6 SYSTEMS SEDUCTION

THE AESTHETICS OF DECENTRALIZATION

Gary Zhexi Zhang

> Ecology in the widest sense turns out to be the study of the interaction and survival of ideas and programs (i.e. differences, complexes of differences) in circuits.[1]

How do we deal with unimaginable complexity? Today, the prospect of ecological crisis looms over our every move, as new technologies unfurl absentmindedly into the political realm, somehow managing to disrupt a biosphere in the process. In so many areas of art and science, our situation demands that we think in terms of heterogenous systems and porous boundaries. Today, as the artist Hito Steyerl once put it, "an upload comes down as a shitstorm."[2] The 1972 publication of *The Limits to Growth*, which warned that the world system would collapse in one hundred years given "business as usual," served timely, epochal notice on our vision of exponential "progress."[3] Moreover, its use of Jay Forrester's World3 model of planetary systems dynamics prefigured our contemporary obsession with data and simulation for understanding where we are, and where we're headed. As Joichi Ito's "Resisting Reduction: A Manifesto" suggests, the once unpopular interdisciplinary science of cybernetics has returned as a paradigm through which to understand knotted social, technological, and environmental issues.[4] A cybernetic vision of open systems and regulatory

feedback seems to offer a conceptual schema through which we might negotiate a more hopeful future, or at the very least, weather the shitstorm. Meanwhile, the internet has brought information networks out of the realm of military engineering and metaphysics and into the fabric of social life itself. Unpredictable networks and ecological entanglements confront us daily, from fake news to climate change, to remind us of our lack of control—a little hubris goes a long way. The challenge is to develop new strategies, polities, and intelligences that can engage in these complex systems with humility and care.

What is lost and what is found when we answer the call to think "ecosystemically"? In what follows, I want to take a step back, in order to contextualize the resurgence of the "systems approach" and its bearing on how we understand technology and society. In doing so, I consider this nebulous discourse as both an ontological enquiry and, increasingly, a design brief. In his *Theory of Moral Sentiments*, the political economist Adam Smith refers to the "spirit of system" as an "intoxicating" impulse that is "founded upon the love of humanity," yet whose trajectory can also be "[inflamed] to the madness of fanaticism." For Smith, the zealous "man of system" imagines he can "arrange different members of a great society" like pieces on a chessboard.[5] The cybernetic approach, on the other hand, invites contingency and perturbation, emphasizing dynamism and resilience in a nonlinear world. Nonetheless, the "spirit of system" is still going strong, nowhere more evidently than in the feverish discourse around blockchain, whose evangelists suggest that a new protocol will transform society for the better. Today, decentralization is the dominant paradigm through which we think about systems. To the apparent failures of central planning and the confrontations of complexity,

decentralization presents itself as a sociotechnical panacea: by giving a little more agency to the parts over the whole, we could make way for emergent interactions of a truly creative kind. From asynchronous logistics to embodied intelligence, contemporary practitioners are mobilizing self-organizing behaviors to navigate, optimize, and negotiate complex ecologies. If the systems approach offers a conceptual schema for how the world works, then decentralization offers a political theory for how it *should* be organized—one that is being advocated across the ideological spectrum, from libertarian Silicon Valley capitalists like Peter Thiel to commons-oriented activists like the P2P Foundation. But what does it mean to design for the part over the whole, govern for the individual over the collective, build the platform over the society?

I call this the *aesthetics of decentralization* because it deals not with a particular set of facts, but something more like a diagram, a "spirit," and a mode of production visible across many disciplines, throughout the last century and increasingly in the present. Here I follow the philosopher Jacques Rancière's understanding of aesthetics as the "distribution of the sensible,"[6] a sensorial training through which we learn to acknowledge the world, and correspondingly, the techniques by which the world is "given" to our senses.[7] The way we see, the cultures we foster, and the technologies we build consolidate an aesthetics that defines *what we think the system is*: and in turn, our place and identity within it. These techniques demarcate what is knowable and thinkable; what is self-evident and what is left out. The development of an aesthetics can be understood as a kind of patterning, a sensorial patina that determines what is meaningful signal and what is lost to an ocean of noise.

