Imagining Human-Machine Futures: Blockchain-based "Decentralized Autonomous Organizations"

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Abstract:

Blockchain-based "Decentralized Autonomous Organizations" (DAOs) communities risk perpetuating the 1990s Californian Ideology of techno-elitism in their imaginary of "autonomy" via technological determinism, free-market economics, and "engineering" approach to social and political challenges (Barbrook & Cameron, 1996). Imaginations include algorithmic governance via Artificial General Intelligence agents running on decentralized blockchains, hiring labour in DAOs, and bartering payment in cryptocurrency. The role of humans in this imaginary is limited. This piece explores autonomy in blockchain-based DAOs to investigate visions of algorithmic assemblages. Do DAOs imagine a different future where the role of humans is one of symbiosis and augmentation with machines? I draw on cybernetic interpretations of DAOs as "autopoietic" organisms to imagine a co-constitutive relationship between people and algorithms in the information age. By understanding the promises and practices of blockchain technology and decentralized governance, we can better engage with these emergent objects of social and policy inquiry.

Introduction:

Blockchain technology perpetuates what Barbrook and Cameron called the "Californian Ideology" of libertarian markets, and individual freedom by providing the infrastructure for "infinitely scalable" "Decentralized Autonomous Organization" (DAOs) (Barbrook & Cameron, 1996; Russo, 2020). From its hacker origins in the Californian Ideology, and the Cypherpunk Mailing List in the 1990s and early 2000s, blockchain communities continue to experiment with individual autonomy via technological integration that transcends the need for existing social and power structures. This piece employs ethnographic methods to explore the question: 'Do DAOs imagine an autonomous future where the role of humans is one of symbiosis and augmentation with machines?'. Here, augmentation refers to extending human capabilities but not displacing them. First, I trace the history and origins of blockchain technology and the idea of "autonomy" as technological disintermediation of existing political structures and self-governance. Then, I explore how the Californian ideology is perpetuated in existing public blockchain communities, specifically DAOs, through the idea of autonomy. From here, I investigate the possible futures that are created by the infrastructural desires and imaginaries of the idea of autonomy that are perpetuated through blockchain communities, including algorithmic governance and decentralized Artificial General Intelligence (AGI). I then reflect on blockchain imagined future of autonomous self-governance in practice by observing a DAO called "1Hive". I draw similarities between 1Hive and the cybernetic concept of "autopoiesis" and autonomy, to imagine a different future where the role of humans is one of symbiosis and augmentation with machines. It is integral to investigate the imaginaries driving blockchain, as a globally relevant and influential institutional technology, as well as DAOs as a site of experimentation in decentralized governance of digital platforms.

The Californian Ideology Perpetuated in Blockchain Imaginaries of Autonomy

The Californian Ideology of the 1960s was a political outlook and cultural style that championed the pursuit of universalist, rational and progressive ideals, including democracy and self-fulfilment, through technological means (Barbrook & Cameron, 1996). This ideology was predicated on ideas of individual autonomy through technology that would replace existing social and political order. The Californian community shared "a nearly universal belief in technological determinism" and free market entrepreneurialism for autonomous individuals and their software to replace existing social, political, and legal structures and "radically reduce the power of the nation state" (Barbrook & Cameron, 1996). The original critique of the Californian Ideology is that it is in fact a polarizing and repressive vision of the future where individual self-fulfilment is exclusively accessible to the elite virtual class and the socially segregated remain subservient labourers who get left behind in this progressivism (Barbrook & Cameron, 1996). This is epitomised in the Extropian community's imaginary of great advances in Artificial and Intelligence and medical science leading to posthuman evolution where some become upgradable, super intelligent living machines (Eder and McCluskey, n.d.).

Fifty years on from the inception of the Californian Ideology at the 2018 Ethereum blockchain conference, hippie, "culture hacker", and personal computer pioneer Stewart Brand told the enthusiastic crowd of onlooking software developers that the book that changed his life was "Finite and Infinite Games" by James Carse (Ethereum Foundation, 2018). The book states that "infinite players look forward, not to a victory…but towards ongoing play", as analogy to pushing cultural boundaries and hacking society to pursue political goals and social change (2013). Preceding the talk, the introducer posed the question: if blockchain is coordination infrastructure, "what do we aim for in using it?" (Ethereum Foundation, 2018). Scholars purport that Stewart Brand was a key influence in a pattern of romantic individualism that appeared as part of the Californian Ideology (Turner, 2006). Following Brand's advocacy for the release of the first NASA images of the whole earth, an alliance between hippies, cyberneticians, nature romantics, technology freaks, psychedelia, and computer culture formed in the 1960s and 1970s that was a crucial impetus or the rise of digital network culture (der Welt, 2013).

