacting informal artistic labour, that supersedes the need, or any quantifiable reason, within a systematic reward mechanism. In fact, the process of capturing activity with culturally coded forms of reciprocity, might actually deter participation, by making it more valuable to keep.

Mycelia makes an argument for a 'fair trade music industry'. Adopting Ethereum's smart contracts, Heap enables contributors to her songs to claim direct payment of royalties: 'cutting out the middle men, there is a sense of getting back to the more intimate direct exchange between artist and listener' (Washtell). This aim mirrors *Ampliative Art*, in that it enables the convention of singular artistic authorship to be distributed with no limit to the complexity of credit administration.

Whilst *Ampliative Art* seeks to observe informal care for and towards art works, *Mycelia*'s retrieval of reward demonstrates a reliance on a much problematized format for recognizing value – intellectual property. Whether individualized or collective, the project still embeds the claim to artistic autonomy over ideas, thereby preventing lawful usage by other producers. The *Mycelia* project has managed to successfully enact and test its proposition, whereas *Ampliative Art* is still in the manifesto stage. The struggle to reconcile informal labour, according to qualitative multi-layered incentives has therefore thus far resulted in a default to the IP model of value recognition, often critiqued as at odds with artistic practices that grow out of the digital commons.

A tide of successful blockchain art start-ups take IP as their starting point. They include Ascribe, the most visible arm of whose brand is a gallery sales assistant flogging limited digital editions; Monegraph, an artists' rights management tool; Blockai – a bottom-up fraud deterrent office; and Verisart, who specialize in verification of provenance for physical works. Ascribe encrypt born-digital artworks in order to create limited edition saleable work and register the certificate of authenticity data on the incorruptible blockchain. The heady combination of IP with machine learning and big data is what separates the ambition of Ascribe from the other start-ups mentioned. For Ascribe, the art market is simply a low risk arena in which to develop a much larger project; IPDB Interplanetary Database. Quoting John Perry Barlow's 1996 'A Declaration of the Independence of Cyberspace' as an inspiration, IPDB proposes a public decentralized database run as a foundation by a network of for-profit and not-for-profit caretakers, delivering escape from walled gardens and centralized silos of data.

Whilst this interplanetary ambition is framed as a gift to the commons, IPBD's precursor Ascribe is a tool that creates proprietary encryption. The same team as IPBD and Ascribe built whereonthe.net as a spin out functionality when trying to build provenance paths and IP track for images. The project whereonthe.net provides users with information on how many websites and unique pages an image appears on, when the image first appeared online, and produces graphics charting how it has spread. This functionality, claim Ascribe is the 'the closest possible approximation to ownership on the Internet' (Sheridan). Whilst the implication here is for IP, one wonders if the IPBD team are setting their sights on ownership of the human mind as well as it's creations. If the tracking algorithm for whereonthe.net is adequately nurtured with enough data, it could develop the intelligence to predict where and how a digital asset will appear online in the future. Interplanetary

AI presents itself as a potential ambition behind the project, although Ascribe and even their Übermensch IPBD do not mention it. Scaling the question of speculation and AI back to the art market, the future of Ascribe points toward a more efficient flow of what Rob Myers describes. In an essay connecting the blockchain to #Accelerationism, Myers imagines 'a prediction market security might reward a hundred Satoshis or ten points if a particular artist has a headline show at Tate Modern. If you think there's an 80 percent chance of that happening, you can pay up to 80 Satoshis or 8 points for the security representing that prediction.'[4] The necessary proof-of-work validation implicit in this marketization leads one straight back to the continuing value of the bricks and mortar museum.

These art blockchain projects, with Ascribe at the helm, and even the more horizontal and collaborative seeming *Mycelia*, present themselves as specifically designed to manage born-digital assets 'created, stored and distributed digitally' as though they were unique, or limited edition, objects (Paul 83). They utilize cryptography to solve what is often called the 'double payment' problem – where an asset is used in more than one location for only one payment. The business of embedding artificial scarcity into the digital asset is aligned with what appears to be an inevitable and continued enclosure of the mythos of the online commons within colonial apparatus. For decades, artists have embraced the lossless reproducibility of digital assets that allows them to contribute and draw upon a vast, apparently *common*, catalogue of digital material available for re-appropriation and remix. These communities – perhaps even generations – of artists have operated formally through Creative Commons (CC) licensing as well as employing the spontaneous right-click copy/paste mechanism of the computer, thus dismissing copyright permissions. The legend often summoned is that artists in the 1990s retained autonomy to share and own their data via off-platform activity such as the female-only mailing-list FACES, initiated by a European collaboration of 'digital workers' in 1997, and net.art collective intervention irational. org, 'an international system for deploying 'irational' information, services and products for the displaced and roaming.'[5] In the same era, first operating as an electronic bulletin board system (BBS) and later transferring to a website *The Thing*. launched in 1991, is often referenced as the first online exhibition host. But breaking with the folklore of the Web 1.0 commons, when remnants of *The Thing* were displayed as part of the New Museum exhibition NYC 1993: *Experimental Jet Set, Trash & No Star* it was revealed that their first online show 'featured a piece by artist Peter Halley, an unsigned unlimited edition which sold 16 digital copies at $20 a pop. With

no way to enforce payment, Wolfgang Staehle (*The Thing* founder), in an act of admitted futility, kept track of who had downloaded the piece in a database file' (Kopstein). This anecdote of the faulty marketization of online art serves to demonstrate a continuity with concepts of value and remuneration between colonial and blockchain cultures, and puts paid to the naive, rose tinted admiration bestowed upon the net.art generation who are often characterized as claiming a practice outside the market.

The ascent of Web 2.0 'Platform Capitalism' saw projects such as *VVORK* (2006 – 2012) emerge as the chosen model for the post-internet generation. That the artist-run contemporary art blog was hosted on the centralized platform WordPress might point toward a very specific kind of corporate enclosure; however, as Rhizome's Michael Connor suggests, the project did enact the ideal of a digital common through the aesthetic collusion of work posted:

'…similarities and patterns made it seem as if artistic production was algorithmic to the extreme. But this is what made *VVORK* radical and interesting. Instead of arguing for artists' uniqueness, it argued for their interconnectedness' (Connor). [6]

The 'Platform Capitalism' generation demonstrates the continued – perhaps increasing – power of reputation, where 'like-ness' and 'similarity' provide a networked affiliative value. The paradoxical conceit of CC is that it argues for the alignment of copyright law with the collapse of artistic autonomy, whilst still maintaining a system for formal recognition and tracking of singular authorship within this. Following this rationale, inscription of IP into digital works on the blockchain facilitates the continued enclosure of a common catalogue of data copied between artists, potentially to the benefit of the CC community while also lending itself to individual's accumulation of reputation and value from the results. However, CC is not a designation preferred by the post-internet generation. As Connor elucidates, the terms of common ownership are no longer situated in the need for free sharing of individual works, but instead the commons is situated as a multiplicity of similarity that has moved so far from the claim of artistic autonomy, it breaks down the very parameters of IP.

Historically and still to a large extent today, commercial galleries and museums have been the *databrokers* for artists' work, tracking its provenance, location, value and futures in databases. Operating as a database, the online space is not only relevant to the management of born-digital work, but also the tracking and distribution of physical

artworks. *The Thing*'s first exhibition was of downloadable photos or scans of physical works, and only later did they host exhibitions as born-digital art and multimedia sets comprised of text, audio, and video files (Kopstein). London-based blockchain start-up Everledger works toward fraud prevention, to track and verify an ethical supply chain for products, most notably through their Vastari product.[7] Bernadine Bröcker, Director at Vastari states that: 'Vastari, in which Everledger holds an investment stake, acts as a middleman between art museums that are looking for new pieces and private art collectors that want to increase the value of their art by getting it exhibited in public. This new partnership will see the art information possessed by Vastari written immutably to the Blockchain.'[8] In this way, a database for physical artwork on the blockchain acts to facilitate the Enlightenment's continued convention of reputation built through museum display.

Focusing on the journey of the physical artwork toward the final resting place of the museum, Vastari formalizes the way artists, collectors and independent curators have used websites to showcase their assets for the self-management of their brand, and the value that is generated from these assets when they reach the museum. The 'network effect' of the www protocol along with the shift from the text-based to image-based internet has seen website *Contemporary Art Daily* (2008 –) prove that databases can provide easily accessible, detailed, timely documentation of exhibition after exhibition. Following in the footsteps of artist initiated *VVORK*, *Contemporary Art Daily* distributes an apparently equivalent rendering of the work-as-review through pure visibility, from scene to market, and back to scene. The era of the image-based and platform-capitalized internet has seen a move away from self-owned as well as self-managed databases towards centrally administered storage and dissemination services. Whilst sites such as *VVORK*, *Contemporary Art Daily* and artist run Tumblrs operate a little like time-based databases tracking cultural capital, where the newest posts are most visible and adjacent posts signal value by association, participation in a Web 2.0 network arrives disguised as marketing activity, in contrast to Vastari who foreground visibility in relation to ownership.

Blockchain start-ups dealing in born-digital art embed value through IP, challenging the informal nature of artistic labour, combined with Web 2.0 user exploitation. However, the argument for redistributing value away from centralized 'Platform Capitalism' is a simplification of the circulation of value. The cultural practice of reputation and incentive exists beyond quantifiable and individualistic concerns of IP.

The management of physical assets through Vastari offers museums, collectors, commercial galleries and artists 'APIs with other major players in the art technology space and processing reputational analysis reports.'[2] The blockchain is often discussed as a tool that does away with the need for a trusted *middle man*. However, Vastari, has developed a business specifically based upon a nuanced understanding of the cultural practice of actors in the art market, in order to act as a mediator of reputation towards achieving validation, beginning and ending with the museum. The speculative markets suggested by *whereonthe.net*, and their big brother IPDB Interplanetary Database threatens to enable automated evaluation of reputation based on the transparency of calculated activity. This distributed form of *self-disciplining* subjecthood continues the panoptical colonial surveillance of the Victorian public museum many artists still aspire to exhibit within.

Notes & References

1 'Security Theatre' is the practice of investing in countermeasures intended to provide the feeling of improved security while doing little or nothing to actually achieve it. Cryptographer and writer Bruce Schneier coined the term in the 2009 article 'Beyond Security Theatre' for *New Internationalist*, in which he describes the airport security repercussions due to the September 11th attacks using commercial jetliners in the United States, as 'security theatre'.

2 This projection of time is broadly out of sync with the agile asynchronous era so tightly bound to automation, as described by Mike Peppi among others. Whilst relevant, for the sake of focus both the question of inconsistency with a-synchronicity and philosophical interrogation of time and space postulates explored by Nick Land have been put aside as an adjacent line of enquiry.

3 http://github.com/ethereum/frontier-guide/blob/master/README.md

4 http://furtherfield.org/features/articles/abc-accelerationist-blockchain-critique

5 FACES is still running but their website is currently offline whist they wait for a new stable version of Drupal Commons. irational.org includes an ongoing archive mostly of the work of Heath Bunting among other members of the group. Some of the net.art works that have broken links and are therefore partially working are referred to by Bunting as 'ruins'.

6 In 2015 VVORK was used as a test-case by Rhizome's Digital Conservator Dragan Espenschied using Colloq, Rhizome's prototype social media archiving tool.

7 Everledger use a similar approach to Provenance, who operate in the retail sector to provide 'the solution for transparency in product supply chains' (Blockchain: the solution).

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Mark Waugh

Artists Rights in the Era of the Distributed Ledger

'A total of just over twenty thousand people died of cyanide poisoning that morning. This was the first figure that came to hand as it is roughly the number of words of which the novel consists so far. Be assured there are not many more, neither deaths nor words.' – B.S. Johnson, Christie Malry's Own Double-Entry [1]

This was a quote randomly sucked from the net to preface this text on the blockchain. It is sourced from Wikipedia, our shared cultural ledger. Wikipedia is not a permanent array of data but one which is subject to the whims and detours of prejudice and punctuation. It seemed appropriate to suggest this penultimate novel by the late British avant-garde novelist B.S. Johnson as the perfect backdrop to consider the frictions and opportunities of the blockchain and the distributed ledger.

We live in an era of simulation. Philosophy is prisoner to the media 'softwar' of militarization and the news increasingly suggests the prescience of the metafictional account of a disaffected young man, Christie Malry, who applies the principles of double-entry bookkeeping to his own life, 'crediting' himself against society in an increasingly violent manner for perceived 'debits'. As Jean Baudrillard argued, the Gulf War of 1991 did not happen but rather it was a regime change from the politics of the 'real' to the production of 'simulation' and media spectacle in which the stakes post 9/11 have become increasingly delirious.[2]

Into this territory as Head of Research and Innovation at DACS (The Design and Artists Copyright Society) since 2014 I have helped shape an agenda that explores the economic and cultural capital of the artist. More specifically I have been asked by the organization to help define strategies to deliver its mission; transforming the financial landscape for visual artists.

DACS and Art Data

The economy of representation and the moral and economic rights

of artists is core to the business of DACS. We distribute and issue licenses for royalties which are often genealogically complex, as rights are often transferred through contract or inheritance.

