DISRUPTIVE ENACTMENTS:
FIVE DIMENSIONS OF CHANGE IN SOCIOTECHNICAL ECOLOGIES

By

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ABSTRACT

This dissertation presents a heuristic analytical framework that examines change in sociotechnical ecologies through five dimensions that diffract through each other. These five dimensions are: agentogenesis/agenticide, rich diversity, cyborg virtue ethics, institutional percolation/creep, and hybrid generative value. Agentogenesis is the creation/recognition of agency and agenticide is the destruction/disregard of the same; these two processes can affect three general types of agency: discursive, performative, and material. By conceptualizing agency in these three types (which overlap and *intra-act* as Barad [2007] describes), interactions between disparate entities, like humans, nonhuman life, and nonliving entities can be described more richly. Rich diversity is the aligning of epistemological perception and ontological effects of relationships of difference across and through different types of agencies. This concept helps to reconcile disconnects between activities that promote inclusion of many types but fails to demonstrate adequate change. When the epistemological gap is recognized and reconciled, even by utilizing indirect forms of promotion, such as through "natural" processes like food fermentation, the ontological effects of diversity are more predictable. Cyborg virtue ethics incorporates both Andy Clark's and Donna Haraway's

conceptualizations of "cyborg" to challenge essentialist categories that unduly limit acceptance and utilization of technologies that can promote *agentogenesis*, *rich diversity*, or virtue, defined as improved and enriched relationships with other entities, greater awareness and potential disruption of entrenched power hierarchies, and communal sharing of values and resources. By rejecting dichotomies like "low-tech/high-tech," "soft-social-tech / hard-material-tech," and "natural/unnatural," more accessible training options, like Clementine oranges for surgeons, and more open learning and value-sharing, like with a new user of the Flow Hive for beekeeping, can occur. *Institutional percolation* and *institutional creep* describe two types of change that involve institutions; *percolation* is the process by which an institution is changed by external factors that build up past a threshold and *creep* is the process of an institution altering the environment and entities within the environment in a positive feedback loop by normalizing power structures and values. These two framings of institution draw from Beth Dempster's (2000) proposal to consider systems as *sympoietic* – permeable and able to be defined externally - in addition to *autopoietic* – impermeable and self-defining. Hybrid Generative Value engages with Ron Eglash's and others' work on Generative Justice to challenge the sharp distinctions between factors like local and global and types of value that can be

generated (labor, ecological, expressive). This dimension synthesizes the previous four dimensions to look at complicated disruptions of power like vegeculture, the propagation of plants not from seed but from plant cuttings, and the widespread embrace of the "Korean Wave" of culture, through media like the song "Gangnam Style" and dramatic television shows. Together, these five dimensions of change provide a dynamic toolkit for better analysis of complex sociotechnological phenomena that both disrupt old structures and enact new relationships.

1. INTRODUCTION TO DISRUPTIVE ENACTMENTS

Disruptive technology, when first coined by Bower and Christensen (1995) captured the imagination and anxieties of the professional managerial class of that era arising from seemingly unpredictable changes in the market for technological products. This idea explained how new technologies introduced different "performance attributes" that overturned assumptions about how well a new technology would be adopted based on existing metrics. However, their framework had little to say about the role of social phenomena in constructing technology in the first place, and even less about the effects on people and the environment -- the lived experience of poverty, sexism, racism, pollution, and similar effects emerging in technological encounters with the , organisms and environments that matter. These nonhuman agents are not merely passive backdrops on the stage of an all-human cast. They too are also players in what I have termed "disruptive enactments."

"Disruption," as defined for the purposes of sociopolitical analysis by Piven and Cloward (1979), is the "application of a negative sanction, the withdrawal of a crucial contribution on which others depend, and it is therefore a natural resource for exerting power over others." (24) This is a good starting place to consider social disruptions because it explicitly

recognizes power and resources in context, but it is limited to negative sanctions against a status quo. My use of the term "enactments" includes positive creation after the disruption: how are things being done differently after, and as a result of, the disruption? What opportunities for previously invisible or disenfranchised actors arise from this disruption, or how could new enfranchisement of actors drive unexpected changes in institutional power structures?

