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Computing Utopia: The Horizons of Computational Economies in History and Science Fiction

Introduction. In his introduction to *Red Planets* (2009), Mark Bould observes that works of science fiction "rarely address the economic dimensions of social totality" (4). Instead, in his view, sf provides us with negative spaces that are "often primarily, if unwittingly, bound by the structures, potentials and limits of capital" (4). While Bould's argument has its own distinctive twists and turns, it borrows substantially from the ideas of Darko Suvin and Fredric Jameson, wherein sf is figured as a critical lens on reality. If the capitalist economy is defamiliarized and/or conspicuously absent in sf writing, we may nevertheless discern within it the traces of this elusive, protean system in which we are all immersed.

Bould's claims do not account for the explicit use of economic language and the thematization of economic processes in more recent sf by writers such as Kim Stanley Robinson, Cory Doctorow, Charles Stross, Lionel Shriver, Adam Roberts, Malka Older, Annalee Newitz, Cary Neeper, Tim Maughan, Bruce Sterling, and Matthew De Abaitua, among others. Economic science fiction also emerges as a distinct subgenre in David Schultz's short-story anthology *Strange Economics* (2018), highlighting treatments of "the production, consumption, and transfer of wealth" (13).

This growing interest in economics and sf converges with the preoccupations of much contemporary political theory and activism. The neoliberal consensus has come under serious pressure in the years since the 2008 financial crisis, with researchers and activists exploring alternative economic forms through science-fictional thinking. Works such as William Davies's *Economic Science Fictions* (2018) and Peter Frase's *Four Futures: Life After Capitalism* (2016) consolidate these energies. In a similar vein, the performative turn in the sociology of technology and the sociology of finance—exemplified by works such as Mackenzie et al's *Do Economists Make Markets?: On the Performativity of Economics* (2008)—raises the stakes for economic sf, by arguing that economic models need not passively describe economic reality but may also shape it. Terms including "design fiction" and "diegetic prototyping" have arisen to describe narratives that try to provoke certain futures into being.[1]

These efforts are increasingly influenced by the datafication of society and the integration of labor and finance within information technology networks. The economic reframing of sf's longstanding engagement with technology and data invites questions about the viability of technologically informed alternatives to capitalism. In many quarters, there has been warranted scepticism about technocentric leftist politics (see De-Arrest Editorial Services, Gardiner, Levy, Negri, Noys, and Wark). Replacing monetized social relations (such as wages and rents) with datafied social relations is no guarantee of freedom from the forms of

domination we associate with capitalism, nor from fresh forms of domination.[2] Furthermore, new technologies provoke old fears about capitalist progress and attempts "to colonize the future, to draw the unforeseeable back into tangible realities, in which one can invest and on which one can bank" (Jameson 228). Such concerns have led writers and commentators alike frequently to distance themselves from associations with so-called techno-utopianism. As Will Davies proposes in *Economic Science Fictions*, "To write science fictions about the economy is to insist on the possibility that the imagination can intrude into economic life in an uninvited way that is not computable or accountable" (21-22).

It is the question of the "computable" in economics that is the point of departure for the present article. Here, we explore examples of computational economies—that is, societies in which economic resources are largely defined and allocated by computational systems—in order to take seriously the imaginative possibilities to which they give life. Our method is at first historical; in line with the work of writers such as Philip Mirowski, we propose that there is much to be gained from understanding computation within a wider historical context of economics and politics. This move unsettles assumptions that are sometimes made about economic planning by computers, with regard to social engineering, surveillance, and co-option by state and capital. It also offers a perspective on past hopes for economic computation that is neither naïvely optimistic nor paralyzingly dystopian. As Ha-Joon Chang suggests:

> You can very easily see that the economic realities that we believe to be the outcomes of some "scientific, natural laws" are really the results of technical changes, institutional changes, political decisions and the influence exercised by individual agencies. Used in this way, historical research becomes similar to writing and analysing SF... as the recording and the deciphering of history involve important elements of imagination. (39-40)

The alignment of history and sf by Chang squares well with our interest in excavating the imagined alternatives elided in stories of economic development. In the following section, we consider the entwined histories of computer science, cybernetics, and economics; these insights are then put into dialogue with sf novels that experiment with different sociopolitical configurations of computational economies, primarily *The Dispossessed: An Ambiguous Utopia* (1974) by Ursula K. Le Guin and *If Then* (2015) by Matthew De Abaitua. The article concludes with some thoughts about the use of history and fiction for expanding the imaginative horizons of the computable in economics.

Histories of the Computable: Cybernetics and Economics. In speculative and science fiction, computation is often represented as morally ambiguous, at odds with human concerns or not entirely explicable within human frames of reason. One such representation can be found in the trope of the supercomputer, wherein anxieties about artificial intelligence and automation combine to produce an entity capable of superseding or displacing humankind. For example, Kendell Foster Crossen's *Year of Consent* (1954) features the totalitarian supercomputer SOCIAC, who manipulates the "consenting" population via forms of social control. Likewise, Isaac Asimov's short story 'The Last Question' (1956) centers on the

human-created supercomputer Multivac (and its successors) and their obsession with the question of how to reverse entropy. They work on the answer for over a hundred billion years, long after the end of humankind and the universe itself. There are also instances in which sf computation takes on a curiously organic cast. The supercomputer may be endowed with unexplained sensory resources, or it may spread its roots, or assimilate technological assets, or become mobile within technical networks; examples include Proteus in Dean Koontz's *Demon Seed* (1973), Skynet in the *Terminator* film franchise (1984-2019), and (as we see shortly) Project Cybersyn in Jorge Baradit's *Synco* (2008). Mirowski writes that in a variety of technoscientific discourses, the computer "straddles the divide between the animate and the inanimate, the live and the lifelike, the biological and the inert, the Natural and the Social" (12-13).

