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Chapter Eight

What Grows in Silicon Valley?

The Emerging Ideology of Food Technology

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The subtitle of Soylent creator Ryan Reinhardt's blog asks "Can Entropy Be Reversed?"¹ What might Soylent, an "open source" drink powder, have to do with the second rule of thermodynamics? Upon what table does this seemingly chance encounter take place? Furthermore, what, if anything, are the politics of such a meeting—what is at stake? The answers to these questions reach across the history of industrialization, the growth of systems theory and cybernetics, molecular biology, information theory, and the development of what Fred Turner has called "cyberculture."² We propose that as the technocapitalist startup culture of Silicon Valley has in recent years shifted its sights beyond more traditionally "digital" realms of computing and the internet towards areas like food and food production, so too have the ideologies, epistemologies, and even ontologies that found and constitute them begun to render these areas in their own terms. We will consider two specific cases of this phenomenon—Soylent, a nutritionally engineered food product that claims to contain all the elements of a healthy diet, and Niwa, a smartphone-operated digital terrarium marketed as a "solution" to urban food production. We argue that not only are Niwa and Soylent problematic in application, more importantly, they serve as examples of an increasingly influential ideology that has the potential to radically shape our food landscape and our conceptions of the body in its own image.

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Contained within these objects are two separate, but genealogically related answers to the question "what is called 'food?'" What will follow is an examination of the particular discourse that has shaped Soylent and Niwa—a way of thinking about and viewing bodies, life, and therefore food and agriculture—that has become culturally and institutionally influential. On one

hand, Soylent sits squarely in a reductionist epistemology of biology, information, and genetics that has been repeatedly criticized by gender, cultural, and STS scholars, among others.³ What is especially relevant about Soylent in this discussion, however, is its further situation within digital culture as an “open source,” “hackable,” “crowd-funded” object with a specific vision of what life—as both biological being and politico-historical existence—is, and ought to be.

On the other hand, Niwa serves as an example of a more network-oriented, cybernetic vision. Here, life itself is less at the core of what Niwa embodies than are techno-political solutions to food chain issues. Niwa, as both object and system, reifies certain neoliberal socio-political assumptions that in turn derive from a vision of both individuals and society drawn from the historical cross-pollination of information theory, cybernetics/systems theory, and cognitive psychology. Here again, Niwa exists as an example of contemporary digital culture. In this instance, it exemplifies trends towards personal consumer goods and ubiquitous computing that appear to have no small degree of discursive power in contemporary American society.

After outlining the history that Soylent and Niwa share, we will move on to discuss specific attributes and claims of each in detail. We will then conclude with a look at alternative applications of digital technology to food and food chain issues that, for several reasons, appear more promising in both material effect and ontological mooring. In other words, in addition to our critique, we hope to demonstrate that the “digital” is a site of evolving epistemologico-political contest with great possibility to be understood and employed on very different grounds and towards very different ends than its current orthodoxies tend to license.

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INFORMATIC ONTOLOGY

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We begin by tracing a history of what we will call the “informatic ontology” that we argue is at work in the discourse that supports Soylent and Niwa, among others, as products. “Informatic ontology” is a dogmatically⁴ reductive-materialist ontology of the world’s constitution and behavior deeply influenced by information and systems theory (especially cybernetics). It is largely coterminous with “reductionism,” the idea that all things that exist can be reduced to certain physical laws describable across different levels of academic stratum: biology is simply the understanding of and accounting for what is *really* just a symphonic aggregate of chemical action, which is in turn simply a provisionally specific scalar description of phenomena accounted for by physics more fundamentally. There are any number of ways a reductionist account of being can manifest metaphorically—that is, there are any number of politico-semiotic versions such an account can produce—and we

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do not claim to exhaust the myriad of these possibilities here. “Informatic ontology” is simply our name for one such rendition, albeit one we view as particularly popular and influential today.

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The groundwork for this epistemological framework, and the vision of being it engenders, was catalyzed in large part with the advent of thermodynamics. The concept of thermodynamics and its laws were defined over the course of the nineteenth century, especially its latter half. This occurred across several rapidly industrializing societies in Europe and America, in large part catalyzed by interest in creating a more efficient steam engine that was a major technological foundation of industrial capitalism at the time. The theoretical consequences of the elaboration of thermodynamics in the sciences are well known—they’re the stuff of introductory science classes today. Less famous, but central to this discussion, are the political, cultural, and semiotic resonances this theory was to have across an enormous array of fields, from communications, to psychology, military organization, ecology, economics, computer science, and biology. These effects continue to be felt today, especially through later fields and theories that took up and redeployed the concepts of thermodynamics towards their own ends in generative and influential ways.