Despite the optimism and promise of emancipatory technological determinism throughout the 1990s, existing Web digital infrastructure and platformitization has had many negative consequences for society. Decentralized digital infrastructure promises to change this (Lee, 2021). To date, digitisation and commercialisation of people as everyday consumers has reproduced and reinforced existing forms of systemic oppression, such as surveillance capitalism, datafication and monetization of the individual (Zuboff, 2019). Some scholars argue that platforms need to be designed and optimised for individual autonomy to avoid the dehumanising effects on society of digital infrastructures and algorithmic exploitation (Hepp, 2020). Indeed, the Californian Ideology imagined "visionary engineers" as inventing "the tools needed to create a free market within cyberspace, such as encryption, digital money and verification procedures" (Barbrook & Cameron, 1996). This is exactly what public blockchain protocols (meaning opensource software code, permissionless to access, and use) are trying to do (Nabben, 2021). Proponents of public blockchains promise guarantees of autonomy via decentralized, encrypted digital infrastructure that can't be exploited (Field, 2018). This piece explores the promise of public blockchains to deliver "public good" social infrastructure for individual autonomy. Through an ethnographic investigation of "Decentralized Autonomous Organizations" (DAOs), I assess decentralized digital infrastructure in practice as a perpetuation of the Californian Ideology to analyse its imaginaries and realities.

The next section addresses the imaginaries of blockchain communities by exploring recent development in blockchain communities pertaining to the idea of autonomy through decentralized governance.

Blockchain Collective Imaginations

Blockchain technology is deeply embroiled in imaginaries about the current and future state of information infrastructure and society. Socio-technical imaginaries are visions of scientific and technological progress that carry with them implicit ideas about public purposes, collective futures, and the common good (Jasanoff & Kim, 2015). Blockchain experiments embody the politics and power structures which they want to enable in society (Husain, et. al. 2020). Bitcoin, the first fully functional, public, decentralized blockchain protocol, was intended to be peer-to-peer electronic cash (Nakamoto, 2008). Bitcoin is a "techno-economic imaginary" of both the role of money, and the role of people as "peers" in a networked, "peer-to-peer" society (Swartz, 2018). Furthermore, the idea that money should be linked to the sovereign control of a state that is able to infringe upon the liberty of individuals is itself an imaginary that Bitcoin seeks to challenge by specifying the rules of societal systems in software code on a public blockchain (Maurer, et. al, 2013). The concept of governance to achieve this revolutionary autonomy has been an evolutionary concept among blockchain communities. "On-chain" governance is when governance rules are made explicit in software code, and blockchain nodes automatically execute code upgrades in the protocol in response to on-chain coin holders voting processes (Zamfir, 2017). In contrast, "off-chain" governance is when rules are much less formal, and the non-code-based processes of how ideas are shared, discussed, and evaluated outside of formal, recorded, transparent decisions are eventually reflected in nodes decisions upgrade their software to pass on changes to the protocol. The "on-chain" governance of Bitcoin is a clear example of the Californian ideology, as the community sought to mechanize the rules of the protocol and minimize human interventions. In practice, the thinking that community politics can be abstracted away through technological mechanisms has proven unrealistic in digital infrastructures that are designed, built, and maintained by communities of software developers, albeit distributed (Hassan & De Filippi, 2017). The next section details the origins of notions of blockchain conceptions of autonomy, before exploring how these ideological underpinnings are being expressed in multiple manifestations of decentralized governance in blockchain communities today.

The Origins of Blockchain "Autonomy"

Blockchain as a decentralized, digital infrastructure promises individual and collective autonomy. "Autonomy" refers to individual freedom through self-governance, enabled by digital infrastructure and automation that removes the need for trusted third parties in economic and social interactions. Public, decentralized blockchain technology offers a distributed record of history with no central point of control so the rules of the system cannot be interfered with. The invention of Bitcoin, the first fully functional, public, decentralized blockchain protocol, is largely attributed to a disparate group of countercultural "hacker-engineers" known as the "Cypherpunks" (Brekke, 2020). The Cypherpunks operated on a mantra of self-organization and direct-action in building privacy preserving, cryptographic software tools to counter the threat of Corporate and State surveillance in the digital age. They believed that "software can't be destroyed", and "a widely dispersed system can't be shut down" (Hughes, 1992).

The desire for autonomy against the threat of corporate and state surveillance is deeply enmeshed in the culture of the Cypherpunks. The online author of "the temporary autonomous zone" Hakim Bey, who shared the popular vision of autonomy as self-governance for self-determination by creating spaces that elude formal structures of control. "The autonomy of the individual appears to be complemented & enhanced by the movement of the group; while the effectiveness of the group seems to depend on the freedom of the individual" states Bey in 1991 (Bey, 1991). Furthermore, Timothy C. May, co-founder of The Cypherpunk's Mailing List and a key spokesperson of the group was a self-professed libertarian and author or "The Crypto Anarchist Manifesto". This manifesto is an inherently political vision of "anonymous computerized markets" that catalyze "a social and economic revolution" (May, 1992). With May as a key spokesperson for the Cypherpunks, libertarianism ensues as the dominant political philosophy seeking to maximise autonomy through political freedom, freedom of choice, and voluntary association beyond the transparent, opensource, permissionless digital infrastructure that the Cypherpunks sought to build (Woodcock, 2004). The Cypherpunks employed software engineering as a form of direct political action, epitomised in the catchcry "Cypherpunks write code" (Hughes, 1993). The Cypherpunks experimented with numerous distributed and digital cash technologies, which culminated in the invention of Bitcoin, a tool for electronic transactions that didn't rely on a trusted intermediary (Nakamoto, 2008).