We are therefore unsurprisingly looking at blockchain technology as an interstice for the accurate migration and translation of data between ledgers or sets of information such as licenses issued, their duration, the royalties due, and the list of beneficiaries. This ledger starts from the public affirmation of a suite of artists' rights articulated in accordance with British Law. The law system itself is an anarchic and disparate set of texts which are supposedly in convergence following the Acts of Union of 1707. Our laws are developed through case-by-case reasoning. In cases following the Copyright, Designs and Patents Act 1988 occasionally amendments are agreed, but aspects of this area of law-making and enforcement remain problematic – particularly when judges refuse to engage with the flexibility and special considerations required by the practices of contemporary artists. Practices such as appropriation, installation or performance art each pose their own challenge to the existing forms of law around copyright in particular. In such deliberations blockchain-based contracts will face similar difficulties. However, in cases of legitimate transfer of title or licensing, we do believe blockchain technologies can help address simple administrative challenges, such as the documentation of business.

The fundamental tenet of law we will build on is: visual artists have moral and economic rights over the use of their images.

DACS would not want to alter this right but we do want to assert that 'visual artists' is an arbitrary classifier – in fact a fictional identity – that may be exploited because of its over-simplicity.

Since 1984 DACS has developed a complex taxonomy which drives increasingly customized databases to facilitate our business globally. Our problem is typical of data hubs whose nodes operate in diverse and often conflicting databases. We work with a variety of organizations who require us to exchange information for business purposes and with whom we may or may not have conflicts of interest.

The question we would ask in this context is, 'What are the practical opportunities of the blockchain and how can these be materialized for the benefits of visual artists and at what risk?'

Post-Internet Art and the Blockchain

In Artie Vierkant's 2010 essay *The Image Object Post-Internet* the author mapped out how the shared nature of images on the internet had fundamentally changed the way in which art is both experienced and produced.[3] The emerging generation of born-digital artists and dealers expect to sell and share online at scale and velocity. Social media platforms such as Instagram, Facebook, Pinterest, Snapchat and others are becoming sales platforms and exhibition environments. The most comprehensive survey of works that explored the roadmap towards 'post-internet art' was the exhibition *Electronic Superhighway 2016–1996* (2016) curated by Omar Kholeif. It traced a trajectory from cybernetic art and internet art, without fully articulating the tensions between political resistance and the capitalization of internet by corporate interests.

This shift was more fully exposed at the recent Berlin Biennial 2016 *The Future in Drag*, where a large exhibition section was dedicated to projections of future blockchain scenarios portraying this new technology as stealth Neo-Liberalism. This political hedging of blockchain was accompanied by an 'in your face' affirmation that the Blockchain had arrived, and artists should be paying attention.

DACS was established in 1984 a year after the publication of Jean Baudrillard's *Simulations*.[4] Measuring history through a theoretical lens does nothing to refine our sense of the truth. It does though allow us to imagine the narrative of an emerging economy for artists in which copies or simulacra were to become the key signifiers of a system of circulation and capitalization in the art market.

Today a work which sells at the top end of the market is likely to be capitalized in a multiplicity of ways in order to maintain and extract value from an investment in it. An artwork is a data generator and recording. How a work such as Afrosheen (2009) by Hurvin Anderson might be loaned, sold, licensed or editioned is a cumulative task. Anderson is represented by DACS for ARR (Artist Resale Rights) which means that we monitor all sales through the secondary market such as auction houses. Additionally, he is a licensing member and his works are available as hi-res files on our Artimage licensing platform. This means that DACS is potentially part of the narrative of the circulation of such works. At several points in time with different interests such as auction houses, international galleries, private dealers, publishers, academics and others whose business systems are

often either by default or by design not transparent. In addition, the systems DACS is exchanging data with are vulnerable to obsolescence. If our systems crash or can no longer operate within the velocities of the market those artists we service will be affected negatively because we would not be able to make accurate payments to them of their beneficiaries or collect revenues for distribution.

Multiple Data Streams Linked to One Data Object

The business of reporting on the art industry is growing in influence. The art market is increasingly interrogated both academically and through niche arts media. Much of this study is composed of a composite of information in the public realm such as declared auction prices and anecdotal information. The fact that the author of the most high profile report on the art market, Clare McAndrew was poached from Tefaf Art Fair to Art Basel in June 2016 was testimony to the increasing value attributed to services that seek to offer robust and economically compelling information on the traditionally opaque dealings of the artworld. As sales slowly begin to migrate online following other markets there is a growing sense that we are at a tipping point that will be disruptive of the existing modes of business. The 2017 *Hiscox Online Art Trade Report* states that: 'The long-awaited consolidation in the online art market has yet to happen although 86 percent of those consulted expected this to happen in the near future.' [5]

Would a consolidation of bricks and mortar and online sales increase revenues for artists?

Artist Resale Rights revenues are collected on behalf of an artist when a work is sold on the secondary market. The incomes rely on the compliance of arts professionals with current legislation. We do not have a system which makes all sales conform to a transparent ledger. There are visible dealers and auction houses and there are those who deal and do not report their sales. This is a problem for collection societies like DACS but also is a challenge for the market as collectors want more information about a work they might buy remotely. They want both watertight provenance and a virtual (networked and globally accessible) ledger.

That artwork sales on the secondary market might increase if there were a consistent and permanent provenance record leads to the

question: should such a permanent record be a legal condition of sales?

A virtual ledger of sales would enable artists to exert their moral and economic rights in works because they would know when and to whom a work was sold. For collectors the benefit is similar in that they know that the artist has visibility of a sale, which would deter people from circulating fraudulent unique or editioned works.

The system would work based on consistency and building of reputation in similar ways to other platforms such as EBay. Of course the virtual ledger is not directly linked to the physical object however a hash of complex data that links objects to a ledger is possible.

From Bronze to Blockchain

The casting of bronze is an historic process and has long been used by artists to make unique editions. The process is technical, highly skilled, and involves the creation of models, moulds, and molten alloys of copper.

The difference between bronze and gold and silver is that bronze has no official hallmarking process. The provenance of bronzes has been decided historically by expert opinion and in more modern times with the assistance of signatures that an artist applies at the modelling stage of production. These signatures are often now supplemented by signed certificates managed by the studio, gallery or point of sale. Including the artists name, title, date, edition size, material and dimensions.

Image courtesy of Verisart Inc and Copyright Shepard Fairey

That these certificates can be copied is of course a problem. Signatures and edition numbers also are not regulated or recorded like hallmarks and often have no viable digital record. Most obviously, a bronze can be recast from the original and although there may be a small reduction in size these may not be detectable – especially by an online buyer. The difficulties in authenticating bronze artworks has been complicated by the emergence of 3D printing and 'cold-cast' bronze, a process which involves merely painting or applying a thin surface layer of bronze to a cast made of plastic.

DACS, working with Maurice Blik, is looking into a system that

would use a new hallmark for UK foundries linked to a blockchain ledger. This could help protect the remaining foundries and the artists with whom they work, linking an historic permanent system of verification to a new one: the hallmark, used along with the emergent technology of the blockchain, proposes a mode for provenance codes that are permanently visible, and readable in a way that verifies value.

Is Fake Art Fake News?

There will be philosophical and ethical tensions arising from an art market migration towards blockchain. Some artists have dedicated themselves to a celebration of the ephemeral: artists such as Tino Sehgal for example, make work that is explicitly opposed to contracting, will no doubt be particularly resistant to forms of contract that exist in perpetuity.

Therefore, DACS imagines a system which is not a legislative requirement but would perhaps offer some market advantage to users: both artists and the art market professional.

DACS believe that these advantages begin with lifting some of the burden of inventory management, but will extend in many directions including operating as a solution for the growing risk of fake artworks circulating in the market.

Fake artworks have always haunted the art market but the damage – both to finances and to reputations – of cases involving authentication issues is escalating. The most outrageous recent case was the law suit against Peter Doig by an ex prison worker Mr. Fletcher, who claimed he brought a painting of Doig's while Doig was in jail for dealing LSD. Since the artist himself and the (art) dealer who represents him say the painting is not a Doig, the art market was never likely to value the work, but the court case raised interesting issues. Surprisingly an almost mirror image case concerning works by Lee Ufan also occurred in 2016. The artist disagreed with the police and their evidence including a confession by his dealer and forensic testimony. The artist claimed he thought the works were indeed his, saying: 'I concluded that there is not anything strange with a single piece.' Adding: 'The use of breath, rhythm and colour were all my techniques.' [6]

For DACS the issue of authenticity, legacy and legitimacy have been highlighted through the action research it has undertaken called *Art360*. *Art360* supports artists and artist's estates in the refining of

their systems and approaches to legacy management. We offer a modest budget for artists and their estates to consider how they might transform their approach to legacy management. We have found that digital tools for inventory control are in high demand. In particular artists want control over the works that should be included in their official catalogue raisonné. We are exploring blockchain solutions which would facilitate this but also track sales, shipping and other tasks.

Of course some artists will continue to barter and gift works but these can also be entered on the blockchain securing the context of circulation.

In the spirit of another B.S. Johnson novel, *The Unfortunates*, distributed as a box of separate parts for recomposition by the reader, we should imagine that the ways that artworks themselves exist in the world will and indeed should be capricious, chaotic and untimely and even without materiality. However, this anarchic quality of artworks could be safeguarded in most cases by a ledger of provenance that can resist erasure. With a transition from analogue studios to digital workflows even the most messy and physical artists have now experienced a break with the gravity of the world, a giddy flight into the filing or ellipsis of emails that document the origins of the work of art – the blockchain offers the opportunity to reground this aspect of practice.

A few artists including Susan Hiller, Eduardo Paolozzi and Richard Hamilton predicted that, like musicians, visual artists of the future might have some moral and economic rights over the use and ownership of their images. In the parenthesis of time elapsed since 1984 DACS has distributed over £85 million to artists for royalties paid on the sale and reproduction of their works. This is a considerable sum but still very finite in relation to the larger visual ecology in which images work. One of the questions DACS and our partners at the Alan Turing Institute, are asking is: how can blockchain be used to address the deficit in the revenues received by visual artists compared to musicians, in ways which would be revolutionary and resource efficient?

A recent article, 'Could Blockchain Put Money Back in Artists' Hands?' by Anna Louie Sussman explored how the blockchain may be the method of bringing a form of Artist Resale Rights to the US market.[7] The article cited arguments made by Amy Whitaker, an assistant professor of visual arts management at NYU Steinhardt, which suggested such a method would build on a shares-based model and follow the example of the 1970s art dealer Seth Siegelaub who developed, 'The Artist's Reserved Rights Transfer and Sale Agreement',

that stipulated artists were entitled to 15 percent of the profits on any subsequent resale of their work. Whitaker is quoted as saying: 'We've democratized creativity, but we haven't democratized ownership.'

Artimage Platform

DACS' encounters with blockchain have been rudimentary so far. We have explored the basic user journeys for our bronze mark, and begun a collaboration on our *Artimage Platform* with the Berlin startup BigchainDB whose founders combine a passion for visual arts with a vision of the future of the blockchain as a scalable utopian platform.

Our first iteration of *Artimage Platform* is linked to our existing image repository and licensing platform. We want to use the blockchain to help transition towards smart contracts that define the conditions of licenses, release hi-resolution images for a variety of uses, and also help us track infringements. Blockchain has already been used by a number of companies to deliver similar services.

In parallel with the actual design of our blockchain services we are exploring the implications in a more theoretical framework. Working with Oxford Internet Institute Director Eric Meyer, and blockchain specialist Vili Lehdonvirta of the University of Oxford, we have agreed to use DACS as a test ecology to ask what kind of side effects will be generated by our journey towards migrating ownership ledgers onto the blockchain.

The abstract for the project states:

Distributed ledger technologies (DLTs) are said to have the potential to radically transform industries and organizations, by enabling new types of horizontal coordination and collaboration, and by replacing gatekeepers and custodians with shared ledgers. However, many attempts at applying DLTs are quite conservative: they attempt to introduce the technology into a picture where the structure of an industry or an organization is taken as a given. Other attempts take the other extreme: they attempt to rebuild an industry such as financial services from scratch with computational primitives, ignoring the history and reasons behind the current practices. The proposed research project seeks to develop a path down the golden middle: a way of reimagining how an industry or an activity would be structured differently, were it built on top of DLTs rather

than centralized databases, based on a deep appreciation of the industry's current practices and other boundary conditions. DLTs have sparked a wave of research at the intersection of computational and economic theory on the theoretical foundations, as well as applied research on practical applications. The proposed project fills a gap in the middle, drawing on methodologies from financial anthropology and social data science to translate between theory and human behaviour. The project is based on ATI's strategic priorities of understanding human behaviour in the financial services sector to feed into systems and platforms development and application.