The term "enactment" is not a claim about how to represent knowledge of the world, it references an ontological claim about the world's agentic character; as described in various frameworks ranging from Pickering's "Mangle" (2005) to Barad's "Agential Realism" (2007). Steve Woolgar's and Javier Lezaun's (2013) invitation to focus on the ontological turn defines the concept of "enactment" as that in which "objects are brought into being, they are realized in the course of a certain practical activity, and when that happens, they crystallize, provisionally, a particular reality, they invoke the temporary action of a set of circumstances," and that "emphasizes the generative power of the practices involved in the constitution of reality." Thus, contrary to the limited sense of changes for products and consumers in "disruptive technologies," the possibilities for disruptive enactments are constitutive of the very fabric of life.

1.1 Theories of Change

Change is difficult to model and analyze because it represents a discontinuity between stable theorized states and can be affected by many factors in additive or even recursive ways. Current approaches to examining and characterizing change open up promising opportunities by focusing on some of these factors, but fall short of synthesizing them into a multidimensional comprehensive model.

Disruptive technology in its original conception, as noted above, has been a popular but limited form of analysis. This idea was developed to explain how a new technology, like personal computers, could dominate a market that was previously saturated with a rival technology (minicomputers) because of changes in customer base and usage potential. They point to disruptive technologies as introducing different "performance attributes" that are not initially valued by the mainstream consumer. Because of this different valuation, the new technology is assessed by existing standards and often are found to be lacking; thus their temporary invisibility. But as consumers' perceptions are "reconditioned" by the technology, they overturn the old standards with new values and uses. While this analysis is useful in a limited context of technological products made for consumption by manufacturing companies, it tends towards

technological determinism, and diverts us from social dimensions of change. It feeds our fetish for the latest gadgets (Clarke 2009), and glorifies their status as agents of change. At the same time, the multi-dimensional relationships between those involved – creators, distributors, users, observers, and the technology itself – are obscured or oversimplified, even flattened, to the point of impoverishing these discussions, leading to, at best, ineffective decisions, and at worst, catastrophic ignorance. A more comprehensive framework for socioecological disruption and its relation to technology is needed.

"Rupture" is a term used by Gwen Ottinger and Benjamin Cohen (2011) to discuss changes in the scientific practice of experts like scientists and engineers when they shift their efforts towards supporting environmental justice goals. This work fills in a missing counterpart to extensive documentation of non-experts as they transition "from quiet homemakers to outspoken activists," such as that by Luke Cole and Sheila Foster (2001) and Mary Pardo (1998). Ottinger and Cohen challenge the idea that communities of expertise and the institutions in which they are usually found are static and insensitive to social pressures from groups seen as lacking established power or leverage. Building upon their work in tracking changes in practices of knowledge creation and use, I will extend from the term "rupture," which

suggests a focus on dis*rupt*ion of old ways, to enactments of new ones.

Rather than limit the analysis to scientists as experts, I am going to examine shifts in the broad network of technical, social and environmental actors, with widely varying positions of institutionalized power.

1.2 Multidimensional Theories of Change

In his analysis of changing environmental discourses, John Dryzek offers a four-point checklist of elements (1997):

1. Basic entities whose existence is recognized or constructed
2. Assumptions about natural relationships
3. Agents and their motives
4. Key metaphors, rhetorical devices

This is a helpful model for me in two ways. First, it offers an example of a multidimensional analysis across a broad variety of examples, as I aim to do in this thesis. Whales, terrorism, pollutants, politics and a wide variety of other subjects appear at first to be a jumbled cacophony in his introduction; but approaching each dimension across multiple examples brings order to the chaos. Second, it is based on a contrast between what he terms

"prosaic" and "imaginative" approaches, which offers another view of the enactment framework. Prosaic approaches are those in which the "political-economic chessboard set by industrial society as pretty much given" (pg. 13). That is, any "technological disruptions" simply act upon pre-existing entities and structures. In contrast, imaginative approaches "seek to redefine the chessboard" (pg. 13). Dryzek does not use the language of enactment or non-human agency but those concepts are at least compatible with the outcomes of his ludic analogy.

Similarly, Andrew Abbott (2001) presents six critiques of General Linear Reality ("GLR"): a characteristic of much social science research that limits its ability to evaluate complex or multidimensional causalities:

1. Fixed entities with attributes
2. Assumes causality flows big->small or same->same, never small->big
3. Univocal meaning
4. Absence of sequence effects: order of things doesn't affect outcomes
5. Casewise independence of dependent variable
6. Independence of context

This is a more expansive list of critiques that argue, generally, for questioning fundamental assumptions that form the building blocks of analysis itself. Of note, recognizing that entities do not remain static (1),

causality can "flow" from small to big, or from low power to high power (2), representations can mean different things to different perceivers (3), interactions are not commutative (4), and that context (in this case, social, normative, and ecological [in the broad sense]) matters (6). In my analysis of "diversity" for example I note that statistical models for diversity often hide as much as they reveal (e.g. quantifying diversity as the presence of people of color plus the presence of women will make any absence of women of color magically disappear from sight). Abbott makes similar remarks about the assumption of linear regression in statistics. Once you assume that reality can be characterized by such reductive methods, they become a self-fulfilling prophecy.