The imaginary of the supercomputer, then, is entangled with both positive and negative impulses. These impulses crystallize in the tension between computational utopia's promise of superior knowledge and reason and the threat of an oppressive and dystopian calculative order. The history of cybernetics is laden with comparable tensions. In popular culture, cybernetics has frequently been conflated with robotics or computer science, an association that was formed through early media reactions to it. The 1948 publication of *Cybernetics: Or Control and Communication in the Animal and the Machine* by the American mathematician Norbert Wiener, one of the originators of the field, gained enormous press attention and led to response articles such as Serge Fliegers's "Will Machines Replace the Human Brain?"(1953) and John G. Kemeny's "Man Viewed as a Machine" (1955).

In fact, cybernetics refers to a far broader set of concerns. In his book Wiener called it "the entire field of control and communication theory, whether in the machine or in the animal" (19). To elaborate on this definition, cybernetics relates to the study of systems governance, including organic, machinic, and socio-economic systems. It also includes the study of self-governance: how systems constitute and stabilize themselves, how they adapt to changes in their environments, and how they survive or fail to survive damage or the introduction of new elements. Precursors to cybernetics go back centuries, but it became established as a discipline in the mid-twentieth century through the work of Wiener, John von Neumann, Alan Turing, Warron McCulloch, Arturo Rosenblueth, and others. From the 1940s onwards, cybernetics overlapped with and built upon other disciplines such as systems theory, information theory, computer science, organizational studies, behavioral science, and game theory in ways that are too intricate to rehearse in detail. The study of communication, feedback, and control, however, would come to define cybernetics as a shared field of inquiry.

It is this interest in feedback, and the maintenance of equilibrium through feedback mechanisms, that most clearly connects cybernetics with economics. In particular, there are correlations between cybernetics and neoclassical models of markets and economies as self-governing systems, entities that accomplish an optimum distribution of resources through the self-stabilizing interactions of supply and demand. These principles were at the heart of what came to be known as the

"Chicago School" of economics through figures such as George Stigler and Milton Friedman. Both worked for the Statistical Research Group (SRG), funded by the US National Defense Research Committee during the Second World War, and links have been traced between cybernetic experiments in defense systems carried out in the SRG and Friedman's later work (Mirowski 205-206). Mike Featherstone foregrounds this connection in his study of the utopian underpinnings of contemporary capitalist thought:

> Read in terms of its historical situation in the period of the cybernetic revolution, we can better understand how Friedman's free market economics presented a computational vision of freedom and social relations, which transformed economy into an apolitical closed space defined by machinic interactions, cold strategic decision making, militarised risk assessment and management, and a complete lack of empathy for the other who was similarly imagined through the lens of cybernetics. (94)

The characterization of "machinic interactions" is central to Featherstone's argument that "it is possible to understand the development of late capitalism through its embrace of techno-science and specifically cybernetic theory over the course of the 20th century" (82). This view, while valid, rests on a partial interpretation of the cybernetic field. Historian Ronald R. Kline has argued for the disunity of cybernetics, not only in its multiple meanings, but also with regard to "the different paths cybernetics took in different countries" (7). To some extent, these histories have been obscured by dominant narratives, which inform ideas—in both science fiction and contemporary politics—about the inseparability of cybernetic theory from capitalism. Yet the uptake of cybernetics in countries with distinct social and political trajectories presents a challenge to such ideas.

The history of Soviet cybernetics is one case in point. Slava Gerovitch's *From Newspeak to Cyberspeak* (2002) follows the rise and fall of cybernetic theory in the Soviet Union from the late 1940s to the early 1970s. Although it is a historical study, it carries echoes of science fiction insofar as Soviet "Newspeak" (a term borrowed from George Orwell's *Nineteen Eighty-Four* [1949]) is juxtaposed with the scientific language of "cyberspeak." For Gerovitch, the story of Soviet cybernetics is one of "fascination with a new revolutionary language and frustration when this language was appropriated by the establishment" (1). Mathematicians and scientists in the 1950s seized on cybernetics as an alternative to *partiinost* [party-mindedness] and the "vague and manipulative language of ideological discourse" (Gerovitch 199). Cybernetics was a truth-telling tongue, believed to be "a science in the service of communism" (4).

Under Nikita Khrushchev's leadership, the legitimacy and influence of cybernetics grew, until it became "fully legitimized, officially recognized, and almost canonized" through its inclusion in the 1961 Program of the Communist Party (Gerovitch 9). This coincided with a flourishing of mathematical economics. In the West, economists such as Friedrich von Hayek and Oskar Lange had been sparring for decades over the theoretical feasibility of efficient command economies, in the so-called socialist calculation debate. In the Soviet Union, challenges were emerging to the haphazard artistry of material balance planning, the central planning techniques developed as part of Stalin's collectivization policy.

Planners were preparing to set aside abacuses and stacks of folders in favor of a burgeoning computer technology. During this period, Viktor Glushkov proposed and initiated the All-State Automated System (OGAS), a national network of computation centers for economic planning and management. There was an early recognition that it would be impossible to centralize all economic decision-making, however, partly due to the limited processing power of Soviet computers and partly due to the difficulties of formalizing a system for planning and resource distribution (Gerovitch 273-74). Therefore a proposal for "optimal planning" was put forward instead. Optimal planning was based on the principle of indirect centralization, designed to introduce economic mechanisms to allow for self-regulation within the constraints imposed by the national plan (274-75).