The Seduction of Systems

The history of systems thinking is a story of desire and anxiety, as Norbert Wiener, the pioneer of cybernetics, knew well. "Like the red queen," he wrote, "we are running as fast as we can just to stay where we are."[8] Perhaps this anxiety is inevitable, as we can neither hope to control "the system" in its entirety nor absolve ourselves of our agency and let complexity do its work. Though the cybernetic approach to systems is generally associated with the dawn of information theory in the mid-twentieth century, the impulse to understand the world through a science of organization predates the invention of bits and bytes. The late nineteenth century saw a powerful tendency toward the synthesis of social theory with a materialist philosophy of nature, galvanized by techno-scientific advances and revolutionary political fervor. Following Karl Marx's "materialist conception of history," Vladimir Lenin famously proclaimed that "everything is connected to everything else."[9] Meanwhile, Alexander Bogdanov, Lenin's intellectual comrade and later his ousted political rival, was arguably the first modern systems theorist. Between 1901 and 1922, Bogdanov, a physician, philosopher, economist, science fiction writer, and revolutionary, developed a monumental work of "universal organizational science," which he called "tectology."[10] "All human activity," he wrote in 1913, "is . . . organizing or disorganizing. This means that any human activity, whether it is technical, social, cognitive or artistic, can be considered as some material of organizational experience and be explored from the organizational point of view."[11] Tectology is seldom discussed today, but readers of Wiener's cybernetics or Ludwig von Bertalanffy's general systems theory should notice deep affinities with those later sciences of organization within Bogdanov's writing.

Later, Wiener would argue: "Information is information, not matter or energy. No materialism which does not admit this can survive at the present day."[12] Though earlier monist philosophers, like Spinoza or Lucretius, had also understood nature in terms of a universal "substance," Bogdanov sought a formal theory of its regulatory dynamics, "from the point of view of the relationship among all of its parts and the relationship between the whole and its environment, i.e. all external systems."[13] Indeed, Bogdanov understood the physical realm of the natural sciences and the ethereal stuff of communication, cognition, and consciousness as part of the same living "currency," foreshadowing the expansive commodification of intangible quantities such as attention and affect by our contemporary data industries.

Bogdanov's ideas echoed a late nineteenth-century impulse toward a totalizing system of nature, combining the natural sciences with a nascent social science and moral philosophy. The term *tectology* was in fact borrowed from the German artist and naturalist Ernst Haeckel (renowned for his richly detailed illustrations of flora and fauna), who coined it to describe the "science of structures in the organic individual." For Haeckel, the organization of biological species formed part of a "world riddle," by which he understood the nature of matter and energy to be consistent with that of consciousness.[14] Meanwhile, Haeckel's contemporary in England, the biologist and polymath Herbert Spencer, developed a totalizing "synthetic philosophy" undergirded by evolutionary theory and thermodynamics. Spencer conceived of society as a "social organism"—an evolved, self-regulating system, even claiming morality to be "a species of transcendental physiology,"[15] and comparing the legal contract to the exchange of substances between the internal organs.[16] For an era captivated

by the sciences of ecology and evolution, the biological metaphor would be an enduring one, weaving human beings into the tapestry of nature, and more darkly, evincing the existing social order as an extension of "natural" law.