The Cypherpunks Mailing List was closely tied to "The Extropian Mailing List", a group that advocated for self-transformation through integration with technology. The core principles of The Extropist Manifesto are perpetual growth and progress in all aspects of human endeavor; transcending the restrictions of authoritarianism, surveillance, and social control; overcoming property rights, including IP and money by sharing knowledge, culture, and resources; intelligence, and smart machines, specifically the attainment of "Friendly Artificial Intelligence" that exceeds human ability (Moore, 1998; n.a, 2010). Extropians advocate for the philosophies of technological self-enhancement (known as transhumanism), extropy (improving the human condition), and the future (Greenberg, 2014). Extropianism has been critiqued as part of the individualistic Californian Ideology perception of the capabilities of new technologies for the purposes of personal escapism (Barbrook & Cameron, 1996). Numerous prominent Cypherpunks subscribed to the Extropian mailing list, including co-founders Timothy C. May and Eric Hughes, as well as Mark Miller, the Co-founder of blockchain project "Agoric". Now, DAOs are being created to further pursue these goals.

Visions of Decentralized Autonomous Organizations

Blockchain-based "Decentralized Autonomous Organizations" (DAOs) are the logical extension of the Cypherpunk ideal of cyber and physical autonomy. Scholars define a DAO as "a blockchain-based system that enables people to coordinate and govern themselves mediated by a set of self-executing rules deployed on a public blockchain, and whose governance is decentralized (i.e., independent from central control)" (Hassan & De Filippi, 2021). In these software encoded institutions, "autonomous" refers to individual and collective self-governance as independence from external force and the control of others, human involvement, and self-direction through intelligent machines that can make decisions and participate in labour in the organization.

The phrase "Decentralized Autonomous Organization" was first mentioned in the field of cybernetics, despite Vitalik Buterin, co-founder of the Ethereum smart contract enabled blockchain protocol, having claimed to invent it (Dilger, 1997; Buterin, 2016). In the field of cybernetics, the idea of autonomy and autonomous systems has been a longstanding theme to

describe self-determination and the emergence of meaning in a system (Varela, 1986). Here, autonomy is also political. Cybernetics developed in crisis as a reaction to the horrors World War II and a critique of liberalism and humanism as "a new fable" (Tiqqun, 2020). It advocates to transcend the human to maintain societal order by treating society as an engineering problem that can be programmed and re-programmed through "the machine of governance". Tiqqun refers to this as "the *ideal of a stable society, expressed by objectively controllable social mechanisms*" to protect against accidents in the future (Tiqqun, 2020). This idea of engineering society through cyber-physical system carries over into blockchain community manifestations of autonomous digital organizations.

The concept of a "Decentralized Autonomous Corporation" was originally proposed in blockchain communities by Dan Larimer to describe cryptocurrency as profit-earning shares in a free market economy (Larimer, 2013). Buterin then adopted the phrase "Decentralized Autonomous Organization" or "DAO" (2013). Buterin described a Decentralized *Organization* as "a set of humans interacting with each other according to a protocol specified in code, and enforced on the blockchain" that control a treasury, and a Decentralized *Autonomous* Organization as "an entity that lives on the internet and exists autonomously, but also heavily relies on hiring individuals to perform certain tasks the automation itself cannot do" (Buterin, 2014). This interpretation of autonomous systems was partly inspired by futarchy (a mechanism for organizational governance via prediction markets by Robin Hanson), self-operating machines long referred to as "automatons", the novel series Daemon in which a distributed, persistent computer application begins to influence the physical world after the death of its creator, and Bitcoin (Buterin, 2014; 2016). This vision of autonomous organizations is hypothetically fulfilled by artificial general intelligence that runs on decentralized blockchains.

The Algorithmic Extremes of Autonomous Organizations

Buterin imagines DAOs as "the dream of science fiction", in that eventually, autonomous agents (full artificial general intelligence, or AGI) would operate and govern the digital infrastructure of society in a self-replicating and self-maintaining manner with very little need for human involvement (Buterin, 2014). In this imaginary of technology-enabled autonomy, fully autonomous AGI agents promise to liberate people from menial tasks, reserving human judgement for higher order, specialized tasks. *"In an autonomous agent, there is no necessary specific human involvement at all; that is to say, while some degree of human effort might be necessary to build the hardware that the agent runs on, there is no need for any humans to exist that are aware of the agent's existence"* states Buterin (2014). The vision of decentralized AGI is that AGI algorithms run on blockchain-based marketplaces to automatically coordinate tasks and earn digital tokens for their work, where they too are autonomous from centralised forces of control or coercion (Salah and Rehman, 2019). Here, blockchain offers the decentralized, digital infrastructure that forms the foundation of a fully autonomous network of AI agents that is resilient against infrastructural or political co-option. DAOs enact autonomy through disintermediation of the social and economic structures that govern society, and replace it with trust minimizing, automated systems for "social scalability", to inculcate digital infrastructure itself as an autonomous zone which eludes formal structures of control (Szabo, 2017). These visions need to be contrasted with the practice of designing, encoding, and organising in a technology-mediated, decentralized manner to better reason about their consequences in society.