Francis Spufford's *Red Plenty* (2010) opens at this auspicious historical moment, drawing from Gerovitch's work to narrate the 1960s Soviet search for a cybernetic path to post-scarcity. *Red Plenty* hovers between history and fiction and is written as a series of loosely connected vignettes involving both fictional characters and fictionalized versions of real people, supplemented by substantial historical footnotes.[3] Spufford details the hopes invested in a Soviet planned economy and the cyberneticians tasked with automating it, setting the scene thus in 1963:

> New cybernetics institutes and departments had sprung up right across the Soviet Union.... Mathematical models were being built for supply, demand, production, transportation, factory location, short-term planning, long-term planning, sectoral and regional and national and international planning. Automated control systems for factories had been commissioned. A group of Red Army cyberneticians were proposing an all-Union data network that could be used by civilians and the military alike. (206)

Despite the efforts of economic cyberneticians, their systems were never implemented. Khrushchev was removed from power in 1964, and the Kosygin Reform of 1965 failed to translate more radical economic ideas, such as OGAS or indirect centralization, into policy. By the late 1960s, the language of cybernetics was becoming "transformed from a vehicle of reform into a pillar of the *status quo*" (Gerovitch 279) and cybernetic analysis was employed to reinforce existing power structures. Soviet Newspeak, like a good self-regulating system, was swallowing the cyberspeak that threatened its integrity. Former cyberneticians tended to disown it as "one more variety of officially sanctioned vacuity" (Spufford 383, n.117).

The motivation for a computerized planned economy was a society of plenty. As Spufford's Khrushchev muses early on in *Red Plenty*, "Fortunately, the hard part of the task was nearly done. They had almost completed the heavy lifting, they had heaved and shoved and (yes) driven people on with kicks and curses, and they had built the basis for the good life, their very own horn of plenty" (21-22). Conversely, the events that *Red Plenty* recreates demonstrate the material obstacles to realizing this utopia on the basis of centralized economic decision-making. Just as the messy reality of human existence is liable to overwhelm blueprints for a perfect social order, so schemes to organize society according to calculative economic models are prone to failure. Nevertheless, Spufford's weaving together

of fact and fiction reveals the potential of cybernetics and its positioning in the context of Soviet-era politics. Furthermore, it highlights the extent to which cybernetics—for a brief moment at least—was perceived to present a genuine alternative to capitalist economics and the mystifications and oppressions of Stalinist ideological discourse.

Another important project that marks a chapter in the diverse history of cybernetics is Project Cybersyn (or *Proyecto Synco* in Spanish), a Chilean computer network for economic planning, funded under the socialist government of Salvador Allende between 1971 and 1973. Cybersyn was directed towards the development of a cybernetic system to manage factories that had come under government control as part of Allende's nationalization efforts. The project was a collaboration between Chilean technical experts and Stafford Beer, a British research scientist in management cybernetics. Beer was interested in cybernetics as "the science of effective organization" and how it could be applied to the field of industrial management (Beer, *Decision and Control* 425). It was for this reason that he became part of Cybersyn's development team.

Project Cybersyn was intended to manage economic production using the feedback of data from the factories. Statistical software programs were designed to model factory performance scenarios, based on data analysis, enabling the Chilean government to regulate production and pre-empt crises with effective action (Medina 6). Decision-making would take place in an operations room, where senior bureaucrats and workers could convene to assess real-time economic activity. Despite limited technological resources, consisting of one central computer and a network of telex machines, the project went some way towards developing this system (Pickering 250). The main objectives of Cybersyn were to maximize economic production while also facilitating self-regulation of the factories. Project Cybersyn thus represented an attempt to incorporate devolved decision-making and worker autonomy into a cybernetic management system. Such features indicate a sharp contrast to the proposal for OGAS in the USSR and, for Beer, the design constituted "a weapon against state bureaucracy" (see Medina 170).

A comprehensive history of Project Cybersyn is the subject of a 2011 book by Eden Medina. Her study focuses on the relationship between computer technology and politics, and the difficulty of embedding political values in systems design. In the case of Cybersyn, she argues that this can be seen in the frequent mischaracterization of the project as a tool for centralized government control of the economy, despite its outwardly decentralized approach:

> Beer viewed Cybersyn as preserving the autonomy of the (industrial) enterprise within a centralized state apparatus. But nationalization brought factories under the control of the state and made top factory management positions state appointments. If Beer's tools gave state-appointed managers greater control of their factories, did this create a form of decentralized control or did it increase the reach of the state and its centralizing power? This ambiguity might have prompted some to read Cybersyn as implementing a form of centralized control. (207)

Indeed, on 7 January 1973, when *The Observer* broke the news of Cybersyn to the English-speaking public, the headline simply ran "Chile Run by Computer" (Hawkes). In an allusion to *Nineteen Eighty-Four*, Cybersyn, the "first computer system designed to control an entire economy," had allegedly been "assembled in some secrecy so as to avoid opposition charges of 'Big Brother' tactics." Later that year, Allende's government was overthrown by a military coup and Cybersyn was never completed. Under the subsequent dictatorship of Augusto Pinochet, economic policy was remodeled by a group of Chilean neoliberal economists called the Chicago Boys, some of whom trained under Friedman. Meanwhile, on Wall Street, newcomers with backgrounds in physics, mathematics, and computer simulation began to trickle in, at first dubbed *rocket scientists*, and later *quants*. Global exchange rates were floating freely; restrictions on international capital flows began to evaporate, and their volume rose steadily. Information technology became increasingly integrated into global finance. In the decades that followed, financial markets were rapidly expanded, deregulated, and diversified, propelled by a free market vision of the future quite unlike the dream of cybernetic socialism that inspired Cybersyn.