In addition to DACS the other research partner is EdgeVerve the product division of Infosys, a global technology company with over 200,000 employees working across financial services, manufacturing, energy, retail, healthcare, and public services. Finacle is EdgeVerve's suite of banking solutions and powers one sixth of the world's bank accounts, with a particularly strong market share in emerging markets, leaving EdgeVerve well placed to deliver DLT solutions where they can make the most difference. EdgeVerve has developed its own DLT framework, and is working with its financial services customers on DLT prototypes and pilot projects in remittances, trade finance, regulatory reporting, and capital markets. Participation in this research will be led by EdgeVerve's R&D Lab, headquartered in Dublin with a presence in London.

In this 12-month project we will develop the methodology and initial findings by focusing on two concrete application areas. One application area will be in payments, and more specifically, in the disbursement of complex royalty payments to artists and estates as done for example by DACS.

We believe that participation in this research will place DACS at the leading edge of research and therefore ideally positioned to attract funding and investment in the growth of blockchain solutions for visual artists.

We Have Erased the Questions but Here Are the Answers

As an epilogue and conclusion to this short note on DACS and blockchain I asked two of our partners where they feel the ethical tensions lie. Below are fragments of their responses.

Liu Smyth, Head of Blockchain Research & Ecosystem Engagement at EdgeVerve R&D Lab, London:

One of the big challenges which often faces automated/distributed/decentralized systems is a human sphere of activity suddenly being populated by non-human actors, which are introduced as 'predictable' agents but may not always be so (*i.e.* they can be buggy, overloaded, compromised), and may be subverted by malicious actors to counter the intentions of the system (*i.e.* spam, fraud, ransomware).

This is a dynamic seen in most automation, but the rights management scenario has some unique characteristics. I'm imagining variations on the 'infinite typing monkeys' problem. For example, an automated, low-friction approach to registering IP might allow me to quickly and quietly lay claim to every two-word combination in the English language. Then in a decade's time when people are talking about some unforeseeable future concept (say 'postbox phrenology') I can say 'hey I was talking about that in 2017!' A more sophisticated attack might be to use AI and webscraping to register en masse slight variations of phrases seeing breakout usage on social media, which might come up with some longer strings of potentially valuable material. We saw something similar to this in the wild with Twister – a Twitter clone built around a public blockchain – which saw all the short, legible usernames nabbed by bots almost immediately after the project launched.

Also, I completely agree on the surveillance angle of this… by definition an append-only log makes it extremely difficult to delete things! It's interesting that right now it is the state itself (in the form of the EU Commission and other institutional privacy advocates) which is the main force insisting systems are designed to forget, and the private sector pushing to remember everything.

Vili Lehdonvirta, Associate Professor & Senior Research Fellow Oxford Internet Institute, Oxford University:

Regarding your question, off the top of my head, I suspect that the kinds of consequences you describe are often the result of applying a system built with one set of values in mind to a field of practice organized around other values. Taken-for-granted norms and assumptions become visible in the clash; black humour results. The challenge for us is to anticipate this before the fact so

that something else may result as well.

It is worth noting that all knowledge is corrupted if we believe its mere record has meaning. Instead like Plato we must imagine that the blockchain has no meaning in itself but as an idea it is powerful and transformative. The blockchain is only as liberating as our interpretation and exploitation of the interface. How we read and write the ledger will be evolving as we understand its capacity and flaws. It is a collective opportunity to share knowledge much like the great task of the enlightenment; the 32 volumes of the *Encyclopédie* by Denis Diderot which in more than 70,000 articles on subjects ranging from asparagus to the zodiac, imagined that information and reason would be of universal benefit. The aim of this collaborative endeavor was in Diderot's words, to 'change the common way of thinking' through the expansion of knowledge and the development of critical modes of thought.

In our explorations of the distributed ledger or blockchain, we are sharing our unique insights into the ways in which artists work with technologists, and are deeply inspired by the potential synergy. We hope the outcome in thirty year's time will be as beneficial to visual artists in the future, as what has been achieved to date by DACS in a blockchain free ecology since its inception in 1984.

Notes

1   B.S. Johnson, *Christie Malry's Own Double-Entry*. London: Colins, 1973, p. 147.

2   Baudrillard, Jean. *The Gulf War Did Not Take Place*. Bloomington: Indiana University Press, 1995.

3   http://jstchillin.org/artie/vierkant

4   Baudrillard, Jean. *Simulations*, Translated by Philip Beitchman, Paul Foss and Paul Patton. Los Angeles: Semiotex(e), 1983.

5   http://hiscox.co.uk/online-art-trade-report

6   *Art Forum*, July 5, 2016. http://artforum.com/news/id=61864

7   Sussman, Anna Louie. 'Could Blockchain Put Money Back in Artists' Hands?' *Artsy*, March 16, 2017. http://artsy.net/article/artsy-editorial-blockchain-money-artists-hands

Everything You've Always Wanted to Know About the Blockchain*
(*But Were Afraid to Ask Mel Ramsden)

When art engages closely with still-emerging financial technologies such as the blockchain, cryptocurrencies, or smart contracts, there is a great opportunity to rethink established links between artist, art work, audience, and art market; links that have been contested and embattled for centuries, if not millennia. Since the blockchain is so far poised primarily to reconfigure the transaction and ownership models relating to information and other digital goods, perhaps most importantly it is the concept of the 'value' of art (in all its conflicted and conflicting permutations) that becomes available as a central node around which rich and productive debate can revolve. At a moment when algorithmic, computational, and generative processes are more deeply enmeshed with creative processes than ever before, we can thus ask ourselves (again): What is an author? What defines an art work? What are the (im-)material conditions of existence of a work of art as an embodiment of intangible qualities and values, required to define concepts such as originality, authenticity, and ownership? How can art-making resist the lure and demands of the market (but also: how can artists survive as part of the market)? None of these are new questions. However, one might hope that the blockchain, if it is as revolutionary and radical at it has been promised to be, will provide some new answers. Moving art onto the blockchain (or, at least, into close proximity to it) therefore seems a good way of opening up all sorts of interesting discussions.

Roughly a decade after publication of Nakamoto's white paper that started it all, it has become clear that the blockchain, beyond initiating interesting and important debate, is (of course!) not a miracle cure for the many ailments of contemporary digital society. If anything, in many of its current forms the blockchain indeed appears to be more akin to a snake oil – a 'miracle product' traded purely on hearsay, and potentially doing more harm than good. Despite wild and wide-ranging promises and predictions, there is no indication that the blockchain will resolve, for example, pressing issues with electoral processes, labour exploitation, free speech, or the environment any time soon. But what about the inequities of the art market? Can the blockchain serve to productively critique, or even counter-act areas

of concern, such as the tightly controlled access to professional art fairs and trade / auction platforms, or the commercial exploitation of artists? It is this last issue of commercial exploitation that I want to address here, not in a speculative mode of looking ahead (which still seems to be the standard way of discussing the blockchain), but, instead, by looking backwards.

Specifically, I want to tell a short cautionary tale that invokes art history and the conceptual art movement of the 1960s and 1970s. While I don't consider myself a blockchain alarmist, I do believe that the technology has qualities that make it, unfortunately, an ideal tool for extreme digital control measures and centralized wealth-accumulation. For example, new blockchain-based art trading platforms that are supposed to grant artists more control over their digital creations (such as those developed by companies like Ascribe or Blockai) generally amount to a problematic hyper-commodification model of contemporary art (for a useful, if naïve, overview of such platforms, see Michalska). Such developments may ultimately turn art itself not merely into a vehicle of financial exchanges, but into a financial tool (see Zeilinger; and O'Dwyer in this volume). This concern with the financialization of art may be best unpacked by revisiting the work and writing of conceptual artists, who have, I would argue, voiced very similar concerns decades ago.

As is well documented, a core project of conceptual art was related to the notion of 'institutional critique,' *i.e.*, practice-based analysis and subversion that focused on institutional structures framing the art work, often drawing attention to their links with capitalist ideologies (Buchloh 1990; Alberro and Stimson 2009). The project of institutional critique was itself intimately tied to experimentation with the 'dematerialization' of the art work (Lippard). In combination, this meant that conceptual art developed and sustained a strong interest in the relationship between the art object and the socio-economic as well as philosophical contexts of its material existence. This interest tended to manifest in formal experimentation, whereby conceptual art works stood in for (or changed places with) commercial, technological, legal, or social paratextual components. The commercial value of an art work might thus, for example, be transferred from a traditional aesthetic object to notarized statement, a contract, or any other kind of legal document. To early conceptual artists, this approach appeared to embody an immensely powerful critical potential, with which they hoped to disrupt the property-based circuits of dominant art institutions and their markets.

I may be stating the obvious by suggesting that the ideologies underlying blockchain-based financial tools resonate greatly with the project of institutional critique. Bitcoin and other cryptocoins continue to be pitched as radical interventions in the centralized, heavily regulated (and presumably corrupt) institutions of traditional finance. In essence, they are said to have the power to expedite the material substrate of finance (banks, *fiat* currency, etc.) into obsolescence. As I want to suggest here, art that engages with the blockchain (and with features like forced transparency, unalterable, self-enforcing rules, and decentralized control structures) can, similar to conceptual art, occupy a position that could very powerfully continue, or even amplify, the project of institutional critique. However, just like conceptual art before it, blockchain-based art is also in acute danger of falling prey to unwanted implications of these experiments, in the form of hyper-commodification and financialization.

Following Marcel Duchamp's 1944 production of a notarized statement asserting the authenticity of his 1919 readymade *L.H.O.O.Q.* (see Girst 1999), which could be displayed as an art work in its own right, some of the most radical aesthetic and critical developments in the conceptual art movement of the mid-20th century continued efforts to dematerialize the art object. Even though there were some heated disagreements among critics and practitioners associated with conceptual art (most prominently a dispute between Buchloh and Kosuth, which played out across several issues of *October*; see Buchloh 1991), virtually all definitions of conceptual art foregrounded its tendencies of dematerialization. An early key essay on the subject, by Lucy R. Lippard and John Chandler, discusses the 'post-aesthetic' ambitions of contemporary art as having the power to disintegrate traditional forms and norms of art production and art objects, and, consequently, to allow contemporary art to directly engage with extra-artistic spheres, including the economic (1973). As Lippard and Chandler propose, this trajectory might ultimately render the art object itself 'wholly obsolete' (263). Importantly, such a development could allow artistic practice to refocus attention on critiquing the very institutions created for the appreciation, (e-)valuation, and commercial trade of art. A more recent, retrospective definition by Alexander Alberro points in the same direction, and associates conceptual art with the 'expanded critique of the cohesiveness and materiality of the art object,' describing the 'fusion of the work with its site and context of display' (1999, xvii). In these definitions, the contours of the art work itself simultaneously implode and expand. As Benjamin B. Buchloh noted, 'the definition of the aesthetic becomes on the one hand a matter of linguistic convention, and on the other the function

of both a legal contract and an institutional discourse' (Buchloh 1990, 118), so that new concepts of the art work can incorporate all kinds of creative and productive processes, as well as contexts of the art work's circulation and reception.

I think that such definitions – of art as process and relation, rather than merely object-based – resonate powerfully with Christiane Paul's much-cited definition of digital art as 'digital-born, computable art that is created, stored, and distributed via digital technologies and uses the features of these technologies as a medium' (Paul 2). Like the dematerialized conceptual art work, digital art is, in theory, well placed to engage critically with technological, institutional, aesthetic, and socio-economic conditions of its existence – precisely because it steps away from the traditional emphasis on objects that underpin the assumptions of much of this infrastructure. Digital art can thus help us rethink questions related both to the materiality of the digital and to the immateriality of the art object as an abstract container of value (see, for example, Scarlett). Critical engagement with the economic circuits within which art circulates might appear to be a particularly powerful aspect of this development. Given that blockchain-based applications continue to be deployed primarily as financial technologies, and given that the blockchain-based regulation of digital art markets is also the predominant context within which these technologies are introduced and offered to contemporary artists, again it appears that digital artists should be in a great position to engage these emerging technologies critically. And again, it strikes me that conceptual art can serve as an insightful precedent.

Significantly, conceptual art's dematerialization drive coincided with the emergence of artistic experiments that supplanted traditional art objects by descriptive placeholders in the form of contracts and other documents. The role of these documents can be well described in computational terms: they often took the form of text-based, quasi-algorithmic descriptions and instructions, and frequently represented enforceable, executable code (although this was frequently of a legal, rather than computational nature). As Lippard and Chandler have observed, an art work that follows this kind of structure 'is a medium rather than an end in itself,' and this 'becoming-medium' was widely taken to signal the rise of art-as-criticism, instead of art-as-art (again, see Lippard and Chandler, and Buchloh 1990). When this tendency is followed through to its logical conclusion, all that may be left is a contractual agreement that constitutes and authenticates an art work, and which simultaneously serves to control the work's value and dictates its use, consumption, and circulation. Or, to again

think this approach forward into a digital context, all that may be left of an art work are a few lines of code that regulate its creation, existence, and circulation. In contemporary terms of decentralized ledger technology, this sounds awfully similar to the possibilities afforded by blockchain-based smart contracts, and a first IRL example of such an art work might be the much-discussed *Plantoid*, or, likewise, *terra0*, the self-owning forest (see entries on both in this volume).