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At the core of these effects is the way in which thermodynamics permitted a new definition of the substrate of being, one that translated into new formulae for and accounts of social, cultural, technological, political, and other phenomena. Industrialization of increasing intensity and widening influence had already been underway for some time in Britain and parts of Europe prior to the establishment of the law of conservation of energy. Apace with industrialization, a vision of labor evolved as a profoundly moral endeavor, as a site upon and through which one performed the virtues (industriousness) and flaws (idleness) of their person—often with explicitly religious overtones.⁵ This vision of labor, bodies, and indeed of the process of industrialization itself was extensively transformed by the advent of thermodynamics. This new body of theory permitted and produced a profound reordering of the world of *bios*, insofar as it removed human bodies and behavior from a spiritual Great Chain of Being and reinterpreted their existence and operation through the flattening, mathematical language of “energy.” So conceived, differences not only between humans and other animals, but bodies and machines, and indeed the organic and inorganic, seemed to dissolve into a materialist unity of energy, matter, and the “physical laws of the universe.”⁶ With this change in the view of bodies, labor and the moral tableau it inhered within was transformed to a physiological process that contributed to the establishment of biology as it is imagined today.

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These developments lent scientific credence—both theoretically and experimentally—to already established accounts of animals as *automata* exemplified in Descartes’ philosophy, and to the evolving suite of economic con-

cepts of the eighteenth and nineteenth centuries, including political economy/government. Labor became a measurable unit, “labor power,” and with it, the productive efforts of societies at large could be similarly conceived: “The discovery of energy as the quintessential element of all experience, both organic and inorganic, made society and nature virtually indistinguishable.”⁷ The action and “health” of human societies began to be described in the scalable precepts of thermodynamic, physical equivalence, and measured by a set of eponymous techniques developed over the eighteenth and nineteenth centuries that we know today as “statistics” (the original *Statistik* was a German neologism signifying measure or analysis of data concerning the state). It became possible to think of nation-states in physiological terms—what are increasingly today called biopower and biopolitics—which differed substantially from the body politic of earlier times. In the field of capitalist industry, the famed technologies of productive increase and administration of bodies, from Scientific Management, to Taylorism, to Fordist production itself, were founded on the concept of the thermodynamic, mechanistic “human motor,” and the study of optimal levels of work and fatigue that fleshy machine could be subjected to.⁸

So, there was a profound transformation, if not an explicit break with the past, in which one can locate the germination of an *informatic* ontology. The influence of this transformation was pronounced in the life sciences, where investigations into the transmission of traits from one body to another, and their subsequent development across and within individual bodies, gradually divided the study of “heredity” into the fields of embryology (later renamed “developmental biology”), and genetics (later giving rise to “molecular biology”).⁹

James Watson and Francis Crick’s description of DNA’s structure in 1953 was a historic moment not only in the development of genetic science, but also for the importation of metaphors and vocabulary drawn from information theory developed by Claude Shannon and Warren Weaver.¹⁰ These metaphors were instrumental in the conception of genes as primary agents of being—and in some cases, even something like the beginning and the end of life itself—a vision later made popular through the genetic theories of William Hamilton and Richard Dawkins.

In an effort to solve physical problems confronting telecommunication systems, Shannon’s work redeployed the concept “information,” shifting from its historical meaning as semiotic indicator of embodied knowledge to an abstract mathematical term indicating “difference.”¹¹ Information became the smallest possible measure of the opposite of thermodynamic entropy (“noise”), a “bit” (the “signal”) and thus transformed the idea of a message from something *meaningful* to something *physical*.¹² This is precisely the utility recognized by geneticists and other biologists, who, following the discovery of DNA, analogized the nucleobases guanine, adenine, thymine,

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and cytosine as informational life-bits, and thus the DNA, gene sequences, and genomes they constituted as effectively informational systems with the unique ability to both harbor and execute the “codes” of life they constituted.¹³ Take, for instance, this passage of Dawkins’:

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What lies at the heart of every living thing is not a fire, not warm breath, not a ‘spark of life’. It is information, words, instructions. If you want a metaphor, don’t think of fires and sparks and breath. Think, instead, of a billion discrete, digital characters carved in tablets of crystal. If you want to understand life, don’t think about vibrant, throbbing gels and oozes, think about information technology.¹⁴