1.3 Five Dimensions of Disruptive Enactments

It is apparent from these approaches that it is important to recognize *who/what* are involved and *how* they interact with each other; with the additional caveat that these are also Barad's "intra-actions"(2007). That is, this is a question of agency, which needs to be defined not just for human actors, but also for nonhuman living (TallBear 2015, 2011; Kirksey 2014; Paxson 2013; Hird 2009; Haraway 2008) and at least in some cases even non-living entities as well (Chen 2012; Bryant 2011; Bennett 2010;

Pickering 1995). Additionally, the involvement of technoscience in expanding or restricting agencies needs to be considered through cyborg theories that focus on actual, rather than essentialist, effects of agency extension through knowledges, practices, and apparatus. These agents are also systems situated within an environment, but the delineation between system and environment becomes blurred in many cases (Barad 2007); hence the term "intra-action" to note that it is really a system acting upon itself. Institutions that serve as locations for interactions work as actors in some cases, and human beings, a common choice of actor, serve as environments for microbial actors within their bodies.

Finally, there is also a need to find points of entry for our understandings of ethics, justice and power. Critics of non-human agency, cyborgs, "new materialism" and other enactment frameworks worry about the loss of traditional ethical judgements (Washick, et al. 2015). Marxist critique, for example, is well-known for its analysis that labor exploitation *dehumanizes* workers. Once we blur the human/non-human distinction, what remains for an ethical foundation? The Generative Justice framework developed by Ron Eglash and others offer a way to track the concept of "unalienated value" as it crosses human, non-human, and non-physical boundaries. By examining how value of all forms can be unjustly extracted,

this allows us to analyze the ways that institutions both act upon external agents and are infiltrated by internal actors to metamorphose into something different.

As writers from Ovid to Darwin have noted, this is the crucial part of theorizing change: something changes *into something else*. Even while something is disrupted – or an activity no longer performed – something else is promoted or solidified, or perhaps simply made more visible, tangible, or audible to observers. The effects are often too complex to grasp as a single whole. Therefore I have developed five dimensions as analytic tools for viewing these disruptive enactments. The 5 dimensions operate as significant "slices"[1] through which we can understand and perhaps intervene in this intra-active technosocial ecology.

1. **Agency**: Enlightenment writers such as Hume and Mills highlighted the importance of human agency using the language of free will: the "natural rights" of people to make their own decisions. As human abilities become amplified by technology, and as science raises our awareness of agency in non-human others, the simplistic binaries of enlightenment founders give

[1] Barad uses "slices" in an analogy to how physics models conceive of our observations in a universe which has greater than 3 dimensions. While we cannot know the whole, we can create lower-dimensional projections--a shadow so to speak--and learn from each projection while admitting to its partial perspective.

way to complex fields of power. How is agency – whether discursive, performative, or material – ignored or silenced (agenticide), and how is it restored or introduced (agentogenesis)?

2. **Rich Diversity**: The institutional identification of certain groups for purposes of control—the exclusion of women from public positions; the targeting of certain ethnicities for slavery or genocide—has given way to the contemporary discourse on difference and "diversity" the way that difference can be incorporated into a cohesive set of relationships. At the same time, there is charismatic vertebrate diversity in conservation; plant diversity in agriculture, and even micro-organism diversity in gut biomes. How is difference measured, quantified, and qualified? How can we resist the reductive tendencies institutions impose, and nurture a positive diversity in appearance and actuality, while protecting its rich set of potentialities from being lost in translation?

3. **Cyborg Virtue Ethic**: Deontological ethics depends on rules and duties, such as the Kantian Categorical Imperative or the Ten Commandments. Consequentialist ethics requires us to consider the consequences of actions, as we often see implied in legal categories of harm. Virtue ethics is a more

performative and iterative approach: virtue as embodied by people who do it well. We are all familiar with the figure of the "ecological native" who exemplifies the virtues of the perfected natural life; and equally so the science fiction imaginary of a subject who embodies "high tech" perfection. But cyborgs, as Donna Haraway famously proposed, offer a kind of partial, compromised figure, never allowed the luxury of returning to the womb of mother earth or the purity of escape velocity. How can we learn from ethically admirable cyborg phenomena as a performance or embodiment of virtue?