For Spencer, the growth of increasingly complex systems produced a "mutual dependency between parts" by which different "organisms" could be understood by analogy. Moving fluidly between scientific inquiry and social inquiry, he mobilized his theories in support of a radically libertarian agenda that was at turns utilitarian, individualist, and ultimately profoundly conservative. A fierce critic of social reform, he viewed social welfare as enslavement to the state; societies, like species, were subject to the "survival of the fittest" (a phrase he coined), and thus develop most ideally when they are unrestrained by government. Indeed, today Spencer is perhaps best remembered (along with Haeckel) as one of the founding thinkers of what became social Darwinism, a discourse whose darker undertones led to eugenics. 'The law of organic process," he wrote, "is the law of all progress."[17] Victorian capitalists like Andrew Carnegie took great comfort in Spencer's evolutionism; the powerful understood their positions to be not only optimal for society, but confirmed by the natural order.[18] Spencer's immensely influential organicist "theories of everything" exemplified the systematic impulse of the late nineteenth century, prefiguring the organizational sciences of the twentieth. As Wiener would later emphasize, communication and control are two sides of the same coin: the prospect of systematic knowledge through biological or statistical abstraction gave "scientific" credence to grand conjectures of social structure. Mathematics turned to politics, biology to morality; the systematic imaginary of biological order propagated across society and culture by the passage of translation and

metaphor. Thomas Robert Malthus, for instance, whose book *An Essay on the Principle of Population* (1798) anticipated *The Limits to Growth*, concluded his grim demographic forecast with proposals for reproductive constraints on the poor.[19] (His book, in turn, had a profound influence on Darwin's theory of natural selection). Then, as now, such assured prescriptions on societal organization seldom engaged with the lives they most deeply affected or threatened the privileged status of the prescriber.

Ecology and the Rationalization of Nature

As Adam Smith observed, a utopian impulse underlies the "spirit of system." ("Whose utopia?" remains the question.) Furthermore, systems are beautiful: modern, biologically inclined theories of organization were not mechanistic, but dynamic and creative. They invoke a choreography of lively actors whose aggregate local interactions seemed to produce a universal harmony. By intimating these rhythms and cadences, systems theory promised to reveal deep structures beyond the surface of the visible world. As a boy, Wiener was himself an aspiring naturalist; he would later reflect that "diagrams of complicated structures and the problems of growth and organization . . . executed my interest fully as much as tales of adventure and discovery."[20] The enlightenment narrative of man's transcendence over nature was replaced by something arguably more sublime, a vision of humanity intricately enmeshed within the web of life. Karl Marx wrote, "What distinguishes the worst architect from the best of bees is this, that the architect raises his structure in imagination before he erects it in reality."[21] A capacity for imagination and structure invokes the two-handed nature of the systems aesthetic: one hand, held captive

by wondrous complexity, and the other, raised toward abstraction, rationalization, and control. One could call the latter a technological impulse, following Heidegger's understanding of technology as a mode of "revelation."[22]

The dawn of analog electronics introduced the logical schema of electrical engineering into the ecosystemic imaginary, and, in doing so, took systems thinking from the discourses of philosophers into the hands of engineers. Circuit notation enabled the spatial representation of physical relationships through electrical schematics, lending systems theory the calculative aura of mathematical equations. In the 1950s, the pioneer of systems ecology, Howard T. Odum, developed an "energy circuit language" called *energese*. In his wide-ranging analysis of pine forests, atmospheric gas cycles, and socioeconomic systems, Odum utilized an inventory of symbols borrowed directly from electronics, while also adding a host of his own, more abstract glyphs, such as a hexagon representing "self-regulation" or dollar signs representing an economic transaction.[23] Echoing the military origins of cybernetics, these "black boxes" made ecosystemic complexes visible and operable to the minds of engineers. In turn, this diagrammatic approach would be used to form a rationalistic model of far less quantifiable systems. Odum's textbook, *Environment, Power and Society* (1971), includes an extraordinary chapter entitled "An Energetic Basis for Religion," in which he maps an ecosystemic model of moral activity. "Religion," writes Odum, "consists of programs of learned human behavior shared with other people and taught in religious institutions controlled by religious leaders."[24] In one diagram, the sun's energy flows into the realm of "good works" and "soul," which in turn is wired up to a rectangular program labeled "Natural Selection, Pearly Gates." Meanwhile, "Disordering Hell's Fire" is represented

by an electrical base, connected to a constellation of symbols labeled "Realm of the Devil's Works."