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As molecular biologists were shying away from earlier, energy-centric language and adapting information theory to their reductive and linear models of life, Norbert Wiener, Arturo Rosenbluth, and others had taken it up for their own analogous purposes, conflating the roles a human and machine play in their interaction towards a given end.¹⁵ Wiener’s World War II-era work on automated anti-aircraft systems spurred him to develop a theoretical framework in which he described humans as a form of servo-mechanical system, equating them with the gunnery machines they interacted with in order to define mathematical formulae for behavioral patterns.¹⁶ Wiener and his contemporaries began to generalize this concept to new areas, drawing on information theory to develop the field of self-regulating bodies they named *cybernetics*. This theory took Shannon’s model of information versus noise and applied it to the self-organization of any number of systems, coordinated, and in some ways constituted, by messages that incorporated environmental feedback towards the end of anti-entropic self-maintenance, or homeostasis. In cybernetics, information built upon, augmented, and in some instances subsumed the metaphor of the human motor—mechanical, industrial energy—of earlier thermodynamic theories of the body to its own computational, homeostatic logic. Upon this new substrate, biological, mechanical, and informational systems became analogous to one another. Presentations on cybernetics at the Macy Conferences, a series of interdisciplinary meetings that took place through the 1940s and 50s, would popularize the theory and facilitate its subsequent spread and application to social, psychological, political, and ecological fields.¹⁷

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The spread of information theory through cybernetic analogies and computer metaphors across disciplines had two major effects directly relevant to the phenomenon of engineered or “digital” food we will explore below. On one hand, this new informatic substrate of being allowed human brains and computers to re-converge as analogues or even mirrors of one another, a concept that helped generate research in the field of artificial intelligence and spur the turn to cognitive psychology.¹⁸ It permitted visions of bodies reducible to the information necessary to describe them, notions taken up by

science-fiction of the time (*Star Trek*'s transporters) and a later cliché of computer culture in the dream of immortality through downloadable consciousness. In short, it founded cyborg discourse and launched a thousand reductive fantasies of posthuman bodies that do *not* matter, as inefficient hindrances that might be improved or overcome altogether through digital technology.

On the other, technologists and ecologists in particular grew enamored of the explanatory power that homeostasis, feedback loops, and systems thinking offered their respective fields, and rapidly integrated these models into their own theories.¹⁹ Among the most influential of these offshoots in ecology was the theory of “ecosystems” developed by Howard and Eugene Odum. Employing the epistemological foundations laid by cybernetics and other systems theories in order to study the “enormous complexity of natural systems,” the ecosystem permitted a “holistic view of system properties such as nutrient cycling” by envisioning natural forces as a set of closed, self-regulating and interrelated feedback loops tending towards stability and homeostasis.²⁰ The ecosystem concept was popularized in neo-Malthusian accounts like Paul Erlich's *The Population Bomb*, countercultural books like Steven Reich's *The Greening of America*, in Jay Forrester's infamous collaboration with the Club of Rome, and especially through Stewart Brand's Whole Earth manifestos and catalogues.²¹ Fred Turner has described the history of post-war countercultural uptake and redeployment of cybernetic theory, and its influential legacy in Silicon Valley through Brand and 60s communitarians, groups like the Homebrew Computer Club, and later techno-utopians like Electronic Frontier Foundation co-founder John Perry Barlow and *Wired* co-founder Kevin Kelly.²²

Neoliberal economists were also among the groups attracted to cyber-systems discourse at the time. In view of the catastrophe of World War II, half a century of totalitarianism, and the rising specter of the Cold War and nuclear annihilation, many had come to reject the political structures and semiotics that they held responsible for this parade of disasters. In search of alternative models, cybernetic theory and computer technology offered the alluring possibility of organizing societies not only without the interference of politicians and state institutions, but in what appeared to be a manner more in accord with nature itself—as was being posited by game theory, ecosystems models, and influential thinkers like polymath Buckminster Fuller at the time.²³ This vision of capitalist markets as decentralized social regulators free of inefficient and cumbersome government intervention imagines them explicitly in the terms of “an information processor more powerful than any human brain, but essentially patterned on brain/computation metaphors.”²⁴ It draws rhetorical power from the notion that such a processor, in contrast to the state, is destined to produce more accurate pictures and efficient solutions to any problem it faces. These neoliberal techno-capitalists conflated their

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particular ideological and epistemological commitments with nature itself, employing all the quantitative, materialist discursive clout of computer science, information theory, and the thermodynamic laws and metaphors that lay behind them to produce a rationalized, quantifiable, networked, ostensible *un*-politics of computerized market self-regulation that is particularly powerful today.²⁵ This dream of de-regulated cybernetic government-by-market is at the heart of many contemporary digital technology companies and visionaries and is reflected in the assumptions, language, frameworks, and models they use when attempting to tackle issues of social, cultural, or political import.

[8.17] We claim Soylent and Niwa are particularly apt examples of precisely this ideology, one founded on a universe increasingly envisioned not simply in informational terms, but as informatic in its very fabric. Our argument is that this “informatic ontology”—despite its rhetorical elision-through-conflation of the historically specific social contexts, economic models, technological discourses, and environmental regimes outlined above with a universalized vision of the physical substrate of being—possesses a set of ontological proposals, epistemological frameworks, ideological commitments, and political manifestations that inform the discourse, and even material, of so much digital technology and technological culture today. As digital devices shrink and spread out from their conventional beige plastic housing and into the worlds of agriculture and foodways, so too do the epistemologies and rhetorics that shape and motivate their use. We now turn to Soylent and Niwa to illustrate some of the issues these developments raise.