Deeply instilled tensions remain between the role of algorithms and the role of people in reinforcing "autonomy" in these systems. The premier example of the tension between algorithmic prominence, and normative decision-making based on established norms based on shared values is "The DAO" hack, the first major experiment of a blockchain-based decentralized, digital investment organisation in the Ethereum community (DuPont, 2018). A bug in the code allowed millions of dollars to be drained from the smart contract, resulting in arguments in the community between whether it is right or wrong to change the record of transactions. This led to a "hard fork" of the Ethereum protocol, and community division about the "truer" blockchain, leading to Ethereum and "Ethereum Classic", as well as early Ethereum CTO Gavin Wood founding his own protocol known as "Polka Dot". In the aftermath of the hack and ongoing debates on governance, Buterin stated that *"people who think that the purpose of blockchains is to completely expunge soft mushy human intuitions and feelings in favor of completely algorithmic governance (emphasis on "completely") are absolutely crazy"* (2017). Today, the Ethereum community seeks a balanced approach to the social and technical aspects of governance, embracing its "off-chain", human-oriented processes. For example, the role of the "Ethereum Foundation" in maintaining an essential coordination role in the development of the protocol, such as hiring research and development staff and facilitating regular "Ethereum Improvement Proposal" (EIP) meetings. While this is excellent in crisis, it can be inefficient and subject to social attacks such as collusion. In contrast, other blockchain communities such as Polka Dot and Tezos embrace a "purer" technological form of on-chain governance, where protocol upgrades are determined by token holder votes, and software code is immutable, meaning it cannot be changed once deployed. While the advantage of this is transparency, a drawback is the reduction of governance to voting, when it is in fact multiple layers of social and technical components and processes interacting in the coordination and control of a system, which can't be anticipated in advance, and are therefore impossible to encode into the rules of protocol in advance (Weyer, et. al, 2015).

From these origins, blockchain-enabled organizations have developed and evolved into a plethora of protocols, applications, and communities which perpetuate and actualise visions of political autonomous futures through software code. Following the initial (failed) experiment of "The DAO", numerous communities are experimenting with blockchain-enabled decentralized governance to initiate and maintain virtual organizations. The objectives and functions of these organizations include investing, building ecosystems for "decentralized finance" economies, and creating cultural artefacts known as "non-fungible tokens" (NFTs). Other DAOs are for funding and commercialising longevity research, and, in the tradition of Steward Brand's advice to Devcon, exploring the intersection between Web3.0 and psychedelics (VitaDAO, n.d.; PsyDAO, 2021). Well-funded projects are also underway to develop decentralized AI services, such as "SingularityNet" in pursuit of the science-fiction DAO dream of a "fully autonomous system" (O'Higgins, 2021). In this way, Ethereum and other blockchain communities are emerging in numerous manifestations to pursue a vision of autonomy through the reduction of government (termed "mutualist minarchism") through the self-provision of "public goods" to provide better infrastructure than the State and build their vision of an autonomous society (Ennis, 2021).

Warnings Against the Californian Ideology

The major critique of the Californian Ideology as a sociotechnical imaginary is that it uses technological advancement as an excuse for exploitation. The neoliberal pursuit of free market mechanisms and technological self-enhancement is dependent on labour commodification and the exploitation of others (Barbrook & Cameron, 1996). The fear is that this results in social

segregation between the haves and have nots. Barbrook and Cameron argue that there is an inherent contradiction between the ideology of self-sufficiency and resentment for any external encroachment of one's own individual autonomy and the goal of "cyborg masters and robot slaves" (1996). They warn of a potentially repressive vision of the future, wrapped in a bio-technological "search for the perfection of mind, body and spirit" will inevitably lead to the emergence of a post-human future of narcissistic self-fulfilment enabled by the exploitation of others, in which "the technologies of freedom are turning into the machines of dominance" (1996). This has already been demonstrated in the Web 2.0 modern day-internet era, which perpetuates asymmetries of power in society, between those that govern digital platforms through "black box algorithms", and users, whose personal data is itself extractible (Barbrook & Cameron, 2015; Hepp, 2020). The hope of Web 3.0 is that decentralized technology will be distributed, participatory, and different.

Warning Against Blockchain

Yet, blockchains rhetoric of transformative new political structures such as delegated voting by "liquid democracy", decentralized artificial intelligence, and "the metaverse" of blurred division between physical and digital spaces is at risk of overshadowing the construction of a cyberspace that inclusively distributes its benefits. Some scholars warn that the "non-hierarchical, decentralized or distributed topologies…are confused with principles such as democratic decision-making and non-hierarchical social structures" (O'Dwyer, 2015; 2016; 2020). These "techno-utopian ideologies" may cause alternative attempts at platform cooperative models to fail, like many before them. "Techno-fundamentalism" risks tainting the potentially positive social outcomes of blockchain technology (Walch, 2015). In the current state of "experimentation" in "decentralized organizations", and pre-"autonomy" through AGI algorithms, the social dynamics of blockchain-based digital communities need to be further investigated to ascertain their promises and realities.