In his novel *Synco* (2008), the Chilean sf writer Jorge Baradit offers an alternative history of Project Cybersyn. It opens six years after the military coup of Chile in 1973 that, in a parallel version of events, is dismantled with the assistance of Pinochet. The completion of Synco—"the hidden leviathan … the mechanical eye of socialist Chile" (Baradit 29-30)—has transformed Chile into a fully fledged cybernetic state.[4] The country's capital of Santiago provides the backdrop for the main action of the story, and it is here that the protagonist Martina returns after some years in Venezuela. She is startled at the changes wrought by Synco, and soon she becomes disquieted after witnessing the full extent of its political influence and surveillance. While the circumstances that lead to this totalitarian regime are never fully explained, it is implied that a cybernetic model of government is inextricable from centralized state control, and that the collaboration between Pinochet and Allende serves to bolster the system. Synco's power grows and by the end of the novel, its network begins to effect changes in the language and geography of Chile. In the final scenes, as Martina is flown out of the country, she sees military jets heading the other way for a final showdown with this "god made of wires" (230).

Baradit's sf rendering of the Cybersyn story is partly a testament to the imaginative energies of the project and its bid to create the conditions for a technologically driven socialist utopia. The design of the futuristic operations room offers a visual frame of reference for these ideas and has been described as "the symbolic heart of the project" (Medina 88). Complete with control panels, multiple screens, and white swivel chairs, the room was to be a hub for senior members of the government to evaluate data and respond to changes in the economy. Photographs of the room have often been shown alongside writings on Cybersyn, images of a socialist future and space of possibility that seemed available to Chile in the early years of the 1970s. On the other hand, the dystopian currents in *Synco* draw attention to the disparity between such visions and difficult

political realities, and the dangerous tendencies that may be latent in socialist schemes of governance.

The novel's bleak view assumes the inevitability of Cybersyn's techno-totalitarian trajectory. The actual project, by contrast, was fragile and fledgling. Its computing resources were minimal. Devoted to a broadly "decentralizing, worker-participative and anti-bureaucratic" form of economic management (Beer, *Brain of the Firm* 257), it was tantalizingly poised between a model and the thing itself. Along these lines, Medina maintains that "there is historical value in studying innovative technological systems, even if they are never fully realized" (10). The recognition that systems like Cybersyn cannot be measured only by the logic of "what happened" is an important one and returns us to the question of making visible alternatives to dystopian economic computation. The lens of science fiction provides fertile ground on which to continue this inquiry and further test the limits of the cybernetic imagination.

Utopia Computed: *The Dispossessed*. Among the major utopian and dystopian works of the twentieth century, Le Guin's *The Dispossessed* is one of the few that writes against the grain of economic computation as totalitarian superintelligence. The novel is set between the twin worlds of Urras and Anarres, and this latter world is the site of the "ambiguous utopia" of Le Guin's subtitle. In Anarres the economy is organized according to anarcho-syndicalist principles, uses no money, and is without government, law, or property. The economy's computational features are a detail easy to miss in a novel more concerned with exploring the education and socialization of its characters. In Anarres, however, it is "computers" that coordinate "the administration of things, the division of labor, and the distribution of goods" (86).

Le Guin writes of the "computers" rather than a supercomputer or singular AI and, while she does link them with the "brain" of society—which is somewhat minimized in Abbenay, the *de facto* capital of Anarres—unlike in more pessimistic portrayals, the computers are generally not personified. In fact, they are barely mentioned. In their few fleeting appearances, however, an affinity between computation and centralization is established. According to the philosophical tracts that inspire Anarresti society, there should be no "controlling center, no capital, no establishment for the self-perpetuating machinery of bureaucracy and the dominance drive of individuals seeking to become captains, bosses, Chiefs of State" (85). Abbenay's concentration of administrative and computational power therefore represents a pointed departure from a foundational utopian plan and is instead cast as a permanent site of contestation.

The computers are part of the Division of Labor Central Posting offices, or Divlab, which "with its computers and its huge task of coordination, occupied a whole square" (223). Nevertheless, even as Le Guin invites us to admire Divlab's efficiency, she also evokes an ominous sense of surveillance, insofar as Divlab uses its computers to coordinate *every* job, *every* position, *every* worker:

> The human/computer network of files in Divlab was set up with admirable efficiency. It did not take the clerk five minutes to get the desired information sorted out from the enormous, continual input and outgo of information

> concerning every job being done, every position wanted, every workman needed, and the priorities of each in the general economy of the world-wide society. (224)

Furthermore, Divlab's work assignments are not always wanted. For instance, the avant-garde musician Salas is unable to secure a posting as a composer. He is offered, but refuses, a posting as a music teacher and ends up doing manual labor instead. Likewise, the controversial playwright Tirin qualifies as a mathematics instructor and yet is posted to a road repair crew in a small outpost community. "He protested it as an error, but the Divlab computers repeated it. So he went" (146).

Divlab's pronouncements are not enforced, however. There is no law to compel the Anarresti, so a job posting is "not an order" (129). In theory anyone who wishes can just "live anywhere and do nothing but get up twice a day and go to the nearest commons to be fed" (224-25). An ethic of solidarity and mutual aid compels labor: "The choices of the social being are never made alone" (225) and "the opinions of the neighbors become a very mighty force" (130). Divlab also appears to offer workers as much choice as possible, constrained by an understanding of who is qualified for what. When Shevek discovers that he cannot follow someone he loves to a research center in the desert, even in the midst of desolation he acknowledges that "the options were endless" (224).

Just as importantly, Divlab's objectives are conjured democratically. Le Guin uses the word "coordination" to describe Divlab's activities, rather than *planning* or *control*. While she keeps its democratic traditions shadowy, they likely involve some form of deliberation and balloting in order to synthesize decisions made at the syndicate level. Throughout the novel, jobs are often described in rotational terms, and we may plausibly imagine Divlab being staffed according to a system of rotation or sortition (cf. Sabia 117-18).