In conceptual art, examples of work that emphasizes its own circulation as its material are available in abundance – I will make brief reference to two. Among the most well-known is Seth Siegelaub's *Artist's Reserved Rights, Transfer and Sale Agreement* from 1971 [below].

While Siegelaub's contract functioned as an art work in its own right, it was also meant to be made available for use by other artists, and contained many provocative conditions highlighting the exploitation of artists at the hands of gallerists, dealers, and collectors. Institutional critique here became both object and subject of the work; intended

for exhibition, reproduction, commercial use, and legal purposes, the contract would theoretically undercut and challenge many of the clauses it contained, and in doing so make visible the problematic conditions of ownership and exchange within which this work (and others like it) exist. For another example, one might look to any one of Sol LeWitt's instruction-based wall murals, such as *Wall Drawing #260, All Combinations of Arcs from Corners and Sides*; *Straight, Not Straight and Broken Lines* (1976) [see below, installation view at The Museum of Modern Art].

Photo by Charlene Lam, 2009 (CC BY-NC 2.0)

Like the works cited above, LeWitt's murals likewise destabilize and reconceptualize the identity of the art work as unique creative expression, and in doing so provoke a rethinking of its unstable and highly complex conditions of existence as singularly authored creative expression, ownable and tradeable aesthetic object, and, by extension, valuable commodity.

Parallels between the methods of production, reproduction, and circulation of the kinds of conceptual art work invoked above, on the one hand, and art works linked to emerging decentralized ledger technologies, such as self-enforcing smart contracts, on the other hand, should be plainly obvious. It might seem that just like conceptual art in its conflicted relationship with socio-economic structures, digital art that exists on, is distributed through, and is controlled by the blockchain might offer rich grounds for powerful critiques of emerging FinTech systems.

This, however, is the critical juncture at which one of the dark sides of dematerialization emerges. Many of the artists and critics most centrally involved in shaping conceptual art in the ways described above became quickly disillusioned, as disenchantment with the critical potential of conceptual art grew alongside the art form's commercial success and commodification. As early as 1969, Lippard observed, 'hopes that "conceptual art" would be able to avoid the general commercialization… of modernism were for the most part unfounded' (in Alberro and Stimson, 1999, 294).

Many conceptual artists shared Lippard's disappointment, and seemed shocked by their own inability to anticipate the high stakes art market's tremendous capacity for assimilating art practices that had been designed to challenge commodification. As it turned out, conceptual art amplified and accelerated the capitalist tendencies of the art market and its institutions – precisely the tendencies that the movement had sought to problematize, even circumvent. Soon, dematerialized conceptual art appeared to be treated quite simply as a high-efficiency container for commercial value. An essay by Blake Stimson, gloomily titled *The Promise of Conceptual Art* (1999), collects a range of complaints by conceptual artists, which document the movement's critical failure to realize dematerialization as a subversive tool. In the present context, this commentary provides a useful, cautionary context for digital art's mounting interest in emerging financial technologies. Consider the following opinions offered by important representatives of the conceptual art movement: Robert Smithson observed that 'Because galleries and museums have been victims of 'cut-backs'… they need a cheaper product – objects are thus reduced to 'ideas,' and as a result we get 'Conceptual Art' (Stimson xliii). Michael Baldwin, co-founder of the influential conceptual art collective Art & Language (as well as of the group's journal *Art-Language*) agreed that 'The artist turned businessman and worse is one of the legacies of conceptual art' (*ibid.*, xlvi). This viewpoint culminates in a statement by Mel Ramsden, a key figure of radical conceptual art-making, mentioned in the title of this essay. Ramsden is both dismissive of conceptual art's critical potential, and insistent that it ended up conforming to – or even reinforcing – the institutions it sought to challenge. His verdict is as insightful as it is devastating: Conceptual art, he writes, is 'quaintly harmless (but essential) to the mode of operation of the market-structure…' (*ibid.*). It is difficult to imagine a formulation that would more sharply encapsulate an artist's frustration with the co-optation of their practice by an ideological apparatus which the practice was meant to oppose.

What the disappointment expressed by conceptual artists conveys above all is that their instrumentalization of the mechanisms, logic, and bureaucracies of capitalism had failed to subvert the system against which they sought to position themselves. The intended subversion was promptly converted into a commercial virtue (arguably, instruction-based, dematerialized art works can be archived, traded, etc., with unsurpassable ease and efficiency!), and was assimilated as a highly profitable market mechanism.

I leave it to the emerging community of artists working within the new rules-based infrastructures offered by the blockchain to consider what useful insights the disillusionment of Ramsden *et al* might hold for them. My sense is that art history may be about to repeat itself. Blockchain technologies, lauded as providing us with the ability to radically disrupt the inequities of the financial realm – including the art market – may instead continue, and again accelerate, the assimilation of art into the property-based circuits of late capitalism. First indications of this development can be observed, for example, in plans by large banks, including Santander and Deutsche Bank, to implement proprietary, internally controlled blockchain-based transaction systems (*e.g.*, O'Connell). In art contexts, similar developments are driven by commercially oriented services such as Ascribe, which, supported by digital art hubs like Rhizome, e-flux, or DIS Magazine (sometimes with disconcerting lack of criticality), are presumed to empower digital artists. The history of art's entanglements with capital and financial technologies, for example through intellectual property regimes, suggests otherwise.

As demonstrated by all of the participating artists in *New World Order*, the Furtherfield exhibition which this book follows on from subversive and critical blockchain-based art is certainly already being made. It is crucially important that this work continues outside of and against the profit-oriented offerings of assistance artists are currently receiving, for example in the form of proprietary, blockchain-based digital art markets. In many such offerings, digital art is assumed to be uncollectable and thus unsellable due to the inherent 'instability' of the digital substrate within which it is bound. Using the blockchain to 'restabilize' the digital art object as uniquely identifiable, or using smart contracts to regulate its circulation, may certainly turn out to be financially beneficial for artists. But it could also represent a *non-plus-ultra* of hyper-commodification, and continue the assimilation of art into commerce that so disappointed Smithson, Baldwin, Ramsden, and many of their conceptual art peers.

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Does Digital Culture Want to be Free? How Blockchains are Transforming the Economy of Cultural Goods

Cultural goods such as music, art or ideas are what economists refer to as 'non-rival', meaning that one person's use, enjoyment or consumption does not inhibit another's.[1] In addition, while the initial production costs of these cultural goods – making a film, a music record or a painting – are relatively high, the costs of reproducing and sharing the goods are relatively low. In an economy of cultural goods, techniques have to be employed to make these goods *artificially* scarce and to challenge their easy reproduction. These techniques include vertical integration (where one company controls many different stages of production), the development of copyright (legal approaches to exclude access to otherwise freely reproducible goods), and limiting access to the means of reproduction (by regulating the development of or access to technologies such as printing presses, photocopiers, copper plates and so on).

Digital technologies are a powerful challenge to artificial scarcity. Where every act of digital circulation is also an act of reproduction, my enjoyment of a GIF or an MP3 file doesn't inhibit someone else's. If it was prohibitive to steal a book or even to take the time to photocopy every page of it, cheap consumer electronics, and new techniques, from copy-and-paste to ripping a CD, make the reproduction of digital files relatively straightforward. The development of sophisticated codecs for audio and visual content makes it possible to compress large multimedia files, making storage and transmission of large files more straightforward. When coupled to high bandwidth networks, all of this makes it relatively easy to store and circulate content and offers a unique set of challenges to the cultural industries. Digital culture, we might say, wants to be free.

There have been attempts to mitigate the reproduction of digital artefacts. Cultural and creative industries work to create norms around online 'piracy' (such as the push in the UK to create a copyright education agenda for schoolchildren). Another approach sees those same industries lobbying governments to make copyright law and practice more extensive. However, for technical reasons it is often difficult (or prohibitively expensive) to identify copyright infringement

online or to seek recourse against individual infringers. Another proposal, then, involves developing new technical fixes to prevent the easy reproduction of digital files. 'Digital rights management', as it's called, includes the development of region specific codecs, rootkits, embedded watermarks, security codes and algorithmic copy protection to automatically circumvent the reproduction of digital files. These too have been largely unsuccessful, either because innovative users have found hacks and ways of working around the technical control or because the approaches taken – Amazon Kindle covertly deleting purchased books in 2009;[2] Sony Corporation installing root software on users' devices without their knowledge in 2005[3] – have been deemed too invasive by users and regulatory bodies alike.

Following on from these approaches, this chapter concerns itself with recent proposals to use the blockchain, the underlying database that records and verifies Bitcoin transactions, as a mechanism to secure, authenticate and commodify digital culture. While these proposals are still in the very early stages, I analyze patents and some fledgling companies to identify the key business propositions put forward and ask whether the blockchain will lead to stronger or weaker property rights for digital culture and in turn what this means for the future of cultural production.

Digital scarcity

The technical design of Bitcoin, by creating a truly digital currency, also produces the first form of digital scarcity using cryptographic proof. With any form of money comes the need to control supply and issuance. With hard currencies or commodity money, supply is linked to a scarce and valuable good such as a precious metal (as was the case with the gold standard prior to 1971). With fiat currencies this scarcity is artificially managed through the interstices of some central intermediary such as the Federal Reserve in the United States or the Central Bank in the European Union. A digital currency has to find other ways of managing scarcity where the 'token' in question is nothing but intangible bits of information. Where every act of circulation is also an act of reproduction the potential for double spending with digital money (*i.e.* duplicating a token and spending it twice) is a big concern. How do I know that somebody who has paid me with a virtual token has not also kept a copy for herself, rendering the exchange value my token worthless?

Bitcoin solves this 'double spend' problem with cryptographic proof. It uses a digital database (or ledger) called the blockchain to keep track of and verify all transactions so that tokens cannot be spent or transferred twice. Each transaction is verified, encoded in a block and added to a time-stamped chain of other such blocks of transactions. Copies of this ledger are distributed across all computers running the Bitcoin software so that no one individual or entity has control or can falsify the record. While the initial application was monetary, therefore, and focused on solving questions of supply and repartition of funds, Bitcoin also produces a networked infrastructure that prevents something digital – and therefore nominally reproducible – from being duplicated and circulated. *Bitcoin produces a form of artificial scarcity in the digital realm.*

Instead of a block encoding the transfer and possession of monetary tokens, a block might instead record and document the provenance of assets such as land, precious metals or indeed digital cultural goods such as music or images. This process is sometimes called smart property, and the software-based agreements about who owns and uses it are called smart contracts.[4]

Notions of ownership and authenticity would be delegated not to an artefact or a specific codec, but to a cryptographic hash that details its origins and transaction history. This cryptographic innovation marks a shift in the nature of authenticity in cultural goods from a scarce 'original' object, to code. Arguably, such an innovation also implies a shift from modern forms of property and the cultural economy built up around them to new property relations and economies of cultural goods.

New business models for digital culture

There are several proposed business models for the monetization of digital goods using the blockchain.

Limited editions

The blockchain database facilitates the development of limited editions of digital goods. Information about a particular digital file can be encoded in a cryptographic hash[5] and this allows these

'objects', as well as their provenance and ownership, to be recorded on the blockchain. Monegraph, a company founded and developed by Kevin McCoy in association with Rhizome, has employed this approach. While initially developed as a partly critical provocation into the political economy of digital art, Monegraph is now a well-articulated business model for the licensing of all kinds of digital images that might be sold to art collectors or licensed to media outlets.

Monegraph creates a user-friendly interface for specifying use rights on the Blockchain, allowing artists and photographers to license content for commercial and editorial use. The mission statement details a number of potential business models, including 'advertising and sponsorship, licensing, sales and subscriptions, or direct support from fans and collectors.' It's worth noting that Monegraph's system makes no attempt to control or curtail the circulation of digital art objects by controlling the ability to copy or reproduce these as with other forms of digital rights management (DRM), but instead makes it possible to authenticate a particular copy of a digital file – making one 'original' copy unique and therefore limited in relation to any replicas that can themselves be infinitely numerous.

Another company that specializes in the monetization of digital artefacts is Ascribe, whose whitepaper describes the development of 'an ownership layer for the Internet' using blockchain technologies. This approach combines the registration of authentic files – as in Monegraph – with machine learning and data analytics. This means Ascribe can register 'original' or 'authentic' files on the blockchain, and then use this registry of originals to track reproduction, identify copyright infringement, and seek retribution on behalf of the copyright holder. Alongside identifying copyright infringement, the registry also provides artists with new data about where and how their work spreads. Ascribe's business model comes from extracting a fee for providing these services to the artist.

Speaking at Moneylab in Amsterdam, founder and CEO of Ascribe Bruce Pon outlined the company's business model in three parts:

Ascribe is based on three different components: first a registry, second a way to secure legalities, and third a visibility tool. These work in providing a traceable history of the artworks for both the artist to follow their works' journey, and for buyers to understand where the works come from.[6]

Firstly, Ascribe consists of a global registry coupled with straightforward contracts that set out the kinds of rights and licenses associated with the digital artefact in a way that is clear for owners and for users looking to collect, use, or transfer the goods. Here the blockchain is used to 'securely record ownership transactions that are impossible to later repudiate or manipulate'.[7] Ascribe uses the distributed blockchain database and a unique cryptographic hash (ID) in order to associate details of ownership and authorship with a particular file.[8] Ascribe view the blockchain as a technology that allows them to overlay a new layer of ownership meta-data onto the existing network infrastructure.