[8.18] SOYLENT: “FREE YOUR BODY”

[8.19] Historically, technologists have applied notions of engineering logic to food technologies with an effort to make kitchens, farms, and production spaces more efficient. In their “Kitchen Manifesto,” Bell and Kaye write:

[8.20] This positioning of the kitchen as a workshop and laboratory is key to understanding the ways in which the domestic sphere was subsumed under the rubrics of industrialization and scientific rationality. Bringing the kitchen into the technological space meant emphasizing the implementation and use of technology of the future, at the expense of supporting real people and real practices in the present.²⁶

[8.21] As startup culture continues to expand, it appears that this logic is being applied not only to food technology and spaces of food production, but also to food itself.

[8.22] Soylent, under the tagline “Free Your Body,” is a food-replacement “open-source drink powder” that claims to contain all of the essential nutri-

ents required to fuel the human body.²⁷ Soylent is a striking example of the kind of food that results when notions of efficiency and optimization are pushed to their logical limit. Soylent can be made in seconds by simply mixing it with water, and it can be ingested at any time, in any location; it exists almost independently of time and space. It has been described as “a thick, tan liquid that is yeasty, grainy, and faintly sweet,”²⁸ and each serving of Soylent aims to “provide maximum nutrition with minimum effort.”²⁹ In many ways, Soylent evokes the science-fiction vision of food-as-pill, but as it grows in popularity, it points to larger trends of engineering, statistical analysis, and the quantification of food in order to manipulate the body.

Ryan Reinhardt, the founder and creator of Soylent, is an engineer, a fact that he highlights in Soylent’s marketing materials:

I have a background as an engineer. I studied electronics and computation, but what I really learned was how to break problems down. Everything is made of parts. Everything can be broken down. Unlike most other foods which prioritize taste and texture, Soylent was engineered to maximize nutrition, to nourish the body in the most efficient way possible.³⁰

The suggestion that food can be broken down into its chemical parts, re-engineered, and built back up into the most efficient food source possible—and moreover, that this is *all* that food is—exemplifies an informatic vision of being. By situating food in a technology-driven framework, it simply becomes a problem to be solved by mathematical means.

The ideology behind Soylent is one that assumes both foodmaking and the body to be problematic aspects of life. In a *Popular Science* interview, Reinhardt has said as much: “Food just seems to pop up, like this obnoxious biological need that I need to get rid of.”³¹ This perspective positions the body as a discrete entity, a closed system that can be internally manipulated. This notion of the body is one that has long been foundational to information theory, which posits the body as “the original prosthesis that we all learn to manipulate.”³² This suggests a privileging of information over other understandings and a desire to precisely control or even disembodiment our experience with food. Yet, the very act of eating implies a deep connection between the body and the external world downplayed or outright ignored by such a notion. “Eating,” Luce Giard writes, “serves not only to maintain the biological machinery of the body, but to make concrete one of the specific modes of relation between a person and the world, thus forming one of the fundamental landmarks in space-time.”³³ When we eat, we engage with the sensory world around us; Soylent, however, aims to disconnect the body from physical space and control it as if it were an information processing machine.

This approach to food, and the desire to break it into its component parts, is not exclusive to Silicon Valley, as throughout American culture we can see

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a persistent focus on nutrition as a way to understand food. Sociologist Gyorgy Scrinis has termed this “nutritionism.” He writes,

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Nutrition scientists, dieticians, and public health authorities—the nutrition industry, for short—have implicitly or explicitly encouraged us to think about foods in terms of their nutrient composition, to make the connection between particular nutrients and bodily health, and to construct “nutritionally balanced” diets on this basis.³⁴

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Soylent exploits this tendency to focus on the nutritional aspects of food—so much so that we are led to believe that there is a singular, universal notion of nutrition and it can be found in this powdered drink solution. However, if technological optimization of nutrition becomes the central focus of food production, we undermine other ways of engaging with food, such as through taste and embodiment. Similarly, if bodies are reduced to quantifiable information, the foundational ideology of Soylent has implications for the nature and systems of labor that support such a vision. Soylent clearly promotes a lifestyle that idealizes extreme efficiency and devalues work associated with food preparation. In addition to the gendered assumptions behind such a perspective, Soylent assumes optimization of the body through food to be the ultimate way to promote productivity. At the same time, Soylent aims to define how we should utilize all the time we save by not engaging in traditional food practices—evidenced by marketing materials that showcase an extremely limited view of leisure time that center around yoga classes and working out at the gym, for example—which has profound implications for the kind of values we place on time, work, and recreational activities.