Thus, while Divlab computes vast amounts of information about the economy's priorities, a studied ambiguity is palpable in this process. The degree to which those priorities are decided by Divlab, or decided elsewhere, is not specified, indicating a shifting, contested dynamic. A computationally organized economy does not signal the end of politics, but rather shifts the ground on which political struggle occurs:

> But, as they said in the analogic mode, you can't have a nervous system without at least a ganglion, and preferably a brain. There had to be a center.... The computers … and the central federatives of most of the work syndicates, were in Abbenay, right from the start. And from the start the Settlers were aware that that unavoidable centralization was a lasting threat, to be countered by lasting vigilance. (86)

Cybernetic theory is certainly implied in this dynamism, and in the "analogic mode" which frames society as organism. But Le Guin does not go into the details.

To uncover richer connections between cybernetics and Le Guin's imagined economy, we need to exercise both imagination and economy. First, as Laurence Davis puts it, Anarresti society is "concerned predominantly with preserving its existence," while also acknowledging that undue conservativism can be

counterproductive, and seeking to maintain "the conditions necessary to nourish a degree of social dynamism and change" (17). Anarresti society, "properly conceived, was a revolution, a permanent one, an ongoing process" (151):

> However vast the distances separating settlements, they held to the ideal of complex organicism. They built the roads first, the houses second. The special resources and products of each region were interchanged continually with those of others, in an intricate process of balance: that balance of diversity which is the characteristic of life, of natural and social ecology. (85-86)

At the same time, the word *organicism* may also imply a critique of overly mechanistic cybernetics. Archie J. Bahm suggests that organicism, "when compared with cybernetics, although it recognizes mechanical aspects of the behavior of all things … prefers to explain systemic (including personal and social) interactions as dialectical rather than in terms of deviation, homeostasis, and feedback mechanisms" (214). The word does not appear elsewhere in *The Dispossessed*, but the metaphor of society as organism runs through the novel: it is an important part of the visionary Odo's teaching and referred to as "the Analogy." Moreover, the organic is frequently aligned with positive sociality, especially mutual aid, solidarity, and effective social coordination: "You're thirty, aren't you? By that age a man should know not only his cellular function but his organic function—what his optimum role in the social organism is" (221).

More subtly, the relatively understated role that computation plays in the novel's plot and setting can *itself* be read as a statement on the status of computation in Anarresti society. The presence of computation in the economy does not mandate a struggle between human and machine. Automation is an extension and an elaboration of existing human agency, operating discreetly to rearrange and modulate social relationships, rather than invading or usurping those relationships. Human and machine peaceably share an ontology.

What values might this system be seeking to optimize? Le Guin comments on the role of technology on Anarres by distinguishing Anarresti anarchism from a conjectural primitivist variant. The Anarresti "knew that their anarchism was the product of a very high civilization, of a complex diversified culture, of a stable economy and a highly industrialized technology that could maintain high production and rapid transportation of goods" (85-86). Anarresti anarchism is to some extent technoscientific. This emphasis on "high civilization" and "complex diversified culture" also distances Anarresti civic virtue, and the way private interests are suppressed in Anarresti culture differentiates it from more ascetic strains of anarchism. On Anarres, frugality is not good for its own sake, nor is it necessarily good for the community. Anyone who is excessively abstemious might gently be reminded of the vice of *altruism*, something every bit as dangerous as its mirror-image, *egoism*, insofar as it departs dangerously from an ethic of mutual aid.

The Anarresti are likewise interested in how the climate of their planet shapes its society. Ecological hardship, Le Guin hints, may even be a condition of possibility for Anarres. Here she is not edging into environmental determinism; rather, the Anarresti critically reflect on the material conditions which influence and instantiate their society. One likely influence on Le Guin for this

environmental framing is Peter Kropotkin's *Mutual Aid: A Factor of Evolution* (1902), which comments "We saw plenty of adaptations for struggling, very often in common, against the adverse circumstances of climate, or against various enemies" (8). Hardship and mutual adversity, as opposed to competition *per se*, are the crucible of the social on Anarres.

So, while economic life on this world does seem to be oriented toward a kind of optimum equilibrium, with the aid of mostly undisclosed computational and administrative procedures, this equilibrium is not one of maximum productive efficiency. The trade-like process of interchange between regions is not based on Ricardian comparative advantage or maximizing production. It is part of "an intricate process of balance" (Le Guin 86). Peter G. Stillman suggests that "Because the anarchist society of Anarres can respond effectively to scarcity, it can resolve the problem that Hobbes thought would lead to a state of war of all against all and require a central authority" (56). Alternatively, we might read the Anarresti as not only responding to scarcity, but also *managing and even cultivating scarcity*. The Anarresti are troubled both by having too little and having too much: "Scarcity means that society has limited resources and therefore cannot produce all the goods and services people wish to have" (Mankiw 4); for the Anarresti, scarcity is not a function of the number of resources, but a function of the relationship between *resource* and *wish*.

Thus, *plenty* is not counterpoised with *scarcity* on Anarres. In fact, plenty is even figured as a pathology, emerging where individual need does not correlate with collective need. There is no indication, however, that the computers have any direct involvement with restoring balance. Instead, when an Anarresti enjoys more than enough of something, social pressure arises both to temper the desire and to transform or destroy the resource in question. For instance, the rather zealous functions analyst Bedap criticizes Shevek's blanket: "There is no need for orange. Orange serves no vital function in the social organism at either the cellular or the organic level" (139).

The computers of Anarres are notable for one more function. They allocate procedurally generated names to newborns, at random, under the constraint that no one should share a name.