Ascribe's 2014 patent describes a step-by-step process where the artist creates a new work and then she or her agent creates a new Bitcoin address, which is both the genesis address and a unique (public) identifier for the artwork.[9] They also create a private passcode, which is associated with this work. From this point, the artist or her representative is in possession of the passcode associated with the work. If the work is sold or transferred, a new hash with accompanying passcode becomes the public identifier of the work. The transfer of ownership from address to address can then be monitored and verified by consulting the blockchain, which is public.

Secondly, Ascribe make use of Internet wide searches, searching the web for copies of the recorded digital works (images, 3D designs etc.) and using machine learning to identify similar works, copies or works that infringe on those recorded in the global registry and reporting their existence and location to registered owners. In this way, Ascribe differs from Monegraph in that it aims not only to *authenticate* digital artefacts but also to eventually use the blockchain as a method for *identifying copyright infringement*. Both, in effect, create limited editions within the technically unlimited form of digital files.

Thirdly, artists and their business partners can use Ascribe as a 'visibility tool' that produces new data metrics about how their work circulates online and where and how it is spread. This includes details about how tracks are purchased and circulated that can be potentially valuable to artists, to marketers and advertisers.

New Payment Models

Along with stronger copyright, the blockchain can also be used to facilitate new payment models such as crowd funding, pay what you want, rental or micropayments. For example, a buyer might be able

to tip or pay a micropayment to an artist (similar to the experimental model used by Radiohead's album *In Rainbows* in 2008 which generated $3 million in revenue from 'pay what you want' payments from fans). A blockchain also allows for new divisions of stakeholders, where those who have contributed to any aspect of a digital work (such as the session musicians, song writers, mixing and mastering engineers, sound engineers, video artists, cover and graphic artists, of a band's single) can all be automatically remunerated by some pre-arranged percentage when a recording is sold. While this can occur with conventional contracts, such subdivisions can be automated with smart contracts. Furthermore, the legalities required to create such complex subdivisions and the associated costs are not an issue.

While there are a number of music platforms experimenting with blockchain payments for files and streaming,[10] a recent artwork by Okhaos illustrates both the copyright and remuneration possibilities of the blockchain well. *Plantoid* (profiled in this volume) is a self-propagating artwork that uses blockchain technology to reproduce itself within the market, acting as a piece that, once activated, also performs the functionalities of artist, art dealer and agent. For the creators, *Plantoid* is not an extension of DRM, but rather an open platform to facilitate new forms of patronage and remuneration for artists. Using a crowdfunding model, audience members and potential patrons donate Bitcoin to an artistic proposal for a material instantiation of the *Plantoid* artwork and when a particular financial threshold is reached, the funds are used to commission a selected artist. In this way, *Plantoid* makes use of a self-propagating micro-funding model to reproduce works of culture, funding the 'governance, production, exhibition and reception of *Plantoids* in a virtuous circle' in relationships more akin to the historic model of patronage than anything the ownership-sales framework.[11] According to Okhaos, the micro-tipping model used by *Plantoid* to keep a particular artwork funded illustrates the possibility for radical new business models for cultural goods in the future.

Proponents of this 'new kinds of payments' approach argue that as well as providing flexible payment and revenue models such as crowd-funding and micropayments, blockchain-based contracts facilitate more fine-grained licensing of content. These allow for ownership arrangements more diverse in scope than the traditional distribution of single items to single users in one direction from producer to consumer. Because some of the proposed smart contracts provide the opportunity to remunerate numerous actors who have contributed to a cultural good – some of whom are collaborators, some of whom

will be fans or investors – the argument is that aspects of the artwork that were previously external to the market can now be identified and compensated within the same structure. This makes the blockchain a powerful platform for free culture licensing. Such models have already been proposed in legal frameworks such as the Peer Production License and Copyfarleft but in the blockchain they have a fit-for-purpose legal infrastructure that is designed to automatically execute in the smart contract.

Data Monetization

A third business model focuses not on revenue from sales or crowdfunding but instead on monetizing data associated with blockchain-based transactions. Here the focus shifts from the sale of digital goods towards the monetization of data with respect to how fans or collectors engage with and use the content, how files circulate, what else users purchase and so on. This data can also be aggregated with other social media and network data concerning who fans are, what they purchase and what they say on social media. Being able to track user behaviours is a powerful monetary stream. So too, having data analytics about streaming and sharing of an artist's tracks or works over the Internet can offer indications about the overall worth of the artist outside of traditional monetary channels. Here data about the circulation of work and its overall popularity, likes and shares becomes a proxy for financial value and may in fact be more valuable than the cultural good itself.

Just as Ascribe provides a visibility tool for data analytics, a number of other companies also emphasize data visibility. In a heavily publicized move, a new startup Ujo (previously detailed under the name Mycelia), alongside artist Imogen Heap, has released the track 'Tiny Human' for sale on the Ethereum [12] blockchain. Ujo is an open-source rights database and payment infrastructure headed by Phil Barry, a consultant also responsible for Radiohead's recent digital sales strategies. Ujo's sale of 'Tiny Human' contains a number of features, some of which relate to the new payment and ownership models discussed above. First it is possible to purchase stems of the song, as well as individual parts of the final mix. Second the smart contract with details of ownership and compensation associated with the file, as well as the price for actions such as download, streaming and licensing, are visible for all to see. [13] Finally, a record of every transaction made is instantly captured, catalogued and available as a report for the artist to view, analyze and potentially use to gain insight

The platform facilitates fine-grained forms of payment and remuneration and new kinds of digital goods such as limited edition tracks. It also encourages other forms of collaboration and remix between fans and between Heap and other artists in ways that might have been difficult to legislate or negotiate under a legacy record label and copyright framework. Ujo's platform not only facilitates new payment models and forms of remuneration, however, it also points towards a possible shift in the monetization of culture from the sale and production of scarce goods towards artists instead financializing data associated with their use and circulation. In other words, artists can gain sponsorship or gigs and other forms of remuneration because social media and network data becomes a metric for the popularity of their brand beyond more straightforward figures like record sales. Or, alternatively, the data that they or the platform intermediary gather about their fans and how they interact with their products might be valuable for third parties.

Some criticisms

For some the blockchain presents the possibility to empower artists working in a digital space. By producing a decentralized platform where artists can theoretically license and distribute their work, and generate trust-free gathering of interested stakeholders intimate with the work, while also gaining direct insight into fan-base behaviour, blockchain technologies could imply a future free of intermediaries such as record companies, galleries, publishers, and legal support agencies. The argument is that a blockchain-based authentication and remuneration system will empower artists, allowing them to license their work and removing the constraints associated with the legacy copyright framework, cutting out middlemen that eat into the fees associated with the sale, distribution and copyright protection of creative content.

But there are a number of criticisms to this idealistic perspective.

The blockchain may not do away with intermediaries, all nibbling away at an artist's fees, so much as replace legacy industries with new blockchain platforms. Blockchains are being presented as a solution that empowers artists, but artists do not necessarily want to be embroiled in the technics of smart contracts; they don't want to be embroiled in the legalities of the sale and distribution of their works

unless they have to. Because these smart contracts are mediated and negotiated by platforms such as Ascribe, Monegraph and Ujo, new blockchain start-ups become new intermediaries rather than doing away with the intermediary altogether. This is particularly the case with the trend towards 'permissioned' blockchains (blockchains controlled and authenticated by privileged users rather than an open access network of peers) and the adoption of the technology by large industry players.

We can also argue that the development of smart contracts on the Blockchain, particularly those focused on the licensing and commodification of 'non-rival' goods, suggest not only more diverse kinds of legal arrangements such as creative commons type contracts but also stronger property rights over digital goods. Aside from new intermediaries taking a slice of the revenue pie, the proposal to make use of the Blockchain in the sale and licensing of digital content is often couched as a new and more extensive form of DRM. Certainly, Ascribe's proposal for 'an ownership layer for the Internet' seems to embody this sentiment, proposing a model that makes use of not only a platform for the development of self-executing contracts, but also the use of algorithmic tools and machine learning for identifying copyright infringement, and even exploring a bi-directional link structure that automatically vetoes unauthorized reproduction.

Furthermore, by proposing micro-monetization structures for cultural goods, blockchain developments also seem to suggest that all contributions to a cultural good *can* and *should* be readily identified, traced and remunerated. Aspects of cultural goods that were previously external to the economy would be drawn inside the market and artists would be fairly remunerated. But this view does not acknowledge the complexity of social production, appropriation, remix and collaboration involved in the making and circulation of cultural goods, particularly in digital spaces. Not only does this business model seem to contradict the open source and free distribution model developed by many digital artists, it also attempts to impose a quantified economic standard onto something that was previously organic, not measurable and socially produced. Much digital art convenes around irreverence for ownership and intellectual property. Indeed, digital works of art are often deliberately irreverent – featuring complicated referential mash-ups to art historical and digital culture.

A new ownership layer?

At any rate the claim that blockchain will implement a powerful form of DRM that actually works seems farfetched. Blockchain in its current inception is not an effective platform for DRM because, while it authenticates digital goods, until it is the sole or dominant foundation of a repository of works, no infrastructure exists to prevent the reproduction of digital artefacts outside of this system (on the Internet in other words). The blockchain model hinges on the creation of hashes for digital artefacts. In order to be an effective control of ownership these would have to be recorded on a blockchain that encompasses a collection of work (the catalogue of a record label for example, or more ambitiously an internet-wide repository of all digital files), and in turn this collection would have to be coupled to hardware that will only access the content that is owned or licensed for use by that hardware-owner. While this is theoretically possible, and companies like Ascribe have developed patents based around such an imagined model, it presumes a radical reorganization of the hyperlink structures underlying the Internet. [14] Also, it is unlikely that even the most extreme measures would prevent content from circulating outside of the remit of the blockchain infrastructure. While smart property systems might be used to secure a car or the door to an Airbnb apartment relatively effectively, there are still too many ways to reproduce and circulate digital content for it to be workable for digital culture at present.

It seems unlikely that DRM will be a viable business model for the blockchain. More significant are the ways in which this technology might be implemented to produce new forms of financialization from and around cultural circulation. Using a cryptographic hash function to ascribe ownership rights to a digital artefact and recording these on a digital database might be less a question of instantiating stronger property rights to aid in the sale of digital goods than one concerned with leveraging the untapped wealth of culture: data metrics surrounding the behaviour of its consumers and producers.

While the speculative developments on blockchain-based contracts are still too immature to make any sweeping claims about the future of property relations, we could speculate here that these proposed business models for cultural goods point towards a new kind of monetization of culture. Today it looks like business models may be structured less around exclusion through devices such as DRM or copyright and more about revenue streams that can be mined from making access and circulation more freely available. Platforms are interested in what kinds of value can be extracted through the monetization of data associated

with the use of digital content, and through financial speculation on the future use of this data and any analytic insights it may pose.

While it is too soon to say with the blockchain, other platform specific business models that monetize content not through copyright enforcement but through advertising or through collecting info about data usage,[15] also point in this direction. *Digital culture wants to be free in the world of blockchains*, not because the blockchain is a democratic tool that will abolish the exploitation of artists by big business, but because stronger property rights and legalities are no longer where the money is at.

Notes

1 Benkler, Yochai. *The wealth of networks: How social production transforms markets and freedom*. New Haven: Yale University Press, 2006, p. 36.

2 http://theguardian.com/technology/2009/jul/17/amazon-kindle-1984

3 http://schneier.com/blog/archives/2005/11/sonys_drm_rootk

4 Blockchains can run code. The scripting language associated with Bitcoin is relatively straightforward and supports the kinds of transactional arrangement necessary for transferring money to and from different accounts but not much more than that. The first blockchains performed a limited set of operations. Today a number of innovators have expanded the scripting languages associated with the Blockchain to support all kinds of transactions supported by Turing complete programming languages. Ethereum, for example, have extended the Bitcoin scripting language to handle not only monetary transactions but a fully articulated scripting language allowing anyone to write different applications and the rules to support them. This is primarily to be a platform for smart contract code. Smart contracts consist of code that is stored, verified and executed on the blockchain. They are used to record ownership rights and to facilitate their transfer between owners. As Josh Stark explains it:

Because these programs are run on a blockchain, they have unique characteristics compared to other types of software. First, the program itself is recorded *on* the blockchain, which gives it a blockchain's characteristic permanence and censorship resistance. Second, the program can *itself* control blockchain assets – *i.e.*, it can store and transfer amounts of cryptocurrency. Third, the program is executed *by* the blockchain, meaning it will always execute as written and no one can interfere with its operation. (http://coindesk.com/making-sense-smart-contracts)

5 McConaghy, Trent, and David Holtzman. 'Towards an Ownership Layer for the Internet.' Ascribe GMBH, Whitepaper, June 24, 2015.