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Reinhardt appears to be genuinely interested in solving problems related to hunger and resource depletion. In a recent *New Yorker* article, he says he hopes to be able to produce the ingredients for Soylent entirely from reproductive superorganisms rather than farms. He highlights Buckminster Fuller’s notion of ephemeralization, a process by which technology will allow us to do more with less until eventually we can do everything with nothing.³⁵ Reinhardt suggests, “Soylent-producing algae would make food a little like that: there would be no more wars over farmland, much less resource competition. To help a village full of malnourished people, “you could just drop in a shipping container” full of Soylent-producing algae.”³⁶ However, this suggestion indicates a lack of understanding of food as more than a biological need, but as something that is deeply integrated with cultural, social, and economic frameworks that differ widely around the world. It is not clear how a food product such as Soylent does anything to address the food system because rather than tackling issues within the current food chain, it promotes opting out of eating and growing food altogether. Soylent provides an alternative that is totalizing, singular, and does not engage with or attempt to fix

the rest of the food system beyond the suggestion that from now on Soylent should be your alpha and omega (fatty acids).

The relationship with food Soylent implies is one that reflects an ideology deeply grounded in our previously explored history of systems theory, cybernetics, molecular biology, and information theory. The rhetoric surrounding Soylent suggests a utopic posthuman vision where bodies are seen as burdensome tools subject to the rules of machine optimization, and this has the potential to radically reorient our perception of what food is and how it is implicated in relation to the body.

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NIWA: "WITH THE 'BRAIN' OF AN EXPERIENCED FARMER"

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Niwa is a small digital terrarium that is designed to help people grow food in their homes. It is aimed at people who don't have yards, such as apartment-dwellers who live in cities, and is marketed as a key technology for a "future where anyone can grow their own food."³⁷ Niwa has its own light and irrigation systems, and connects to a phone app that provides information about the produce that is growing inside. The device is fully automated, and is marketed as a system that can think for itself: "With the 'brain' of an experienced farmer, Niwa is the world's first fully automated, connected, and responsive hydroponic growing system. Niwa uses an array of sensors and actuators to create the perfect growing environment for your plants, watering and feeding them exactly what they need when they need it."³⁸ Like Soylent, Niwa promotes efficiency and functionality, and as a consequence of emphasizing the ease of growing food, this system removes people from the process entirely. Again, suggesting an engineering-driven, and ultimately, disembodied engagement with food.

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Lisa Heldke has developed a useful conception of "bodily knowledge" as a way of understanding ourselves as inherently connected to the things we cook and grow. She writes, "The knowing involved in making a cake is 'contained' not simply 'in my head' but in my hands, my wrists, my eyes and nose as well. The phrase "bodily knowledge" is not a metaphor. It is an acknowledgement of the fact that I know things literally with my body, that I 'as' my hands, know when the bread dough is sufficiently kneaded, and I 'as' my nose know when the pie is done."³⁹ Niwa discounts the role of the body in growing food, both as an individual and a social practice. Farming and gardening require a skill set that can only be developed through physically engaging with the earth, with plants, and with *other people*. This kind of knowledge practice develops over time and through repetition, success, and failure. If Niwa's *raison d'être* is as a solution to food supply problems, it is difficult to imagine how what amounts to outsourcing knowledge and labor to a hydroponic cyber-terrarium contributes to that end. Such an approach

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reframes a fundamentally socio-political problem in the individualized, ahistorical and depoliticized language of capitalist, market-oriented technological “solutions” so ubiquitous among startups and Silicon Valley today. Instead of self-organizing to press for greater control over development and land use in one’s own city or neighborhood, to push for community-run farms or gardens, for food production subsidies or building codes that mandate rain-water collection and architectural support for rooftop gardens—any of which may help strengthen community ties and cultivate a sense of self-value, empowerment, and agency⁴⁰—a product like this suggests only the development of a certain aesthetics of consumption. The food that grows in Niwa is encased in glass, preventing the grower from even touching it. The app provides a real-time image of the plant that is growing inside; however, one wonders why this experience needs to be mediated at all when the user could simply *look* at the plant itself instead of the screen. Niwa doesn’t contain any dirt, as the seeds are dropped into a tray. This too removes much of the sensory experience of gardening, a large part of which requires getting your hands dirty. The design of Niwa essentially removes the entire experience of gardening from the act of growing food, transforming it into a gamified app whose own logic, semiotics, and politics stem from the informatic genealogy traced above.⁴¹

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The decision to grow your own food is one that is often driven by personal convictions related to environmentalism. In his study of urban agriculture, Tad Hirsh has addressed this aspect of urban gardening. Regarding a local community garden, he writes, “It wasn’t simply a technician’s attempt to optimize food distribution systems or to wrest greater efficiencies out of small-scale agriculture; it embodied a set of values and political ideas.”⁴² Niwa seems to be partly built on this ideology by promoting notions of growing healthy, fresh food at home; however, it neglects to consider how these ideals are deeply connected to the embodied practice of growing. Additionally, Niwa neglects to account for the social, cultural, and environmental factors that influence local food-growing practices.