"Is it true that you get your names from a computer?"
"Yes."
"How dreary, to be named by a machine!"
"Why dreary?"
"It's so mechanical, so impersonal."
"But what is more personal than a name no other living person bears?"
"No one else? You're the only Shevek?"
"While I live. There were others, before me." (167-68)

It is a telling detail. In Le Guin's epic fantasy series EARTHSEA (1964-2008), knowing the True Name of a person confers the power to influence and transform that individual. This relatively common fantasy trope of the power of names may be seen as an enchantment or estrangement of the capacity of names, in real life, to communicate and enact categories such as gender, race, and class. Names convey not only the individual, but the individual's connectivity. Surnames in

particular "root the individual in a kin network" (Finch 712). We could then infer a practical egalitarian rationale for the Anarresti convention: without it, certain names, passed on through kinship networks of various status, might engender the first stirrings of a class system. Furthermore, annexing the traditional parental power of naming to an artificial process, symbolizing the collective, is in keeping with the Anarresti elimination of marriage and the nuclear family form.

Whether or not we actively use their guidance, names confront us with offers of guidance. That is to say, we react to names: names trigger presumptions and associations. People "might argue that someone's given name does/does not 'suit them' in some way, in terms of their embodiment" (Pilcher 2016). Moreover, when someone tells us their name, we cannot *not* react; we cannot avoid a faint network of association with other people of that name or related names, nor suppress the tacit knowledge that we have gathered from treating people as comparable, quantifiable, and available for multiple forms of analysis and classification.

The key point, then, is that people, just like machines, sometimes compute the uncomputable. The dangers of computational dystopia, such as malicious compliance or the imposition of oppressive regimes, are *already* a feature of human social relations. The Anarresti system of naming introduces a machinic element into these relations. Le Guin, with characteristic dialectical mischief, also gives us an example of this system perhaps not quite working: a rare episode of Annaresti violence occurs when a man named Shevet takes a dislike to his near-namesake Shevek. "I'm tired of getting mixed up with you" he tells him, and "knock[s] him double" (49). It does not matter to Shevet that their names have been allocated by an impersonal process.

To summarize, what appears in *The Dispossessed* is a sketch of a computational economy, provisional and imperfect from many angles, that is nevertheless a working, existing alternative to capitalism. Le Guin's computational economy combines a central economic plan for society with democratic decision-making on a syndicalist model, bureaucratic and computational efficiency, and a negotiated tension among syndicate federalism, individual autonomy, and the danger of centralized authority.

Yet Le Guin remains largely caught up in a binary of centralization vs. decentralization. Because of this, the novel does not richly or forcefully acknowledge the ways in which Anarresti social engineering is compatible with technocapital's more dispersed modes of domination, modes which were only beginning to emerge at the time it was published. But such indeterminacy is also in keeping with Le Guin's utopian method; that is, even as *The Dispossessed* depicts an alternative to capitalism, it does not foreclose a future of capitalism. Rather, in the juxtaposition of Urras and Anarres we are invited to measure the human distance between a capitalist-authoritarian state regime and a perpetually imperiled anarchist utopia.

Utopia Run by Computer: *If Then*. In *The Dispossessed* utopian computation is a device that gives shape to the various innovations and struggles of Anarresti social relations. The ambiguity of Le Guin's utopia comes from the prospect that

some Anarresti are being stifled to sustain a social order in which most flourish. This tension signals the long-term fragility of the utopia as well as the need for constant cultural and political renewal, and a creative vigilance against a creeping centralization and bureaucratization. The technicity of computation and its relationship to society is left largely to one side. Therefore, to interrogate the social effects of the technical, we consider a more recent work of sf, Matthew De Abaitua's *If Then* (2015), the second in his Seizure Trilogy (2007-2016).

Here we focus on *If Then* as an exemplary work of contemporary economic science fiction for its vision of a world where datafied social relations have taken the place of monetized social relations, within a framework of algorithmic opacity. Loosely speaking, it is a dystopia, or just possibly a utopia, that is run by a computer. It is set in what was once England, after the disintegration of the state and the withdrawal of the wider economy into shadowy chaos, an event called the Seizure. The novel centers on a community in the town of Lewes that is governed by a computational system known as the Process. In one sense, this is a society without money, property, government, or law. All such forms are liable to be provisionally reconstituted by the Process, however, just as they are liable to be dissolved. The character Alex Drown thus describes the basic set-up: "Instead of using market forces to distribute goods to meet needs, the Process monitors the lifestream and physiological condition of each individual within it, and then manufactures and distributes the required goods. The overriding imperative is fairness" (79).

In *If Then*, everyday life is comprehensively mediated by the Process, but its workings are mostly tucked away, hidden under the hood. The early stages of De Abaitua's story frequently emphasize the mysteriousness of the Process's reasoning as it pursues its alleged goal of social fairness. As one of *If Then*'s main characters asks, "Does this mean we now live inside the black box?" (79). Jenna Burrell points out that black-box processes give rise to an intrinsic opacity "that stems from the mismatch between mathematical optimization in high-dimensionality characteristic of machine learning and the demands of human-scale reasoning and styles of semantic interpretation" (2). De Abaitua draws attention to the confidence invested in these systems and the attendant belief in their power to generate positive outcomes that seem to defy human reason, although this immediately raises questions about frameworks of evaluation and accountability and the extent to which flexible implementation, appeal, or veto is possible.