As an inherently reductive methodology (Odum called his method a "detail eliminator"), the systems approach is characterized by a tension between its expansive application to ever more complex worlds that, in turn, would inevitably overflow its capture. Odum's analysis is curiously resonant with the writings of surrealist French philosopher Georges Bataille, for whom the surplus energy of society—the "accursed share"—would find its ultimate expression in the glorious excess of opulence or war.[25] In the allegory "The Solar Anus," Bataille imagines the earth as a planetary organism, sublime and abject, in the cyclical throes of erotic eruption.[26] At every moment, like entropy's "disordering fire," the ontological anxiety of chaos seeps into the sciences of control. Whether in Spencer, Odum, or Bataille, the nominally rationalistic schema was seldom more than a few steps away from theodicy. "In a very real sense," Wiener would write in *The Human Use of Human Beings* (1950), "we are shipwrecked passengers on a doomed planet."[27]

The Aesthetics of Decentralization

Like the cybernetics of Wiener and his colleagues, Odum's systems ecology invoked a world of lively matter, both living and inert. "Purposeful mechanisms," he wrote, "are self-organized into a decentralized program of ecosystem control."[28] If decentralization describes the nature of a global system without a single source of control, self-organization can be understood as the interactive local dynamics by which global order is constituted. The enduring influence of this idea proliferated across disciplines, from geology to computer science, perhaps

most famously in Lynn Margulis and James Lovelock's "Gaia hypothesis," the controversial proposition that the earth is a self-regulating "organism." With the birth of cybernetics, decentralization and self-organization became not only the principles of systems theory, but the tenets of systems design and engineering. The first, and arguably most elegant, example of this was W. Ross Ashby's "homeostat." The English psychiatrist modified and connected four Royal Air Force bomb control units to produce a machine capable of responding to environmental perturbations and returning to equilibrium. For Ashby, the homeostat's "ultrastability" was analogous to the brain's capacity for learning, as well as to the evolutionary process of natural selection—adaptive behaviors within dynamic environments, whose implicate order was purposeful in appearance only.

From an administrative view, decentralization involved the automation of control. Decentered from the behavior of individuals, organization was an emergent property of the system as a whole. The idea that systems were, to some extent, essentially autonomous would be of powerful inspiration to artists, dreamers, and technocrats alike. It evinced unpredictable, responsive, and creative systems—more collaborator than instrument—producing intricate patterns of order far beyond their designers' limited prescriptions. These patterns could be found everywhere, from computational cellular automata to the distribution of human societies. Stewart Brand's countercultural "bible" of the late 1960s, the *Whole Earth Catalog*, is littered with references to chaos theory, ecological metabolisms, and "whole systems."[29] For Brand, Buckminster Fuller, and other leading futurists of the hippie generation, the beauty of self-organization affirmed the "bottom-up" transformation of society and the self against the destruction wrought by

centralized governments and corporations. Self-organization gave them hope: the dissemination of technology and knowledge would engender forms of individual self-actualization they believed were necessary for a more utopian society to take shape.

In 1968, Jack Burnham, an artist and writer who was then a fellow at the Center for Advanced Visual Studies at MIT, published an essay entitled "Systems Esthetics." "We are now in transition," declared Burnham, "from an object-oriented culture to a systems-oriented culture." For Burnham, the "creation of stable, on-going relationships between organic and non-organic systems" within all "matrixes of human activity" was now the primary context for artistic and aesthetic investigation.[30] In 1970, Burnham organized *Software—Information Technology: Its Meaning for Art* at the Jewish Museum in New York. The exhibition featured leading conceptual artists of the day such as Vito Acconci and Hans Haacke, new media art pioneers such as Sonia Sheridan and Nam June Paik, and Nicholas Negroponte's Architecture Machine Group, which would later become the MIT Media Lab. Although it was, at the time, an unqualified technical and financial disaster that contributed to the dismissal of the museum's director, *Software* was a landmark experiment in which artists and technologists investigated information technology not as mere tool or entertainment, but as process and cultural paradigm. In Negroponte's contribution, *SEEK*, a group of gerbils inhabited an architectural environment made of modular blocks, which were manipulated by a robotic arm in response to the gerbils' movements. As it turned out, the gerbils were not model citizens for Negroponte's cybernetic "city," choosing instead to attack each other.[31] Ironically, Negroponte's morbid experiment exemplified the enduring influence of self-organizing,