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Niwa presupposes the ability to afford an internet connection, smart phone, and the system itself, which is to say, it’s likely to be inaccessible for many people, thereby contradicting its gestures towards democratic inclusivity. Even in terms of productive intensity, the system as it is currently designed appears to be essentially aesthetic; there is only room to grow two or three tomato plants at a time in the space provided. Thus, Niwa would not meaningfully contribute to solving or abating food security issues for those who are most exposed to them—who, again, would likely be unable to afford the system in the first place. Niwa is infused in rhetoric that promotes systemic change, suggesting that, “Enabling personal food production carries tremendous rewards for our environment, our economy, our health and our lives.”⁴³ However, “personal food production” as the term implies is an

individual solution to a problem that by necessity must be solved on community and industry levels. Again, as an individual, consumer solution, Niwa depoliticizes the fundamentally political problems of food security and food justice. That there are more than enough calories produced to feed the world at present is by now increasingly common knowledge—the key issues of food insecurity are those of distribution and access.⁴⁴ Niwa situates itself as a technology that can contribute to solving issues related to food production, however it contradictorily disengages from the food system itself, suggesting personal, individual solutions, rather than directly addressing the food system.

The environmental impact of a device like Niwa is perhaps the most troubling aspect of this system. Niwa is promoted as a “green” technology, and their marketing copy highlights this point: “Help save the planet! Niwa reduces your impact on the environment by eliminating the problems of transportation, packing and soil erosion.”⁴⁵ However, this device is designed with petroleum and rare earth minerals, and utilizes an unnecessary light and irrigation system. In contrast with the explicitly socio-political act of organizing to grow food in urban spaces (lots, rooftops, etc.), which require comparatively minimal inputs (seeds, earth, sun, labor), if produced on any real scale, Niwa could only exacerbate the human and environmental costs associated with digital technology: mountaintop removal, toxic leaching and groundwater contamination, carbon and other warming, toxic gas emissions, and so forth.⁴⁶

Niwa, though expressly different from Soylent in its design and application, is firmly situated within this complex theoretical history. It is a personal device that promotes a “solution” to urban agriculture that contradicts many of the ideals it claims to support, such as sustainability, accessibility, and the economic benefits of growing your own food. Like Soylent, Niwa does not engage with the current food production system, or attempt to support systematic changes, but rather offers an alternative system that envisions a future where individuals are disengaged from collaborative methods of food production.

FOOD PRODUCTION AND COLLABORATIVE DIGITAL TECHNOLOGY

We have explored Soylent and Niwa as examples that suggest an emerging and troubling trend in the application of an information-centric ideology to issues of food production. However, this is not to say that there are no technological solutions that align with alternative, non-mechanistic visions of ecology and support a range of sustainable food production practices. Digital technology can and should have a role in developing new ways of

growing, producing, and distributing food. We see particularly important opportunities for collaboration and community development in applications such as Falling Fruit and Yard Sharing.

[8.41] Falling Fruit is an open-source mapping project that charts the location of edible plants in urban spaces. Anyone can contribute foraging knowledge or publically available fruits and vegetables to the map. Among the motivations behind Falling Fruit are the cultivation of foraging knowledge as well as a desire to reduce food waste by indicating when fruits or medicinals are ripe and ready for harvest.⁴⁷ At a time when an estimated 40% of the food produced in the United States is wasted⁴⁸ while some 17.2 million American households (~50 million people) experience serious food insecurity,⁴⁹ even modest efforts like Falling Fruit aimed at reducing waste and feeding people for free are laudable.

[8.42] One significant difference between Falling Fruit and the previously explored example of Niwa is the way in which the latter both creates and requires an engagement with a new form of knowing and behavior oriented around the object itself, one that explicitly reduces user agency as a part of the process. That is, Niwa does not facilitate the already common practice of growing plants in one's own home, but rather it asks you to radically reorient that practice, relinquishing a set of skills and the cultivation of agricultural knowledge to the device. In fact, this very abdication of control to its digital "farmer's brain" is one of Niwa's most prominent marketing points. To the contrary, Falling Fruit acts as a coordinator and multiplier of extant conservationist, DIY cultural practices that have demonstrably sound environmental and social benefits (reduction of food waste, sharing/cultivation of knowledge, fostering of community and group action). Food issues do not exist in a vacuum, as is implied by Soylent and Niwa, but they inhere in networks of power that among other things are deeply classed, raced, and gendered, as innumerable communities, scholars, journalists, activists, and others have demonstrated (e.g. Bohle 2009, Cone 2000, Fraser 2003, Dixon 2009, O'Brien and Leichenko 2000, White 2012, etc cetera). Any meaningful approach to large-scale change of food chain practices aimed at reducing environmental harm and increasing local food production is unlikely to succeed without taking these facts into account.