The politics of this ideology reveals how reference to "experimentation" is somewhat of a sly turn of phrase in blockchain communities. The term experimentation elicits depictions of safe, small-scale, and low-cost play. Yet, referring to Carse in "Finite and Infinite Games" and the provocation of 'what can be achieved with our newfound tools?', these are in-fact very serious games. The stakes are high in some of these multi-million-dollar digital platforms, which can have hundreds of participants, and are commonly hacked (or "rekt"). "Experimentation" underplays the fact that the rules of decentralized organization are still being invented. Some scholars warn against these unchecked visions of decentralized, autonomous futures arguing that the ideological promises of the uses of decentralized technologies, such as widening political participation, contradict the reality of these tools in practice which inevitably collapse into re-centralisation under the forces of commerce as a powerful driver of technological innovation (Heemsbergen, et. al., 2020). At present, these digital institutional infrastructures are more at the stage of "decentralized organization" rather than "decentralized autonomous organization", given the limits of algorithmic agents as being sentient agents capable of human-level intelligence. Without assuming that this is inevitable, or desirable, this vision and the means to its realisation in terms of who designs, builds, and programs these systems needs to be questioned as it has far-reaching implications about what it means to live in a digital society. Imaginations, visions, and narratives shape the future. The blockchain narrative of the superiority of algorithmic governance and the rhetorical power it holds to attract and retain faithful followers may prove more important than the technological practices of blockchain itself (Zook & Blankenship, 2018).

The next section explores a case study of a DAO experimenting with the possibilities of decentralized organization, algorithmic governance, and automation called "1Hive", to explore and test the DAO imaginary of autonomy.

Case study – 1Hive, where "Honey is Money"

"1Hive" is a decentralized autonomous organization with the objective of building and experimenting with decentralized applications and protocols to generate and maintain a self-sustaining, decentralized community (1Hive, n.d.). The concept behind 1Hive was heavily influenced by the Bitcoin and Ethereum protocols as technology with surrounding communities that recursively maintain and improve them over time because they care about them. 1Hive has existed in various instantiations since 2017 but has no core team (Duncan, 2017) The 1Hive "Honey" token was anonymously listed on cryptocurrency exchanges (CoinMarketCap, n.d.). The objective of the ecosystem is "for the everyday person to earn their wages, and store their capital, in cryptonetworks" for individual autonomy. "One of the goals was to see it take on a life of its own" states one early contributor. 1Hive is structured to function automatically, in accordance with a decentralized social contract (known as a community covenant. A smart contract issues Honey tokens, anyone can make a proposal to request Honey to build 1Hive modules, and anyone with Honey tokens can vote to support a proposal using a novel voting system (known as "conviction voting"). The threshold of support required to pass proposals changes depending on the supply of Honey and the amount requested, meaning that the system automatically self-stabilises. This dynamic of allocation funds is reinforced through a dispute resolution protocol called "Celeste" which the community has designed and built (Sacha, 2021). Accountability for fulfilling proposals once granted is largely socially reinforced through reputation. Through the "gardens" initiative, anyone can use this model and infrastructure to run their own DAO.

1Hive is a self-governing organization. Its operations are autonomous from external forces of governance or coercion. It is also self-functioning, in that the rules of the community, including arbitration, are enforced via economic incentives in the governance of ecosystem. Through its core mechanisms and community, there is enough momentum for things to happen without specific direction. Barriers to participation are low and people can freely participate, contribute to development, or exit the community. With no company, core team, or management hierarchy, community working groups called "Swarms" orient around a self-invented currency called "Honey" to coordinate an ecosystem of activities (1Hive, n.d). The community covenant specifies the values and norms of the 1Hive community, including the goal of fostering a "healthy community economy" (1Hive, n.d). These standards of behaviour guide the allocation of honey towards development and blockchain based incentive mechanism to enforce behaviour. To make a governance proposal within the ecosystem, Honey tokens must be "staked". Voting is conducted using a novel decision-making algorithm that continually signals preference called "conviction voting". Economic interests align incentives within the ecosystem in the "on-chain" governance components. In cases of dispute resolution, staked tokens are risked in the Celeste decentralized arbitration mechanism or "court" (1Hive, n.d). The community has effectively allocated Honey to the development, maintenance, and improvement of shared tools that sustain the community, such as the development of a decentralized exchange aggregator ("Honeyswap"), a decentralized arbitration mechanism (known as "Celeste"), and a liquidity market protocol ("Agave") (1Hive, n.d.). From these foundations and goals of determining one's own work and wages, the 1Hive community has generated a valuable market capitalisation of around $8 million, and $30 million at its market peak. The combination of social dynamics and blockchain protocol enforcement of votes and

dispute resolution makes 1Hive a socio-technical system. 1Hive acknowledges its social dynamics, including the community "Discord" chat and forum (1Hive, n.d.)).