6 'Bruce Pon. 'Blockchain: Revolution or Business as Usual?' *MoneyLab#2*, Institute of Network Cultures, Dec 2016 http://vimeo.com/148159485

7 McConaghy, Trent Lorne, and Maria McConaghy. 'Method to securely establish, affirm, and transfer ownership of artworks.' U.S. Patent Application 14/913,344, filed August 21, 2014.

8 When an artwork is registered on the blockchain via the platform, a unique bit hash is generated ensuring the origin of each bit can be traced. Those who receive the digital artwork will be able to prove that the copy is an original, by comparing a cryptographic hash of the picture with a correspondent one on the Bitcoin blockchain. If they match, people can be assured it is one of the limited edition proofs.

9 McConaghy, Trent Lorne, and Maria Mcconaghy. 'Method to securely establish, affirm, and transfer ownership of artworks.'

10 See for example the projects Muse and Bittunes.

11 Myers, Rob. 'Plantoid: the blockchain-based art that makes itself.' 28 October, 2015, http://furtherfield.org/features/reviews/plantoid-blockchain-based-art-makes-itself

12 Ethereum is a blockchain-based platform for developing smart contracts.

13 http://medium.com/hatching-amazing/part-1-how-my-ssn-prevented-me-from-buying-music-on-the-blockchain-and-why-blockchain-for-music-a85eaeaca7ad

14 Such as in Ted Nelson's Project Xanadu.

15 See for example YouTube's Content ID. Content ID is how YouTube monetises copyrighted content. Instead of simply removing videos that infringe copyright, Content ID gives the option of monetizing the content through advertising or through data analytics.

Aphantasia – Blockchain as Medium for Art

We propose blockchain as a handle for an art object, a *being@time*, which is in a state of aphantasia. The *being@time* is considered empty, a thought without content, a pure form (an impossible metaphor), while its condition as aphantasia is considered blind, an intuition without concept (another impossible metaphor). We are calling for an art which can be furthered given these implications since we feel we have come, in a sense, to an art and a mind at the end of its tether.

Artistic intent

Is it possible to use and abuse blockchain in a reversed / inverted / perverted / undermining way – artistically? Some interesting forms this could take would be *ephemeral / formless / immaterial*, a sibling of other art models outside traditional formats, like net art, (post-)conceptual art, performative, descriptive, land art, or others.

The *Aphantasia* project attempts to explore the blockchain from a more conceptual point of view. We want to explore if blockchain can be a medium for art. We emphasize 'medium', to distinguish it from projects where the blockchain is being used as a tool in relation to art, for instance to protect intellectual property. *Aphantasia* runs contrary to the approach taken in the area of intellectual property, which appears only to re-commodify art, serving solely the markets and its agents.

At the end of this text you will find a call for works that respond to the concept of *Aphantasia* and *being@time* (introduced later), leading to an exhibition exploring the different experimental forms the medium of the blockchain makes possible, and makes possible to transgress.

Let us begin with two tales of other older 'chains' – the mythological, unbreakable chain 'Gleipnir', and the obsolete signal device for trains containing a 'bat chain'.

Impossible metaphor

In Norse Mythology, *Gleipnir* (Old Norse 'the open') is the chain which binds the Fenris wolf. The Gods asked the dwarfs to forge a chain which was impossible to break. They used six impossible things: the sound of a cat's paws, a woman's beard, roots of a mountain, a bear's tendons, a fish's breath, and the spit of birds. Even if Gleipnir is as thin as silk it's stronger than a chain. The chain will hold until Ragnarok (the final apocalypse).

Blockchain puller

A chain with yellow lights
That glistens like oil beads
On its slick smooth trunk
That trails behind on tracks, and thumps
A wing hangs limp and retrieves…

Bulbs shoot from its snoot
And vanish into darkness
It whistles like a root snatched from dry earth…

This train with grey tubes that houses people's thoughts,
Their very remains and belongings… in faulty circles,

Caught in grey blisters
With twinkling lights and green sashes
Pulled by rubber dolphins with gold yawning mouths
That blister and break in agony
In zones of rust
They guild gold sawdust into dust.

– Extracts from Captain Beefheart, *Bat Chain Puller* (1976)

A bat chain refers to the chain that hangs down from a signal post on a train line. The signal device that was pulled down was called a bat and different bats had different colours to signal the train driver the condition of the track ahead, or whether the train could proceed, etc. The bat chain puller was the person who set the signals for the approaching train according to track status reports received by telegraph. The lines: **'This train with grey tubes that houses people's thoughts, /Their very remains and belongings…'** contain a poetic image of

what the blockchain technology seems to promise people; and for our purposes, that it would hold both thoughts and things, even if they should be both empty and invisible. The text *Bat Chain Puller* can also be interpreted as referring to the fact that this job is obsolete in an automated world. In *Aphantasia* a 'blockchain puller' is metaphorically reintroduced as a playful, intervening layer and middle-man between the brave new world of blockchain technology and the 'obsolete' world of human-mediated signs, symbols and meaning.

Art medium?

The format of the blockchain is a timestamp and a hash-reference of the content, *i.e.* a kind of *being@time* formulation. Everything registered on the blockchain can be easily verified / confirmed by anybody. To 'confirm existence' seems important for our use, as documentation, witness, a quality of being 'written in stone', that contrasts or combats the given immateriality of late / postmodern art.

In what sense could art be made on or of the blockchain? Since the blockchain format is this minimal *being@time* formulation then one could suppose a corresponding expressive potential gets maximized. The properties of the art work (what it is) is detached from its objective status as a being in time (which is taken care of by blockchain). And perhaps also the *being@time* formulation partially detaches art from existence. Existence becomes a category, a pure concept of understanding, akin to Kant's philosophy. Such a category is not a classificatory division, as the word is commonly used, but is instead the condition of the (epistemic) possibility of objects in general – that is, any and all objects, not specific objects in particular. Whereby, if our system of abstraction includes 'existence' as a possible and provable property or category of objects, then 'existence' isn't essential to them. In other words, a *being@time* type of object makes existence a non-essential property since existence is already part of its formulation. Or again, an existential medium detaches its produce from existence, as for instance life. As living beings, we can be said to not be attached to existence, and if we think we are then we are wrong since death will disprove us – existence is just a condition of the possibility of living beings in general, not of specific lives in particular.

It might be seen as old-fashionable nonsense to bring quantum mechanics into the argument, but as far as we (don't) understand it, existence appears to be just a condition of a statistical possibility in general, not of specific quantum-real entities in 'superposition' (neither particles

nor waves). As far as a Copenhagen interpretation of this goes, there's no sense in discussing what the quantum entity in superposition is in reality, as existence, except than describing its behaviour in mathematical form – the Schrödinger equation of the wavefunction. In a similar, metaphorical way, we're disengaging existence from the formalism of *being@time*, seeing it as merely a condition of possibility of art objects in general, not of specific art objects in particular. We believe blockchain makes this possible, as an agent for provability, behaving similar to a quantum measurement leap, forcing a particular existence to appear, based on the experimental-contextual setup of the *being@time*.

Such an existential or quantum approach touches on fundamental questions about what art is. One could say with this that art is not even immaterial: if conceptual art detached the material object from art, we are considering a type of post / non-conceptual art detached from the concept also. But even under these conditions, we are usually left with something tangible and documentable, attestable, and experienced. Art theorist Peter Osborne makes a point that post-conceptual art isn't a special type of art but rather a 'historical-ontological' condition of contemporary art in general.[1]

Could this approach be an opportunity to reconsider phenomenology, in particular Husserl and Heidegger, as a way to understand art and art experience? There's a fundamental uncertainty about what this *being@time* object is or refers to. We could liken it to a phenomenological cloud of unknowing[2] where a method of *epoche* (suspended – to put in parenthesis) could reveal to us how the object constitutes itself: to hold back judgement, a procedure where we refrain from judging whether something exists, or can exist, as a first step in recognizing, understanding, and describing appearances. To put in parenthesis allows us to put aside questions about the existence of art in addition to all other questions about the art object's physical or *objective* nature. *being@time* as a form of blockchain art detaches object and existence from art and leaves it for us as 'meant and experienced' according to one's subjective or contextual intentions and intentionality.

In addition to seeing *Aphantasia* in relation to a form of conceptual art, the project is thus related to phenomenology and its objects of thought or intentional *objects from acts of consciousness* (noemata). Another meaning of noemata is as a rhetorical figure of an obscure statement which nevertheless is meant to be understood and elaborated. *Aphantasia* considers art as a condition of a possible intentional object of consciousness in general, including the technological simulacrum / fiction of our medium.

Against the backdrop of blockchain technology we might perceive the simulacrum and fictionalizing elements as extensions of a proof-of-work system, or another form of client puzzle protocol – that the work/object requires some imagination and fantasy on the client side, a threshold which might be common for all arts, and which has as a consequence that the world isn't inundated by it. Not that art should be elitist, but rather to keep it a cold medium, in McLuhan's sense – one of *low-definition*.[3] These forms of media possess very little information and consequently require from the audience a higher degree of participation and imagination. We have to engage to receive back, or as John Cage stated in relation to Robert Rauschenberg's assemblage art: 'As the lady said, "Well, if it isn't art, then I like it."'[4] (Where art becomes a 'hot' medium, overheated and untouchable, just by naming something 'art').

Synergy? Gimmick?

There is a given 'thing', verifiable. We could call it fact, the state of things, truth, and other terms. Put into system, as register/catalogue? A work referred to in the unbreakable chain as *being@time*, written in stone, a fact…

Imagine the conceptual artist On Kawara using blockchain as medium, writing 'I am still alive. On Kawara, 5.8.2017'. This makes it clear that there is no necessary relation between form and content in the blockchain record (On Kawara died in 2014). The blockchain doesn't verify the semantic content of the record, only its form. The relation between form and content remains 'synaptic' – without a fixed connection, and is better utilized as a creative gap rather than to impose any authenticity. The relation is on the contrary, inverse: imposing authenticity will increase the degree of fictionalization, dissimulation, and exploitation. So it seems the 'blockchain puller' intervenes 'in faulty circles' in whichever way we deal with it.

A lot of conceptual art can only be known through the documentation which itself isn't the art. Land artist Robert Smithson divided his work into 'site' and 'non-site' as a sort of solution to the fictionalization of art via documentation. The integrity implemented in the blockchain format ensures a trustless documentation, in both paradoxical meanings of the word: a documentation which is independent of trusted sources (other than the blockchain); and secondly, trustless in the sense of not worthy of trust; faithless; unreliable; false.

'Your work isn't a high stakes, nail-biting professional challenge. It's a form of play. Lighten up and have fun with it.' – *Sol LeWitt*[5]

On the other side, conceptual art and precarity could be worth a sociological study.

'I too, wondered whether I could not sell something and succeed in life. For some time I had been no good at anything. I am forty years old… Finally the idea of inventing something insincere finally crossed my mind and I set to work straightaway.'

– *Marcel Broodthaers*[6]

'From "appearance" to "conception"' – *Joseph Kosuth*[7]

The blockchain register has a relevance as a catalogue. In addition to built-in functionality for provenance/conception and transactions. Experimentally one could use all these properties and find ways that the technology could be redefined rather as a simulacrum for human consciousness (whatever this is).

'Art is art' – *Ad Reinhardt*[8]

'Let's roll!'[9]

Aphantasia

'To my astonishment, I found that the great majority protested that mental imagery was unknown to them.' – *Francis Galton, 1880*[10]

'When he thinks about a face, it comes to him as an idea, as an intellectual concept, rather than a mental picture. This has prompted scientists to re-examine an experience that we so often take for granted – our imagination. He thought it was a joke, so he checked with his four-year old daughter. I asked her whether she could picture an apple in her mind, she said "yeah, it's green"… I was shocked.' – *Helen Thomson*[11]

Aphantasia is the intentional art object *being@time* in the blockchain medium. It's an invisible thing in the sense that it doesn't mirror itself – its *being@time* is detached from any 'objective' properties – and a blind thing in the sense that without such representation it doesn't hold or show any belief of what it is.

This doesn't prevent the thing from existing, on the contrary, to the extent it puts itself in parenthesis it becomes an object to the perceiver, us, even as an impossible belief/metaphor – as in object, to throw or put before, oppose – as if it throws itself out of what it is – a contradiction.

The relation between *Aphantasia* and *being@time* is exemplified using the blockchain's own method that cryptographically proves the existence of an object without producing the object. Paul Virilio makes a similar distinction between provability and existence in relation to Gödel's theorem, [12] though he doesn't seem to get it entirely right. [13] However, if understood with a certain poetical license we might make sense of the relation, as Gödel's two incompleteness theorems stated in the language of mathematical logic, expresses that **1) in any formal, consistent system there will be true statements that are unprovable within the system**; and **2) a system cannot prove its own consistency**. So still with a metaphorical license, we say that Aphantasia represents these blind, unprovable truths within a system – they exist without being producible, even via imagination – being outside it, being not even imaginary, stating the impossibility of imagination, of metaphor. On the other hand, the *being@time* is cryptographically provable within the system. As stated earlier, if proven existence is a property of an object in the blockchain, then existence isn't essential to it; existence becomes non-essential since it's already part of its formulation; an existential medium like blockchain detaches its produce from existence.