The material instantiation of the Process is ambiguous both intradiegetically and extradiegetically. The Process is spread throughout the landscape, perhaps suggesting an extrapolative vision of ambient computing and the Internet of Things. The Process occurs in "the computational matter" that is kept "[h]ere and there" (47). Whatever the Process is, it is certainly not something contained within a set of conveniently unpluggable machines: "It is hard to say where any of us ends and the Process begins" (329). The observations of the animal world—a fox (29), a rook (47)—provide the Process with extra data for its calculations. The population of Lewes is fitted with invasive surveillance biotechnology: at a minimum, the broadcast-only "stripe" and, in a few cases, an implant that both sends and receives data: "We're exploring correlations between the digital and

biological. Some of them are merely analogous but significant findings indicate that, operationally, we can move data from one to the other" (47).

While the novel emphasizes the adaptability and mutability of the Process's population, the data these characters generate through their lived experiences and memories mark them as creatures of capitalism. At one point, for example, Jane figures the Process's activity on the model of product design, testing, and iteration: "Jane's stripe would register her elevated body temperature, the nagging discomfort of the dress, her irritated adjustment of the straps and this data would inform the next iteration of dresses" (25-26).

The Process also retains a link to capitalism insofar as it "is partly composed of algorithms and associated data sets that evolved under the pressure of the needs of billions of consumers, salvaged from the internet and transferred to ... biotech" (68). Those who study the Process notice relict algorithms "from financial services, dating agencies, retailers, market research, some from national health monitoring, some from national security agencies" (69), as well as other sources:

> He walked the orderly line of repairmen with individual placards detailing skills offered and services required. This was residual behaviour, rendered unnecessary by the Process. Their skills and availability would be sorted algorithmically and bartered accordingly with other townspeople and their labour; that was how the Process generated the core work schedule for the town, and gave meaning to labour that had become meaningless. But the market had a role to play that was more than trade. It was a social occasion, a chance to get out, to see and be seen. The metrics of happiness required old rituals, old ways of doing things, and so time was set aside within the work schedule for the townspeople to make their own trades. (52)

The tricky, quasi-market character of the Process reflects the contemporary prominence of the digital platform as a form of economic organization. Prominently exemplified by companies such as Airbnb and Uber, the platform can be an apparent contradiction in terms: a kind of private market. The techniques of economic system design which underlie platforms were developed from the 1970s onward in the fields of mechanism design, game theory, and institutional economics, as new financial instruments were invented together with the markets on which they could be traded, and as governments and other actors sought to transfer planning to specially designed smart markets. In this sense, mainstream economics has undergone a shift "from the description of markets 'from the outside,' as it were, to participation in the design and implementation of markets as hands-on engineers of the economy" (Mirowski 154). The platform is likewise a mixture of centralized and decentralized features, disrupting the binary which shapes *The Dispossessed*, as well as many less nuanced imaginings of computational economies. Platform owners cultivate the effects they desire by manipulating the protocols through which its agents recognize and interact with each other, rather than by forming plans and promulgating commands. In their plurality, digital platforms also make visible a fact that has only been sporadically understood even within mainstream economics for nearly half a century: markets are heterogeneous formations, shaped in complex ways by many layers of design.

In a similar way, the Process is a layered and constantly evolving system, assimilating ingredients from beyond its boundaries and ejecting unwanted elements. As suggested previously, this evolution is supposedly guided by fairness. The Process "monitors and meets the needs of the people within it" (De Abaitua 40), and "reconciles the strivings of individuals within a framework of mutual benefit" (39). The Process "is the future of mankind. It is the best way to ensure the maximum amount of fairness in society" (328). Fairness is mentioned a number of times: the Process "is supposed to create absolute fairness" (76); the Process "will make a fair society" (79); the "overriding imperative is fairness … composed of over a hundred and twenty metrics" (79).

But De Abaitua's England is also a place where fairness appears to have lost its familiar associations. Instead it is established in a manifold of metrics, echoing contemporary proposals to soften capitalism by directly quantifying and targeting human wellbeing, to "measure progress more holistically, developing a broader set of metrics and reducing the importance of GDP figures" (Trebeck and Williams 207). In De Abaitua's narrative, the result is a version of fairness that is almost unrecognizable, despite the efforts of the townsfolk to imagine and to make practical sense of it. *If Then* presents this situation as the consummation of longstanding tendencies within global capitalism; the value of labor has steadily declined under pressure from algorithmic trading, management, and design, and other forms of automation, as well as cheaply exploited overseas labor. People have "ceased to be a vital component of the economic system" (78), and public services such as libraries and hospitals have been dissolved into swarms of assets. These are disintegrated and reintegrated by algorithmically governed finance in pursuit of value and without apparent regard for their wider communities of stakeholders. Even core state functions such as national security and the rule of law lose their autonomy and are redistributed according to technologically derived metrics. Yet, "To call what happened next a collapse or a Seizure was to speak from an anthropic perspective. From the point of view of the financial instruments themselves, the system was thriving" (78).

The Process is (by analogy with disaster capitalism and disaster socialism) disaster algorithmic governance. From its early pages, *If Then* frames the Process as an agency both materially transformative on a macro scale and capable of neurologically influencing characters to reshape their perceptions and memories. In the aftermath of the Seizure, it offers hope that an "anthropic perspective" will be reasserted against "the point of view of the financial instruments themselves" (78). Yet the genre-savvy reader knows that even the best-intentioned utopias may go badly wrong, and the utopian promise of the Process is communicated through some decidedly shifty characters, such as Alex Drown and Omega John, under the aegis of The Institute. As it turns out, the society which the Process gradually builds seems as far from humane and fair as can be imagined. In the second half of the novel, it re-creates the bloodshed and suffering of the First World War, specifically the conflict between Britain and the Ottoman Empire at Suvla Bay in 1915.