As a blockchain-based DAO, 1Hive reflects some of the dynamics of the Californian Ideology, including technological determinism, free market economics, and algorithmic governance. Yet, the community describes itself according to Elinor Ostrom's "Principles of the Commons", seeing itself as producing public goods (Ostrom, 2005; 1Hive, n.d.). Algorithms in the system are to serve the goal to build, fund, and self-maintain infrastructure. Rather than algorithms being predominant or subservient in this system, it is a co-constitutive human-machine ensemble in which humans determine algorithm rules, and human outcomes are thus determined by algorithms. Early contributor Luke Duncan states that "You hear about DAOs putting people to work. Most DAOs are about putting machines to work. The infrastructure coordinates people and labour through incentives and rewards but people generate the infrastructure and reap the benefit". 1Hive is geared towards coordinating human labor that can't easily be automated. In fact, 1Hive is closer to Dilger's original cybernetic view of a "Decentralized Autonomous Organization" (Dilger, 1997), rather than a dystopia of AGI marketplaces where humans have a minor oversight role and autonomous algorithms coordinate independently.

Cybernetic Principles of Biological Autonomy and DAOs

In line with the field of cybernetics, Dilger imagined Intelligent Home technology as a complex, multi-agent system of algorithms that would operate like a living organism. The formal definition of an autonomous dynamical (or adaptive) system in cybernetics comes from control theory engineering, to describe systems whose "steady-state" is disturbed by external inputs (Dimirovski, et. al., 1977). Also in this field, the term "autopoiesis" is used to describe human-machine systems as "living" organisms, the attributes of which include adaptability, withstanding perturbations, and reproducing themselves and entirely new systems (Varela, et. al. 1974). In this conception of complex sociotechnical systems, "autonomy" is a state that results from autopoietic organization, as the process of an individual's ongoing operation as a self-generating organism (Varela, et. al. 1974). Autonomy is achieved through autopoietic organization of the individual, to participate in a greater whole (Varela, 1979). "Wholeness relates to autonomy", in that something that is whole is complete, self-governing, free from external control or influence, and generated by itself (Glanville, 2015). Dilger's conception of an Intelligent Home was a "self-defining and self-maintaining system" capable of "evolutionary" processes (1997). This type of DAO is comprised of sensors and actuators (controls), with the capacity to evolve, adapt, and grow like a biological immune system. In this way, 1Hive embodies these attributes of an autopoietic living system in its objective to self-generate and its ability to evolve and reproduce decentralized governance mechanisms to continue to sustain itself as a functional whole, without relying on external entities. Varela describes that "death" of a living, autopoietic organism would result from disintegration from being a unified whole and loss of identity (Varela, 1979). In the same way, DAOs like 1Hive exist because of participants are oriented towards a shared objective, without which it would die. The life of a decentralized organization is sustained thought the relational interactions between constituent components, for example in 1Hive, the constitution, issuance of Honey, proposals, voting, and arbitration that comprise the DAO as a functional whole. 1Hive is designed for resilience from external capital dependencies. The value of Honey is intrinsic to its ecosystem and scales up and down over time. "We'll never run out of capital because we've chosen not to use capital" states Duncan. This inherent homeostasis is dynamically determined

over time. The ecosystem reproduces and evolves as other DAOs deploy a similar social and technical framework.

This vision of an autopoietic, cybernetic DAO offers a stark contrast to the dystopian, mechanistic picture of human minimization through "trustless" transactions, strictly on-chain governance, and algorithmic automation with humans at the edges. Instead, autonomy is projected as a whole system or society, that is greater than the sum of its individual parts and can achieve things as a collective whole that it otherwise could not have (Glanville. 2015). Here, a system is autonomous and whole when it is self-organising and self-reproducing, rather than when it is free from human intervention. In this same way, autopoiesis describes systems that are capable of producing, reproducing and maintaining themselves (Verala, et. al., 1974). Some blockchain community and DAO participants argue that this may be a more suitable way to conceive of the mode of operation and being within and through DAOs (Zargham, 2020). The protocol is at the centre for coordination, with humans at the edges to contribute to, and benefit from, the system.

This is not to pretend that cybernetics is the "correct" response to how to organise society. Cybernetics was developed as a reaction to the tragedies of World War II in the hopes of better ways to "steer" and control social systems (Wiener, 1954). Cybernetic approaches have been criticized for overemphasizing an engineering approach towards the mathematical "optimization" of society (Burrell & Fourcade, 2021). Cybernetic approaches also advocate for the technological extremes of human-machine integration for societal advancement. The Cybernetic Manifesto predicts a neural-link type "physical integration" of direct connection between technology and the nervous system for individual immorality (Principia Cybernetia, 1989). This includes "Embodied Artificial Intelligence" (EAI), which is not the Extropian "abandoning the wetware" of human physicality but draws on the epistemology of autopoiesis to embrace integration between technology and biological processes of cognition and sensing (Damiano & Stano, 2021; Varela, et. al., 1991). Still, in this information age paradigm, cybernetic approaches to digital futures mean making machines able to sense and develop more like humans, rather than replacing humanness.