In other words, we say that *Aphantasia* is blind, while *being@time* is empty, and so restating with Kant 'thoughts without content are empty, intuitions without concepts are blind.' [14]

To summarize, what is meant by *Aphantasia* is:

A notion of art where a *being@time*-formulation on the blockchain provides the basic handle, and which at the same time serves as verifiable documentation.

This *being@time* as medium or format is a highly abstract entity, in that it is without 'mental imagery', it is cryptographic, it is not even conceptual; and since conceptual art often relies on mental imagery to complete itself, the *being@time* medium could rather be considered a type of (post-)(non/anti-) conceptual art. It is certainly structured by information, but in an *aphantastic* way – it is 'invisible and blind' as a medium.

Since it cannot exist without being documented, parts of the troubled aspect of conceptual art finds a solution. Still, the 'synaptic' reference (hash) cannot be bridged, it remains coded, requiring an 'act of consciousness' (a noetic simulacrum).

The combination of an existence detached from properties (including 'existence' as property) and a paradoxical/dissimulated relation to imagery and metaphors makes it a critical field for an exploration of what is art, and what it possibly can be when we leave the spectacle, objects, concepts, and imagination aside, or at least disengage from them.

Stated short and sweet; blockchain's *being@time* provides a handle to an art object. This object is provable but disentangled from existence and concepts. It can be likened to an empty thought, a blind intuition – an impossible metaphor. In a sense we've come to the end of the rope, a 'mind at the end of its tether',[15] as the content of art has been emptied to a *being@time*, its concepts blinded to a state of *aphantasia*.

We are looking for solutions in how art can be furthered given these implications of blockchain as a medium.

Open call for works

Theme/material

Our current material is experimental research about art and object/ state/experience. Even if blockchain is a digital technology made possible by the internet and decentralized networks it does not mean an artistic production in the blockchain medium should be limited to digital materialities. The project rather looks at how blockchain art could melt down a form/content-paradigm and create new states of formlessness. Material is a theme, and theme is material. The method is 'epoche' (bracketing) and a productive unknowing.

Exhibition

The dissemination is two-part. Blockchain functions as a catalogue which partly is the art itself and partly the documentation of it. The creative doubt is implied in conceptual art and could be said to be further developed here. The other part is what the records in the catalogue

refers to, the content (traditionally seen). There doesn't seem to be any reason to delineate the content genre-wise, it's rather a play with contexts and understanding of what art is.

Robert Smithson's distinction between 'site' and 'non-site' can be useful. Call the catalogue-part of the blockchain 'non-site' and the intended object (content / *being@time*) 'site'. Non-site is an abstraction and (impossible) metaphor for site. The two terms are used here in a sense that is similar to the relation between blockchain and formlessness. The division leads to an exhibition which is both online and offline (a similar pair of terms). Specifically the project leads to an exhibition of an online catalogue of blockchain art, and which can refer to offline content (directly or metaphorically), which again is made available to the degree the material allows it.

We are looking for works that challenge notions about art, either through formal, philosophical, conceptual means, or through material, media, application. We are particularly interested in exploring how new forms of expression can emerge from pondering the properties of the blockchain. An art bordering onto the impossible, the invisible and blind, the limits of mental imagery and cognition, played out in the gap between form and formlessness, code and consciousness, technology and fiction. A metaphor for the unbreakable chain made up from impossible things – a *trustless existence*, in both meanings.

Please send proposals to: aphantasia@noemata.net
More info: http://noemata.net/aphantasia

The project is open-ended and doesn't operate with a formal deadline. Reflecting on the blockchain as an unbreakable chain, something that likens it to our notion of time or as a stream of consciousness – two other types of trustless chains in two meanings – it seems only natural to leave it open-ended since any closure is done by the chain itself. Imagine what closing the stream of consciousness would mean… we couldn't imagine it. In trying to formulate an art as trustless existence, independent from, devoid, or beyond imagination (as a mirror of trusted and known appearance), the project is also realized as an unbreakable chain without closure.

Notes

1   Peter Osborne. *Anywhere Or Not At All: Philosophy of Contemporary Art*. London: Verso Books, 2013, pp. 3 & 51.

2   Cunningham, Candler (Ed.). *Veritas – Transcendence and Phenomenology*. CSM Press, 2007, p. 339. See also: *The Cloud of Unknowing (The Cloude of Unknowyng)* an anonymous work of Christian mysticism written in Middle English in the latter half of the 14th century.

3   McLuhan, Marshall. *Understanding Media*. New York: McGraw-Hill, 1964, p. 22.

4   Milman, Estera. Pop, *Junk Culture, Assemblage, and the New Vulgarians*, 2004. http://text.no-art.info/en/milman_pop.pdf

5   Marzona, Daniel. *Conceptual Art*. Cologne: Taschen, 2006, p. 21.

6   Compton, Michael. *Marcel Broodthaers*. London: Tate Publishing, 1980, p. 13.

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9   Van der Weyden (Bernard Pruvost). *Li'l Quinquin*. BluRay. Directed by Bruno Dumont. 2014.

10   Galton, Francis (19 July 1880). 'Statistics of Mental Imagery.' *Mind*, 5, pp. 301–318. http://psychclassics.yorku.ca/galton/imagery

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12   Virilio, Paul. *The Lost Dimension*. New York: Semiotext(e), 1991, p. 66.

13   Sokal, Alan and Jean Bricmont. *Fashionable Nonsense*. London: Picador, 1998, p. 174.

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Interview with Holly Herndon & Mat Dryhurst

Photo by Suzy Poling

Marc Garrett   One of many interesting and experimental things about the album *Platform*, released with Holly Herndon in 2015, is the decision to break away from the perspective of singular genius, and involve a variety of collaborators. This included artist Spencer Longo, Claire Tolan (of Tactical Tech), and Dutch design studio Metahaven. On the 4AD press release page it says that it 'underscores the need for new fantasies and strategic collective action.' Under the name of Holly Herndon, along with Holly, you all became a kind of cooperative, collective construction. What inspired you and Holly to explore what could be seen as a decentralized body, or assemblage of individuals as a collective? Or how would you describe your working identity and the importance of this move?

Mat Dryhurst   To put it in pretty boring terms, it has become a core part of our mission to be pretty candid about what we do. Holly had been making albums and touring by herself, and then during the early experiments that later became *Platform* (*Chorus* and *Home*) we had begun working together, as we were occupying this tiny apartment in San Francisco, and I was working on this weird net concrete stuff in one room, and Holly was writing for voice in the other, and I think both of us picked up from the ambient sound that the two worked really well

together! For the *Chorus* video we had seen the work of the Japanese artist Akihiko Taniguchi, and really enjoyed the collaborative process of putting that video together, and so then sought out Metahaven, who we'd been in touch with for some time out of aligned interests. Basically most art production at a certain high level is collaborative, and I think it's just part of our idealistic view on the world that this be transparent and celebrated. Beyond that, when we were coming up with the vision for *Platform* it also felt very necessary as a political gesture to make a point of the project being aligned with certain political interests, and a politicized way of working and acknowledging others. Working this way has changed my life, and made everything more fun and exciting without diminishing the importance of any individual contributions. It makes for better results, I feel, better general feeling, and also creates these very tangible collaborative connections between fields. It's also just an interesting experiment to run in music when it feels like so many sonic experiments have been done to death – I'm personally interested in how decentralized practices, collaboration and connectivity, can change the construction and dissemination of music, and ultimately it's power to be a force in the world.

Holly Herndon   It sometimes feels like our society is 'every person for themselves'. We promote hyper-individualism at the cost of the planet and social health, and the music industry largely parrots this mentality. We realized how problematic this is, and if we are going to be true to ourselves, then the practice should reflect that concern. It's been a learning curve for me; learning to not control every single aspect (I tend to micromanage), to hear other opinions, to let go, and not feel threatened if someone else's idea is better than my own. Releasing my debut album solo was an important step in building my confidence, however ultimately the work itself is the most important, and not the ego. Not to mention that we spend a lot of time on computers, which can be lonely, so working with other people helps us to unplug and see the world around us a little more.

MG   In a world that traditionally, economically and politically, supports the values of individuality above community, or peer to peer collaboration. How did the audience, the music industry, and others in the world (presuming they have) come to terms with this adventurous, creative intention?

HH   It was varied, but overwhelmingly positive. When we were doing press around the record, it was difficult to get some journalists to write about the other artists and thinkers that I was collaborating with, or even just referencing. Those that understood the gesture

really embraced the idea, and that successfully provided a platform to highlight everyone's work.

There are a few industry complications; for example, the project is released under my birth name, so in some ways I still at the centre of the orbit, which is a problematic professional necessity, but also helps somehow. We used the idea of the Trojan Horse a lot, as in a way my easily understood singular presence served as a gateway into this whole other universe of people. It's a balancing act, as in various different scenarios you feel different expectations as to what the industry wants; on a pop level they want a simple narrative of my face, and tend to focus on often mundane characteristics such as my gender and education. On other levels you see that the experiment has opened up a different narrative potential, where people's interest in the record and it's cast forks off into the direction of their choosing.

It's really noticeable live, where the audiences have been really supportive. After the shows you experience all kinds of people who come along, hanging out with different people who were on stage – Mat has his own audience somehow, and the same with Colin Self, who often tours with us. As a result of opening up the process and allowing the full breadth of interests and approaches to shine through a little more than is standard, at different shows we have people come up to talk to us about the music, or nerd out about cryptocurrencies and ICO's, or Chelsea Manning. It feels meaningful, and gratifying for that. We always address the location of the show, whether through the visual or sound, and try to always be alert and responsive. It's a special privilege to share that time with people, and I think that the concept comes across quite effectively in a live situation as each individual serves a very different purpose in constructing the collective experience.

MD   I think that *Platform* was received really well. Holly opening up her practice didn't diminish her signature on the artworks, and I think that it has really won a lot of people over. I think you can feel at our shows that we have a greater principle to what we do, and I think it has maybe made a lot of space for people to conceive of their own experiments and maybe not be concerned at how being ambitious on a conceptual level will affect the ability for the art to travel in the world. Naturally there is also a throttling effect within aspects of the creative industry, where maybe they didn't want to deal with the bigger ideas around the record, however I feel that the music is strong enough to kind of live in those circles without knowing the story behind it. Overall I think people were refreshed and encouraged by the idea, and transparency of the whole thing. For us now it is a way of being. In my mind, there is more room

for individuality to shine when you can guarantee that someone's work and ideas will be respected and celebrated. The canon of artistic history has omitted so many people's ideas and contributions for the purpose of having a simpler market narrative, and yet we live in a time when people can and want to dig deeper, and perhaps have a greater capacity for complexity of information – so we want to try and harness that for something positive. Particularly given our interests in subcultural music history, software, crypto etc. there is really no other option but to put the community first. Without community literally none of this exists. Zero. All of our talents and ideas have been incubated in community environments, so channelling that legacy is important.

MG   On *Platform* you released the track called DAO. I am always interested in shifts between the use of technologies as metaphor and as tools that change practice. So, what was interesting to you about Decentralized Autonomous Organizations (DAOs)?

MD   I'll let Holly talk more about where DAO came from, with the telematic performance work she was doing at Stanford. Regarding the blockchain, I've been developing my own decentralized publishing framework for the past few years, that shares a lot of the same principles as the *Ethereum* logic, and I'm looking to have it interact with the blockchain in its next iteration. A lot of the spirit behind the crypto community is so synonymous with the models of collectivity we have already been exploring in our work that it's the logical next step. I'm particularly interested in what this architectural / infrastructural new capacity can mean for the medium of music itself. With *Saga* you have this whole other performative dimension added to media with the ability to version work, fork it, and have it perform in real time to it's surroundings online, which I think is a whole other proposition for the medium very much worth exploring. It's also fascinating regarding the question of attribution and collaboration, as we have grown to understand that the web as it stands currently is very much designed to privilege those who appropriate and curate others creative work and ideas for free – mirroring greater society, it is a winner takes all environment. I want systems of virtuous attribution that do not consolidate the DRM era of copyright takedowns, but instead build markets and new interactions around collaboration, augmentation and live interaction. There is so much more that could be done, and a lot of the blockchain tech emerging offers clues as to how we can get there quickly. There are also a lot of old ideas masquerading as something shiny and new, so you kind of have to read the small print to distinguish what is a genuinely new proposition, but it is our job as members of marginal communities to educate ourselves and anticipate the best options.

HH   DAO came out of a piece that I wrote called *Crossing the Interface*, with a libretto by Reza Negarestani. The piece was my first venture into telematic performance, where a soprano (Amanda DeBoer) was in another geographic location, but the audience could hear her physical body moving throughout the space using ambisonics. I wanted her to be hyper present, and physically super human, moving in ways impossible to a human body, to be able to be in multiple places in the room at once, as eventually her voice and her body separate, stalking the room. I was trying to find a way to make something so clearly highly mediated, feel extremely personal and embodied at the same time, which seems appropriate for the DAO concept as it exists in the world – this simultaneously complex and distributed network that is also hyper intimate and moves with collective intent.