To smooth the transition from near-future Lewes to wartime Lewes, *If Then* plays on various homologies and resonances. For example, the first half of the

novel explores a jingoistic English imaginary grounded in disjointed temporalities, as though it were Hitler's death camps that spurred the British to liberate Germany and then establish their Empire. When everyday life in bucolic England is already shaped by pervasive misremembrance of spatially and temporally distant conflicts—and the desire for a community that can "[face] the worst" and affirm its authentic self through resilient suffering and redemptive sacrifice—it proves uncanny, rather than unintelligible, when those conflicts stir to life. Furthermore, life in algorithmically governed Lewes has a dreamlike quality, which intensifies into a dissociative fugue on the quasi-illusory, blood-soaked Ottoman Gallipoli peninsula. Conversely, the World War itself is framed as a kind of algorithmic process, incorporating human agency as it unfolds but ultimately transcendent of that agency: "We can't apprehend the truth of this war because we are under the influence of it" (De Abaitua 289); "The suffering here will never end. It has become energy. Indestructible and ever present" (323).

While these factors blur the division between the novel's two halves, they stop short of integrating them into an explicable sequence of events. Whatever reasons there are for the cruelty and destruction, they are mostly obscured by algorithmic logic. But Omega John insists that the duplicated Suvla Bay offensive is a justifiable means to an end, and that the Process can fashion a counterintuitive best of all possible worlds: "the Process has—on some level—calculated that its dominion must be expanded in the future, and urgently, if it is to ensure fairness for all, and to avert a greater disaster" (329). Of course, "to avert a greater disaster" is a standard formula used to justify all manner of war and violence, and at this stage in the story Omega John is largely coded as supervillain so that readers are invited to distrust him. But the fact that a faint doubt may linger, even in the midst of massacres, is testament both to the opacity of the Process and to its capacity to harbor utopian hope, however contradictory the experience of such hope might be.

Conclusion. Discussion of *The Dispossessed* and *If Then* has drawn out some of the complexities of utopia in computational economies. Just as it has been important to historicize the development of computer science, cybernetics, and economics, it is important to read these works in the context of their corresponding historical moments. *The Dispossessed* emerged at a time when cybernetics as a unified, disciplinary study of biological, machinic, and social systems was losing traction as a practical basis of policy; *If Then* came at a point when the constructed and computational character of markets had been substantially integrated into everyday experience through the rise of platform capitalism. In both novels, utopia is an ambiguous prospect that nevertheless materially shapes the conditions of its respective societies. In Le Guin's Anarres, the cost of your utopia may be concealed from you: the exclusion of curious neighbors and the suppression of dissident desire. In De Abaitua's Lewes, you are plunged into uncertainty as to whether the artificial hell you experience may not, in some categorically inaccessible yet overriding sense, actually be heaven.

The other ambiguous motif we highlight here concerns the computable, and how far it may be possible to extrapolate computational economies that are not

dystopian or that do not rely on forms of technocapital. By reading across diverse contexts, and by emphasizing both history and fiction, we have sought to recover alternative currents of thought and practice and to reassess the contemporary imaginary of the computed economy. Science fiction's suitability to this task—and that of redefining the horizons of the possible—has been widely acknowledged. Its techniques of defamiliarization can be used to create clearer pictures of the present or to articulate a broader range of visions for the future. We argue that sf should also be allowed to dwell in strangeness and difference. When mobilized critically, sf narratives have a tendency to collapse into normative claims about what should happen or diagnostic accounts of what has happened. We caution against the flattening and closure implied in such instrumentalizations. Novels such as *The Dispossessed* and *If Then* dismantle positive-negative paradigms to encourage a more fruitfully ambivalent approach to technology and social change. Further, these works disturb our present with their own histories and simultaneously open us up to the many co-presents of computational, economic, and utopian thought.

NOTES

1. The term design fiction comes from Julian Bleecker's work, and the idea of diegetic prototyping from David Kirby's.

2. It is worth noting, however, that there is a rich field of financial and economic experiments (some proposed, some implemented) being tested for their potential to radically alter or even dismantle capitalist society. Projects such as FairCoin and EnergyCoin seek to redeem blockchain-based currencies from their right-libertarian origins. Platform co-operativism explores how digital tools can contribute to governance of the commons. Delic, and many other projects involving attention-tracking and micro-payments, seek more just and fine-grained ways of discretizing and remunerating work. The Robin Hood Co-op, the world's first co-operative hedge fund, hopes to use blockchain technology to radically widen access to financial markets. Like the sf texts we explore in this article, these projects and many others articulate alternative currents of thought around the computed economy. Investigating them in detail lies beyond our scope here.

3. In a review of *Red Plenty*, Adam Roberts contends that the book "is science fiction, although of an original and unusual sort…. The speculative portion of the science here is the striking attempt by Vitalevich and Nemchinov to modify the catastrophically inflexible Soviet economic model with a mechanism—'shadow prices'—better able to match supply to demand without simply instituting Capitalist 'free' markets."

4. All quotations are translated by the authors of this paper.

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ABSTRACT

This article connects the recent flourishing of economic science fiction with the increasing technicity of contemporary financial markets, to pose questions about computational economies, both historical and fictional, and their ambiguous utopian currents. It explores examples of computational economies and societies in which economic resources are largely defined and allocated by computational systems to challenge—if not entirely dispel—assumptions about the inextricability of computation and the dystopian specters of capitalism, authoritarianism, and totalitarianism. The article puts insights from the histories of cybernetics, computer science, and economics into dialogue with sf novels that experiment with different sociopolitical configurations of computational economies. The novels that are the primary focus of the discussion are *The Dispossessed: An Ambiguous Utopia* (1974) by Ursula K. Le Guin and *If Then* (2015) by Matthew De Abaitua. The article concludes with some thoughts about the use of history and fiction for expanding the imaginative horizons of the computable in economics.