Cybernetics has undergone critical self-reflection from within the field with the development of "second-order cybernetics". Second-order cybernetics approaches argue that system designers cannot exist independent of the system itself and the designers' model of reality (Mead, 1968). The concept of autopoiesis and autonomy arise out of these developments. From this basis of self-awareness, a conception of AGI autonomy that is a system which evolves and makes decisions with no external input is impossible. However, a whole system, in which individuals and the collective are free of political coercion over decision-making may be possible. Cybernetic visions of human-machine integration emphasise preservation of the "creative core" of the human individual, because it is the essential "engine of evolution" (Principia Cybernetia, 1989). Humans are always in the loop of complex systems engineering, whether that is establishing initial settings, deciding what objectives to optimise for, or training algorithms. The understanding of autonomous human-machine systems as coherent wholes presented in this field offer a potentially more complete vision of what technologically enabled Decentralized Autonomous Organizations could be.

The cybernetic vision of Decentralized Autonomous Organizations as autopoietic organisms provides an alternative to some blockchain instantiations of DAOs that appear heavily informed by the Californian Ideology. Rather than limiting or foregoing humanness, cybernetic approaches to societal organization embrace co-constituency with machines as a continual

process of optimization instead of a perfect end state of decentralized blockchain-AGI "singularity". This is perhaps a better integrated sociotechnical imaginary for autonomous organization in a digital era for blockchain communities to consider.

Analysis

The real forefront of how decentralized governance is evolving through DAOs is in the detail of autonomy. A clear picture of an autonomy that benefits the people participating in Decentralized Autonomous Organizations is yet to be articulated in blockchain communities. Who or what is being made "autonomous" in "Decentralized Autonomous Organizations", and whether this is sentient algorithms, or individuals and communities is yet to be clarified in the participatory visioning of DAO builders. When our imaginaries mature to allow the perceived participants in these systems to consider "autonomy", perhaps we will be ready to meet our self-made systems of superintelligence.

Visions of the future are born out the contexts they are created in and carry with them implicit ideas about collective purposes about the common good (Jasanoff & Kim, 2015). Blockchain communities and the innovation of "Decentralized Autonomous Organization" is a truly admirable vision of an information age which enabled self-governance via decentralized technology. This vision is being actively pursued by communities that are designing, building, and governing their own digital infrastructure with the aim of greater individual and collective autonomy. Yet, the end goal of DAOs as truly *autonomous* systems remains a fuzzy, far-off, and under-explored concept. In the articulated imaginaries of Decentralized Autonomous Organizations, it is intelligent algorithms that are self-governing, autonomous and free, and the role of people is reserved for labour, including some higher order managerial oversight, presumably by tech-literate software engineers. The constant tension of algorithmic systems is whether they should reflect an individualistic of collective ontology in terms of who they serve and what they optimise for (Benthall & Goldenfein, 2021). In DAO interpretations of autonomy, this is a tension between individual, collective, and machine, regarding who is being governed, and who owns value in the system. Either humans are free, as in self-governing to make their own choices, or they free through omission of responsibility by having AGI govern for them. The latter describes the singularity, a posthuman society which has been engineered and optimised beyond the limits of human fallibility (Bostrom, 2019). This vision of autonomy in DAOs is a far-off vision of a future information society governed by AGIs, more so than a present reality. Instead, there are inherent trade-offs on the spectrum between individual autonomy, and the benefits of collective autonomy sought through participation in a group. Rather than envisioning individuals that are autonomous from an organisation, organisations that are autonomous from individuals, cybernetic projections of autonomy describe a complete whole, that is autonomous from external forces of dependence or coercion that sets direction and makes decisions in a self-contained way.

The narrative of what DAOs are, and what they will be is in flight. At present, DAOs are neither optimistic and emancipatory, or deeply repressive. In some ways, they might be both. The idea of "autonomy" is an imaginary perpetuated in DAOs, which both helps bind a community in participating towards the objective of effective self-governance and creates risks of abuse of power and exploitation. This piece has explored the concept of autonomy and autopoiesis in decentralized organizations as a means to inform the subjective design and governance of these systems. Some scholars warn that digital infrastructure, even if decentralized, will not provide a techno-fix without deep consideration and work on the social and political institutions that determine its ownership, governance, and systemic consequences (O'Dwyer, 2015; Walch,

2021). In this view, technocratic solutions to organising society omit the inherently complex nature of human behaviour in socio-technical systems, and the necessity of calculating and continually measuring the social outcomes of technological interventions. For the most part, these warnings of technological repression are not what I observe in DAO communities.

Many DAOs in the Ethereum community are not geographically concentrated around the Venture Capital funding and socio-economic disparities of Silicon Valley but are geographically diffuse, diverse communities bound by memes that may actually represent a kind of "world computer". Digital artisans are being celebrated and finding their place in generating all kinds of hypermedia, including memes and "NFTs", applying capitalist "DeFi degeneracy" to spawn new ecosystems, and bridging the "Metaverse" between physical and digital space in creative ways that enable individual ownership of digital assets and data for individual and collective autonomy. The permissionless nature of the decentralized digital economy does not just create pathways for digital artist engineers but also new categories of roles, such as "dank meme lords", and self-employment opportunities, such as "play-to-earn" cryptocurrency games (Cryptojobs, 2021; Axie Infinity, n.d.). Whilst this still is a niche field in many ways, a culture that welcomes curiosity and an ideology of permissionlessness mean that participation is open to anyone that wants to engage in playing serious games.