The vocal work that Amanda delivered while workshopping that performance was really great, so I used some of those outtakes for the vocal work in DAO. With the instrumental I was simply just trying to capture an atmosphere, a heavy energy with lots of wide stereo movement. It's also really fun to play live with Colin, because he sings the soprano line with live processing, which creates a nice contrast of heavy electronics with extremely expressive alien vocals, taking the entire gender spectrum and contorting it into a circle.

MG   Do you have any plans to formalize any part of your creative collaboration to work on the blockchain?

MD   Holly and I are starting a studio after we finish this next album to more formally develop work and devices that exist in this new frontier, as it has been so instrumental in our discussions for the past few years. I describe it as a frontier deliberately, as if we are to task ourselves with actually experimenting with our work then it feels almost like a duty to get our hands dirty in these areas. We have already started work on two new projects in this domain, but it's hard to tell when they will be ready to show to people, and what shape they will eventually take.

MG   OK. Last question, in light of the current suppression of the spirit of humanity by despots, and the rich buying up democracy for their own ends, what part do you see artists playing in the world of blockchain, to disrupt the regurgitation of an already bankrupt system?

MD   IMHO, there are two dimensions to this. First, I encourage artists to become familiar with the language and potential of blockchain technology, as there are a lot of opportunities to attempt to re-engineer

how we experience, transact and grow community in the arts outside of centralized traditional channels. Real money is being made, and there is a lot of good will amongst the crypto community who invest faith that better systems can and will be constructed using these logics.

I also encourage artists to develop some fluency around the blockchain ecosystem, for exactly the reason that there needs to be wary and critical voices guarding the community from the business-as-usual corporate crowd, who are increasingly flexing their muscles and influencing the course of its development and maturity. By getting involved early, and being vocal, there is an opportunity to intercept plans for how this next internet runs, and who ultimately it will benefit.

The best case scenario is that we can develop our own systems along the blockchain to change music and the arts for the better. Alternately, we need critical voices active within these conversations to avert the worst case scenario of power consolidating itself even further outside of the greater public awareness.

I should say that the third wild card possibility is that blockchain technology is inherently flawed and infeasible once it has been properly stress tested at scale. Irrespective, if your mandate is to be experimenting, and abreast of where things may be going, there are fewer areas of interest more dynamic and potentially transformative. It's a lot of fun to think about.

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Brussels (2016); Serpentine Galleries, London (2015); MoMA PS1, New York (2015) and Portikus, Frankfurt (2014). Selected group shows include: Unfinished Conversations, The Museum of Modern Art, New York (2017); The 9th Berlin Biennale (2016); Hack Space, K11 Art Foundation, Hong Kong (2016) and Political Populism, Kunsthalle Wien, Vienna (2015). Denny represented New Zealand at the 56th Venice Biennale (2015).

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Max Dovey can be described as 28.3% man, 14.1% artist and 8.4% successful. He is also an artist, researcher and lecturer specialising in the politics of data and algorithmic governance. He is an affiliated researcher at the Institute of Network Cultures and writes for Open Democracy, Imperica & Furtherfield. His work has been performed at Ars Electronica Festival, Art Rotterdam & many U.K based music festivals. http://maxdovey.com

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Mat Dryhurst is an artist and collaborates on audiovisual projects with his partner (and RVNG Intl-signed producer/composer/vocalist) Holly Herndon under the name Kairo, and last year started a graduate program at UCLA. He has lived in Salwa, London, Berlin, LA and Oakland – where he has been since 2008.

Primavera De Filippi is a Permanent Researcher at the National Center of Scientific Research (CNRS) in Paris, a Faculty Associate at the Berkman-Klein Center for Internet & Society at Harvard

University, and a Visiting Fellow at the Robert Schuman Centre for Advanced Studies at the European University Institute.
http://cyber.harvard.edu/people/pdefilippi,
http://okhaos.com/plantoids

Marc Garrett is an artist, writer, activist and curator. Co founder and co-director with artist Ruth Catlow of the Internet arts collective Furtherfield, online since 1996, and in since 2004 the Furtherfield Gallery and Lab in London (Finsbury Park), UK. Co-curating various contemporary Media Arts exhibitions, publications, projects nationally and internationally.

Pete Gomes is a London based artist and filmmaker who makes transdisciplinary work using moving image. His doctoral research is developing a system for improvising cinema, using improvisation and ensemble practices across performance and production in the development of narrative films. http://petegomes.net

Elias Haase is one of the founders of blockchain education provider B9lab. He is based in London and Catalunya where he works on non-aligned technology for local power and keeps bees. http://b9lab.com

Juhee Hahm speculates through drawings, she designs experience through stories, as a result of societal researches. She materializes the reactions between the interactions of humanity in an empathic and playful manner. She believes that the real issue is hidden underneath the surface, therefore, she connects diverse scale and subjects together.
http://juheehahm.com

Max Hampshire is a researcher living and working in Amsterdam. He holds an MA in Philosophy from the University of Amsterdam, and recently spent time researching at the Institute of Network Cultures. His research involves unraveling the politics of cryptographically-enabled platforms and the poietic nature of autonomous technologies.
http://cargocollective.com/interspersed-wjth, http://terra0.org

Kimberley ter Heerdt and **Nikki Loef** are both students at the ArtEZ University of the Arts in Arnhem, the Netherlands. Their shared interests in exploring the possible functionality, specification and ownership of smart-contracts brought them together and resulted in their speculative short film documented in the book.
http://kimberleyterheerdt.com, http://nikkiloef.com

Holly Herndon is an American composer, musician, and sound artist based in San Francisco, California. She is currently a doctoral student at Stanford University studying composition. Her work is primarily computer-based and often uses the visual programming language Max/MSP to create custom instruments and vocal processes. She has released music on the labels RVNG Intl. and 4AD. Her most recent full-length album Platform was released on May 19, 2015.

Nathan Jones is an artist and researcher based in Liverpool, UK. He writes and collaborates frequently on intersections of poetry and new media. He is PhD student at Royal Holloway University of London, and teaches art/writing at Liverpool School of Art and Design. He is also co-founder of Torque Editions, and the new media performance agency Mercy. His posthuman play The Happy Jug is forthcoming from Entr'acte as audio CD and illustrated book. http://alittlenathan.co.uk

Helen Kaplinsky is a curator and writer based at Res., gallery and workspace in Deptford, London. Her projects consider collections and archives in the age of digital sharing. In recent years she has contributed to programmes at Whitechapel Gallery, South London Gallery, Glasgow International Festival, ICA (London), The Photographers Gallery (London) FACT (Liverpool) and Tate (Britain and Modern). http://beingres.org

Paul Kolling is an artist and designer currently living in Berlin. He studied at the University of the Arts Berlin and works at the intersection of design research, media art and industrial design. His projects strives to explore the interaction between (new) materials, objects and new technologies. http://paulkolling.de, http://terra0.org

Elli Kuruş is a Leipzig-based collective artist, 44% complete. Her practice spans artistic and curatorial approaches that converge into installations, videos, drawings and lecture performances. Investigating the agency of the things around her, she critically examines the development of media and technology, reading the present as material history. http://ellikurush.com

Bjørn Magnhildøen has been involved with network cultures since the 80s. He is interested in procedural, virtual, unstable technology, border areas and negations, the formless, abject and precarious. He runs Noemata, a production site for digital and netbased art, affiliated with PNEK (production network for electronic art in Norway). http://noemata.net

Rob Myers is an artist, hacker and writer from the UK now based in Vancouver, Canada. He's just trying to make sense of an increasingly technologically mediated world. http://robmyers.org, http://keybase.org/robmyers

Martin Nadal is an artist/developer based in Linz and studying the Interface Cultures program at KunstUni. In the past years he has collaborated in a variety of projects and taught some workshops related to art and technology. He is also interested in illustration and cinematography. His works have been shown at Medialab Prado (es), Ars Electronica (at), AMRO Festival (at), Settimana della Scienza (it), ZKM(de), ADAF(gr), NODE(de). http://spectrum.muimota.net

Rachel O'Dwyer is a research fellow in CONNECT, Trinity College Dublin. Her research focuses on the politics of new markets emerging in fintech. She is the curator of the festival and conference http://openhere.data.ie. Writing and talks can be found at http://tcd.academia.edu/RachelODwyer

Edward Picot lives in Kent and works for the NHS as a Practice Manager. His criticism and creative work have appeared in PN Review, TrAce, Furtherfield, HZ, and The London-Worldwide Comedy Short Film Festival amongst others. He started Dr Hairy, a series of comedy-videos about an NHS doctor, in 2010.

PWR is a studio for Research, Design and Development run by Hanna Nilsson and Rasmus Svensson. PWR is occupied with practical and speculative investigations into present and future communication systems. Additionally, PWR is a service provider in the areas of digital development, interface design and image manipulation. PWR are recent fellows at Jan van Eyck Academie and V2 – Institute for Unstable Media in Rotterdam. PWR have lectured at Rhizome & New Museum New York, ArtEZ Arnhem, Jan van Eyck Academie, HDK Gothenburg, Impakt festival Utrecht et al. Their work have been featured at Guggenheim New York, V2 Rotterdam, Futura Prague, Kunsthaus Rhenania Köln, MOMA New York amongst other places. http://pwr.site

Paul Seidler is an artist/interaction designer living and working in Berlin. Since 2013 he studied at the University of Arts in the class of Prof. Joachim Sauter. During his studies, he worked in various research facilities, including the Design Research Lab and the Hybrid Plattform. http://plsdlr.net, http://terra0.org

Sam Skinner is an artist and curator. Current projects include: Torque Editions; co-curation of The New Observatory at FACT, Liverpool; research associate on the Ethics of Coding and the Human Algorithmic Condition project at Kingston School of Art; and chair of working group 1 of the EU COST Action on New Materialism. He lives and works in Thamesmead, London. http://samskinner.net

Hito Steyerl is a German filmmaker, visual artist, writer, and innovator of the essay documentary. Her principal topics of interest are media, technology, and the global circulation of images. Steyerl holds a PhD in Philosophy from the Academy of Fine Arts Vienna. She is currently a professor of New Media Art at the Berlin University of the Arts, where she co-founded the Research Center for Proxy Politics, together with Vera Tollmann and Boaz Levin.

Surfatial is neither dead nor alive. It is always at home, devising its next play. Surfatial comprises of three roles - Surface, Mirror and Perspective. Surfatial is a collective that performs collaborative musical and scholarly activity. They form perspectives and philosophical narratives on observed, emerging and imagined phenomena, founded upon a self-reflective exchange of individual experiences. They have written numerous essays on the state of the contemporary Internet and have also released an album called Phil-K that combines spoken word and sound in new ways. Surfatial is Malavika Rajnarayan, Prayas Abhinav, Satya Gummuluri. http://surfatial.com

Lina Theodorou is a video, Internet, and installation artist. She studied Graphic Design at the School of Graphic Arts and Creative Studies in Athens. She received a BA degree in Fine Arts, from the National School of Fine Arts, Athens. She has participated in numerous international contemporary art exhibitions, among them: the 8th Istanbul Biennial, 'Monument to Now: The Dakis Joannou Collection', 'The Gesture. A Visual Library in Progress' in the Macedonian Museum Of Contemporary Art of Thessaloniki, and at Quarter, The New Center of Contemporary Art in Florence, 'In the gorges of the Balkan' . http://linatheodorou.com

Pablo R. Velasco is a PhD candidate at the Centre for Interdisciplinary Methodologies (CIM), University of Warwick. His research explores the rationale behind Blockchain design and in the interwoven relations between authority, space, politics, and Cryptocurrencies' distribution of power. His academic (and non-acamic) work can be found at http://pablov.me.

Ben Vickers is a curator, writer, explorer, technologist and luddite. He is CTO at the Serpentine Galleries in London and an initiator of the open-source monastic order unMonastery.

Mark Waugh is head of Research and Innovation at DACS. He has curated numerous group and solo exhibitions and contributed to publications, catalogues and magazines including co-editing with Thomas Frank; We Love You / On Audiences. He is also author of the novels, Bubble Entendre and Come. http://dacs.org.uk

Cecilia Wee is a curator/researcher and Tutor in the School of Communication, Royal College of Art, London. Cecilia works with experimental sound, performance, visual art and design practices to investigate economic systems, relationships with technology, environmental change and organizational behaviour. Cecilia wrote her DPhil on the documentation of live art and is Chair of the Live Art Development Agency. http://ceciliawee.com

Martin Zeilinger, Senior Lecturer in Media at Anglia Ruskin University, is a London-based new media researcher, curator, and practitioner. He also serves as co-curator of the annual Toronto-based Vector Game & New Media Art Festival and co-convener of the Digital Art Research Group (DARG) at Cambridge University.
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