[8.43] Similarly, Yardsharing.org (and other sites, such as hyperlocavore.com) aim to connect community members by providing listings to share yard space for gardening and growing food. Many urban food growers resist technological intervention or augmentation of their agricultural practices, such as sensory devices that monitor soil conditions, because they value the knowledge that develops through practice.⁵⁰ However, by identifying the values of such communities, technology can act in a way that is not disruptive to already in-place practices. William Odom's work on urban food production suggests that those engaged in community garden projects value resourcefulness and

re-use of materials that would otherwise go to waste.⁵¹ Rather than developing technology that adds material waste to the practice of growing food, we see a need to develop more technology that supports the re-appropriation of existing materials within a given community. Yardsharing facilitates this desire by linking people to tools and sites in which to garden and produce food that can be shared with the larger community.

Another novel interactive design that aims to work on a collaborative level is the Fair Tracing Project, an ongoing effort to support ethical trade. The Fair Tracing Project utilizes tracking technologies (such as RFID tags) in supply chains to provide information to consumers and producers. There are numerous things that can potentially be added to a product's "story" as it travels from grower to consumer, including date of harvest, notes about the product, video, photos, and other multimedia contributions, and information about the farmer who grew the produce or those who interacted with it along the way.

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The Fair Tracing Project, in disclosing more about constitution of provenance as contemporary technology can deliver it, begins a conversation about how knowledge or provenance exchanged along the chain might change the means of production and the chain itself, and the role of consumers as well as producers in determining it.⁵²

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Tracing a product's provenance may provide essential knowledge to producers, distributors, and ultimately consumers who want to know more about where their food comes from and how it was grown. At the same time, it aims to uncover and change problematic practices along the chain of production.

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Finally, there are several startups devoted to collecting and distributing fresh food that would otherwise go to waste, such as Food Cowboy and CropMobster. Wholesalers and distributors throw away tons of produce every day largely for economic reasons, often because they can't find charities to donate it to in time, and websites such as Food Cowboy and CropMobster aim to connect charities to fresh food before it goes to waste. Charities, which in many cases are only a few miles away from food distributors, often don't have the complex supply chain technology that suppliers and distributors rely on and thus are marginalized from the process.⁵³ By engaging with these sites, charities can become connected to food distributors, as well as truckers and other volunteers who get the food to them before it goes bad.

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What these projects collectively suggest is that there are numerous ways for technology to support growing and production practices without necessarily disrupting the way we already engage with food. There is significant opportunity for digital technology to shape food production and distribution practices in ways that don't rely on individual consumer solutions, but rather

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support broader, collaborative change throughout both global and local food systems. There are limitless possibilities for technological engagement with food production, many of which are already in use, including digitally controlled farming equipment, computational intelligence in crop production, the use of drones and robots, new kind of bioengineered foods, and digital augmentation of the built environment. With so many areas exposed to technological intervention, it is essential that we consider the various ways in which our interactions with food are embodied practices that necessarily involve community and collaboration.

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CONCLUSION

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On a certain level, there is very little “new” about Soylent or Niwa. The former is essentially Ensure marketed to tech culture, and the latter an app or gamified rebranding of hydroponics. Soylent and Niwa therefore merit attention not so much for what they are, *per se*, but for their rhetorics. Both situate themselves in a discourse whose history and effects we have attempted to outline here, in what we have called an “informatic ontology.” This reductive vision of being tends to efface the historical composition of social and political problems, eliding their embodied (race, class, gender, sexuality, age, ability) dimensions with totalizing appeals to purportedly apolitical “market” solutions, understood as natural physical rules of which contemporary digital technology are simply logical manifestations. The historical foundations and future implications of this ontology have a clear connection to issues of food production, and as Silicon Valley and computing culture continue to accrue clout and capital, these practices and their ensuing influence on policy, labor practices, and perceptions of the body must be challenged. Digital technology has the potential to—and in many ways already has—radically reshaped the landscape of food technology, and by understanding and critically engaging with this rhetoric we aim to highlight some of the emerging problems of this ideology. At the same time, we believe information technology is by no means determined by its orthodoxies: there is significant opportunity for digital tools to support and promote meaningful food practices that account for social, cultural, and political perspectives and value community-based and ecologically robust practices of food production.