In terms of autonomy, DAOs are still subject to external influences that influence decision making. This includes nation-state law and enforcement, such as attraction to legal limitations on where a DAO can be registered as a legal corporation, ensuring that token economics won't be considered Securities under United States Law, and fleeing from crypto regulatory crackdowns and towards crypto-friendly regulatory jurisdictions. Although not emancipated from the external or internal bindings of the politics and bureaucracy of the governance of infrastructure, 1Hive demonstrates that other visions of decentralized autonomous organizations which enact a state of synergy between people and algorithms are being explored. These visions loop back to the original cybernetic conceptions by applying "control theory principles to social and political systems, to optimize for a complex system of interactions to gain new attributes at the group level that it didn't have before" states Michael Zargham, Founder and CEO of systems engineering design firm "Blockscience". The cybernetic inspired articulation of human-machine systems encompasses the quality of autonomy, while maintaining wholeness and the individual and the group level. This instantiation of a technological organization is closer to cybernetic conceptions of "decentralized autonomous organizations" as living, autopoietic, organisms that are capable of reproducing and maintaining themselves in an adaptable, evolutionary, and resilient manner. 1Hive acknowledges the social components of its ecosystem and governance processes as critical to its being (1Hive, n.d.). In this vision, autonomy is people shaping systems and systems shaping people for collective benefit and without co-option. "Autonomy" refers to freedom from external reliance or control, as well as computers augmented decision making for human-machine hybrid decision making systems, rather than superseding humans.

It is crucial to clarify understandings and hopes to shape this digital future into a long-term vision. To avoid a narrative and a future of technological advancement under the guise of narcissistic pursuits and perpetuating social segregation between elite token holders and a labour class that is subservient to owners and algorithms, concepts such as social organization, governance, and democracy need to be engaged with, rather than just tweeted about as buzz words to "meme" autonomy into existence. In fact, blockchain-based systems may provide an approach to more distributed governance of AGI, with public blockchains offering a more

distributed, open, and secure infrastructure for governing Machine Learning and AGI algorithms (Harris & Waggoner, 2019; Montes & Goertzel, 2019).

What is omitted from the concept of the Californian Ideology is what an alternative might be "to make autonomous initiatives flower and make the new technology truly a tool for liberation" (Barker, 2007). DAOs offer a perspective of what this alternative might be. Rather than a Californian Ideology, DAOs could aim to be closer to the desire for self-determination that is expressed in the Declaration for the Independence of Cyberspace of "a world where anyone, anywhere may express his or her beliefs, no matter how singular, without fear of being coerced" (Perry Barlow, 1996). What people are trying to imagine is possible with the information age is a future that is "actually democratic, meritocratic, decentralized, and libertarian" (Rossetto, 1996).

Conclusion

The perpetuation of the Californian Ideology through blockchain communities is still vulnerable to the same risks of technological repression expressed in the exploitative algorithmic digital platforms of Web2.0. The social outcomes of governance both of and by algorithms remains to be tested across the various instantiations of decentralized organizations. It is worth questioning this imaginary before pursuing and integrating intelligent agents as peers in the digital social structures that blockchain communities are building to coordinate society. The realities of the question of who or what is being made autonomous in DAOs as they experiment with algorithmic extremes, and potentially governance by intelligent algorithms, is pertinent for enthusiastic onlookers and participants to consider. By articulating the visions and imaginaries of blockchain-based DAOs, this piece draws on cybernetic conceptions of DAOs to imagine a symbiotic relationship between algorithms and people.

In this piece, I have sought to draw attention to the opaque blockchain framing of DACs and DAOs as organizations that achieve autonomy through governance by artificially intelligent algorithms, with humans at the margins. Some visions of DAOs in blockchain communities risk perpetuating the Californian Ideology of technological determinism and hopes of advancements in AI but are underformed and not clearly articulated or deliberated among these communities, although the capabilities don't exist yet for this level of algorithmic governance. I propose that this provides an opportunity to question, critically reflect on, and shape desired futures for an information age that promotes harmony between people and algorithms by emphasizing a state of autonomous individuals and wholes through Decentralized Autonomous Organizations presented in original articulations of "decentralized autonomous organizations" in the field of cybernetics. I explore the autopoietic properties of DAOs to self-generate, self-sustain, and self-reproduce by drawing on the case study example of "1Hive". I argue that the field of cybernetics offers a more sophisticated articulation of autonomous organization in human-machine systems, which requires engineers to consider the role of people in guiding and shaping these socio-technical-political constructs towards autonomy. In the end, our aspiration for autonomy, or "self-law" is as nuanced as people, in that it is both individual, and collective, and certainly cannot be left up to others to articulate for us.

"Infinite players look forward, not to a victory…but towards ongoing play" (Carse, 2013). In the case of DAOs, the ultimate goal is for people to keep on playing.

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