emergent principles on architects, planners, and social scientists to this day. With simple rules and responsive environments, it suggested, complexity performs itself. The "social organism" of the nineteenth century grew into the evolutionary algorithms, "soft architecture machines," and artificial societies of the information age. As the gerbils might attest, these models often stumbled over their own ambition, more reflective of the will of the designer than of intelligent design itself.

Meanwhile, over at RAND Corporation, Paul Baran was working on the schematics for a distributed communications network that would become ARPANET, the precursor to the internet. The principles of decentralized organization reified the idea that stability and control could be built into a system through its morphological, protocological, and infrastructural design. Not only were decentralized systems more resilient to perturbation, but their asynchronous logistics and self-regulating feedback could efficiently automate complex processes once relegated to burdensome (and vulnerable) centralized management. Again, Bogdanov was prescient here. In his science fiction novel *Red Star* (1908), the Soviet theorist imagines a decentralized, self-regulating economic organization known as the "Institute of Statistics." Set in a communist society on Mars, the Institute would "keep track of the flow of goods into and out of the stockpiles and monitor the productivity of all enterprises and the changes in their work forces. . . . The Institute then computes the difference between the existing and the desired situation for each vocational area and communicates the result to all places of employment. Equilibrium is soon established by a stream of volunteers."[32] Bogdanov's technocratic utopia, imagined four decades before the invention of computers, bears an uncanny resemblance to the "smart cities" of today, in which omniscient sensors

and ubiquitous computing promise to solve all manner of sociotechnical challenges. In Bogdanov's city, through a non-coercive machinery of urban-scale regulation and control, "equilibrium is soon established" by the labors of a voluntary citizenry. As the historian of science Orit Halpern points out, contemporary ubiquitous computing is "imagined as necessary to supplant, and displace, the role of democratic governance."[33] Far from a socialist utopia, "futuristic" smart cities like Songdo, South Korea, are marketed to global elites as technologically enhanced Special Economic Zones, replete with financial deregulation, tax incentives, and luxury real estate.

Therein lies the contemporary dogma of decentralization. Since the early days of the Web, the design of decentralized information networks have developed in tandem with the libertarian ideal that, with technologies to ensure secure and unfettered communication between individuals, governance would organize itself. Though the early dreams of crypto-anarchy were short-lived, the dramatic and egregious centralization of power on the internet by corporations and states in the past two decades has returned the question of decentralization to the fore. The emergence of blockchain's decentralized, "trustless" networks are perhaps the most concrete iteration of this fantasy to date. Viewed energetically, "proof-of-work" implementations of blockchain automate the labor of institutional "trust" to the cryptographic infrastructure of the network, securing by algorithmic consensus and computational work, rather than the physical, political, and emotional labor involved in forming and maintaining social institutions. Similarly, smart contracts bind individuals via the insurance of executable code, deferring the social contract to an operating system.

Even if we are to ignore proof-of-work's disastrous impact on the environment, the contemporary discourse around

crypto-currencies largely rests on the notion that with the right technological conditions, politics and society will follow—in this case, in the direction of individual emancipation from silos of institutional power. As journalists Michael Casey and Paul Vigna write in *The Age of Cryptocurrency*, "It speaks to the tantalizing prospect that we can take away power . . . from the banks, governments, lawyers . . . and transfer it to the periphery, to We, the People."[34] When Odum proposed his systems ecology as a "detail eliminator," he was abstracting from observable phenomena in order to bring the general picture into clearer focus. Blockchain's "trustless" utopia does the opposite, reducing the full range of human activity to game-theoretic dynamics of self-interested individuals. Where the nineteenth-century philosophers concluded that sociopolitical systems behaved in accordance with evolution and competition, these "natural laws"—and the social values they encode—are now the work of systems designers and engineers. Blockchain is libertarian to its core, built for competition over cooperation, accumulation over distribution. When political organization is conceived as a genre of game design, we need to consider the values and assumptions at play, and currently, blockchain's are powerfully skewed.