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NOTES

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1. Rob Rheinhart, *Mostly Harmless*, 2015. last accessed 3/29/2015, <http://robrheinhart.com/>

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2. Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism*, Chicago: University of Chicago Press, 2006.

3. A very small cross section would include work by Donna Haraway, Sandra Harding, Karen Barad, Anne Balsamo, Lucy Suchman, and Shelly Turkle among many others.
4. This term deliberately chosen to invoke Francis Crick's "central dogma" of genetic action, a description of the chain of genetic influence or process described using the language and models of information theory: "The central dogma of molecular biology deals with the detailed residue-by-residue transfer of sequential information. It states that such information cannot be transferred back from protein to either protein or nucleic acid." Crick, Francis. "Central dogma of molecular biology." *Nature* 227 (5258), August 1970: 561-3.
5. Anson Rabinbach, *The Human Motor: Energy, Fatigue, and the Origins of Modernity*, (Berkeley: University of California Press, 1990): 7-8.
6. *Ibid.*, 65.
7. *Ibid.*, 46.
8. *Ibid.*, 242-243.
9. Evelyn Fox Keller, *Refiguring Life: Metaphors of Twentieth Century Biology*, (New York: Columbia University Press, 1995): 4-21
10. Keller, 18
11. John Durham Peters, "Information: Notes Toward a Critical History," *Journal of Communication Inquiry*; Vol. 12, no. 9 (1988): pg. 17.
12. Jonathan Gleick, *The Information*
13. Lily Kay, "Cybernetics, Information, Life: The Emergence of Scriptural Representations of Heredity," Vol 5.1(1997): 23.
14. Richard Dawkins, *The Blind Watchmaker*, (New York: Norton, 1996): 112.
15. Peter Galison, "The Ontology of the Enemy: Norbert Wiener and the Cybernetic Vision," *Critical Inquiry* 21, No. 1 (Autumn, 1994): 228-266.
16. Turner, *From Counterculture to Cyberculture*: 21-23.
17. N. Katherine Hayles, *How we became posthuman: Virtual bodies in cybernetics, literature, and Informatics*, (Chicago: University of Chicago Press, 2008): 50
18. Paul N. Edwards, *The Closed World: Computers and the Politics of Discourse in Cold War America*, (Cambridge: MIT Press, 1996): Chapter 6.
19. Hayles, chapter 6.
20. Robert V. O'Neill, "Is it Time to Bury the Ecosystem Concept?," *Ecology* Vol. 82 (12), 2001, pg. 3276-77.
21. Turner, 44-45.
22. Cf Turner, *From Counterculture to Cyberculture*.
23. Edwards, 117-119; Turner, 57-58.
24. Philip Mirowski, 2009, Postface: Defining neoliberalism, in *The Road from Mt. Pelerin: The making of the neoliberal thought collective*, edited by P. Mirowski and D. Plehwe, (Cambridge, MA: Harvard University Press): 433-440. Consider this passage from Gleick: "Economics is recognizing itself as an information science, now that money itself is completing a developmental arc from matter to bits, stored in computer memory and magnetic strips, world finance coursing through the global nervous system."
25. Mirowski, 435, Turner 259-60.
26. Bell, Genevieve, and Joseph Kaye. "Designing technology for domestic spaces: A Kitchen Manifesto." *Gastronomica* 2, no. 2(2002): 46-62.
27. Soylent. 2015. *Soylent: Free Your Body*. Last accessed 3/29/2015. <http://www.soylent.me/>
28. Lizzy Widdiecombe, "The End of Food," *The New Yorker*, May 12, 2014. <http://www.newyorker.com/magazine/2014/05/12/the-end-of-food>
29. Soylent. 2015. *Soylent: Free Your Body*. Last accessed 3/29/2015. <http://www.soylent.me/>
30. Soylent, 2015, *ibid.*
31. Julie Beck, "How I Survived A Week Without Food," *Popular Science*, June 7, 2013, last accessed March 30, 2015.
32. Hayles, 3.

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- [8n39] 39. Lisa M. Heldke, "Foodmaking as a thoughtful practice," *Cooking, eating, thinking: Transformative philosophies of food (1992)*: 203-29.
- [8n40] 40. Cf Monica M. White, "Sisters of the Soil: Urban Gardening as Resistance in Detroit," *Race/Ethnicity: Multidisciplinary Global Contexts* 5, no.1 (2012): 13-28.
- [8n41] 41. Cf Alex Galloway. *Gaming: Essays in Algorithmic Culture*, (Minneapolis: University of Minnesota Press, 2006), esp. 90-104
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- [8n43] 43. Niwa. *Niwa: Grow the freshest food on Earth right from your smartphone!* Last accessed 3/29/2015. <http://getniwa.com/>
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