My intention here is not to dismiss the potentials of distributed ledger technologies, which clearly represent an important milestone in the development of secure, decentralized databases. Rather, it is to reject the implication that technological decentralization in our ever more informatic world is inherently aligned with a more progressive trajectory for society as a whole. Despite the cacophony of political conjecture, the story of blockchain so far is a tale of financial speculation, in which the cash rewards reaped by bankers and venture capitalists are largely the result of techno-utopian hype. *Plus ça change,*

plus c'est la même chose. The prospect of decentralizing control does not absolve us of the hard work of politics, and blockchain has so far failed to transfer power to "We, the people," whatever the white papers might claim. Political economy cannot be replaced by technology alone. As Karl Marx understood over a century and a half ago, the worth we attach to technological progress is not intrinsic: it is only as valuable as the relations they produce among people. Today, technological wealth produced by society as a whole largely oils the machinery of capitalist accumulation for the few. While we have yet to witness the decentralization of control, the collective wealth produced by the decentralization of production—that is, the "sharing economy," the big data industry, and other platforms that monetize our daily social interactions—remains firmly in the service of exploitative (centralized) corporations. Whether in logistical services like Uber or social media platforms like Facebook, it is not so difficult—nor even particularly radical—to imagine decentralized, peer-to-peer services whose value is produced by and for society as a whole. Nonetheless, it would require governance, by nationalization or other means: the distributed network is not identical to the commons.

What does it mean to design decentralized systems that sit so comfortably within the regime of contemporary capitalism? If our current systems are flawed, then the technologies we build cannot be tolerant of the power structures in which we're enmeshed—attending to business as usual, albeit at an accelerated pace. "All is well since all grows better," reflected the industrialist Andrew Carnegie, happily inspired by Spencer's evolutionist thought.[35] Uncritically, the seductive power of the systems approach seems to reveal an intricate map that affirms the "nature of things" as the way they ought to be—a conservative tendency that must be resisted. As the feminist

collective Laboria Cuboniks declare in its manifesto *Xenofeminist Manifesto*, "If nature is unjust, change nature!"[36]

In "A Cyborg Manifesto," the feminist technology scholar Donna Haraway describes an emancipatory figure that is "wary of holism, but needy of connection."[37] Even earlier, in 1960, the computer visionary Ted Nelson conceived of Project Xanadu, a would-be alternative to the World Wide Web that privileged "visible connections" between links. Nelson, who invented the concept of hypertext, understood from the outset that information technologies would only make us wiser if they helped us to comprehend the ways in which the complexities of our world are interconnected. These pioneering ideas remind us that rather than deferring our cognitive and political labor to increasingly automated systems, only by constantly traversing these connections can we produce a critical and reflexive understanding of how knowledge, power, and society are organized. Through this kind of systems approach, neither siding with parts nor wholes, but forever in a process of negotiation, we might realize a more emancipatory politics and its concomitant technological forms. The aesthetics of decentralization reveals a rhizomatic scene, an intuition that our routes are chaotic and ambulatory, not headlong and domineering. As Haraway wrote, over thirty years ago now, "single vision produces worse illusions than double vision or many headed monsters . . . in our present political circumstances, we could hardly hope for more potent myths for resistance and recoupling."[38] We need to imagine systems that read signals other than market signals, that answer to dreams other than Silicon Valley dreams. Contemporary transhumanists and Singularitarians should take note of Alexander Bogdanov's pioneering example one last time: the great theorist died in middle age

from a botched blood transfusion, a process by which he had hoped to gain perpetual youth.

Notes

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Against Reduction

Designing a Human Future with Machines

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