4. **Institutional Creep and Percolation**: How do institutions enact or resist change by altering the social environment in discursive, performative, and material ways through regulations, normalization of values, and resource allocation? We often experience an institution gradually extending its purview, standardizing and regulating matters under their control to better match its own patterns. Much like mildew spreading through a damp house, this creep can work in subtle ways and go unnoticed until one is overwhelmed. At the same time, however, institutions experience pressure to change from within when gradual increases in individual agential change overcome inertia in a seemingly sudden shift. This can be likened to drip

brewing of coffee, where even though water has begun to drip in, nothing is seen until a little later, once a certain critical mass of water has infused the grounds. Additionally, that which is percolated in, whether water to coffee grounds or diverse participants in an institution, transforms things from the inside out as it both takes in features of the institution (such as professionalization) and exerts pressure from within (activism).

5. **Hybrid Generative Value**: The original publications on Generative Justice (e.g. Eglash and Garvey 2014; Eglash 2016) carefully distinguish between three putative types of unalienated value: labor value, ecological value, and expressive value. This typography may be useful for communicating the concept, but my attempts to apply the framework indicated that hybridity between these forms is more the rule than the exception. Since co-evolution between people, technologies and nature created cycles of unalienated value circulation in the first place, they cannot be fully protected against extraction if our starting point is dividing them into purified categories. What sociopolitical barriers exist to overcoming the binary of natural purity versus technological efficiency, and instead reconceptualizing ecological value generation as a hybrid in symbiosis with the political economy of human value circulation?

In the next five chapters, I will flesh out each of these five dimensions and provide several illustrative examples that help to refine my analysis of their role in disruptive enactments. *Agenticide* and *agentogenesis* will be demonstrated through three types of interactions with bees: people gaining agency through interactions with bees, denial and reclamation of bees' agency through an analysis of Colony Collapse Disorder, and bees using sugar sources other than nectar to produce deviant "honey." *Rich diversity* will be illustrated through a debate about the existence of ant "supercolonies" and the increased use of probiotics. Here I aim to show that a deeper understanding of diversity is poorly captured by linear views, and requires epistemological pluralism in which diversity extends to the analytic tools themselves. *Cyborg virtue ethics* will be explained through discussions about cochlear implants and the Deaf community, using Clementine oranges for laparoscopic surgery training, and the controversial new "Flow Hive". Once we remove the traditional categories of natural/unnatural, better analytic categories can guide us through the ethical attributes of these cyborg exemplars. *Institutional percolation* and *creep* will be examined through the gradual acceptance of acupuncture as a treatment covered by medical insurance and the Pasteurian microbiopolitics of raw milk and cheese aging boards, respectively. Here we see how the gradually expanding purview of

regulatory bodies neither meets the expectations for liberal ideals of federal protection; nor does its absence embody the conservative ideals for free markets. Lastly, *Hybrid generative value* will be explained through the social politics of vegeculture and the hybrid discourses of Korean popular culture as an international phenomenon.

Although seemingly disparate in every way -- subject matter, technologies and affected populations--my thesis is that this bestiary of disruptive enactments can better enable our ability to understand this theme once we have applied the five essential dimensions I have defined above. Bower and Christensen (1995) had no problem with the juxtaposition of plastics, personal computers and jet airplanes; the fact that they all enjoyed rapid uptake by consumers was enough to celebrate technological disruption and ignore consequences such as endocrine disruption. My thesis in some sense inverts those priorities. It does not matter if a disruptive enactment moves with sloth or blinding speed; tepid consumption or a commodity feeding frenzy. It does matter if it offers the possibilities for attuning us to alternative configurations that offer a more just and sustainable world.

2. AGENCY

The first dimension of disruptive enactments revolves around agency, commonly defined as an individual's capacity to act (i.e. Jonsen 1998; Piepmeier 2004; Khader 2011; Ferber 2013). Agency's role in social change is often placed in dualistic contrast to social structure, generating disagreement about which is the originator of actions, choices, and change. Rather than take a position on the "structure vs. agency" debate, I intend to define and identify *how* agency can work as a process and how it can be increased or decreased during periods of change. Agency is a crucial dimension of social change, as noted by García Agustín (2015), "Although the importance of structures is evident, there is no social change without agency." But in the case of disruptive enactments, we cannot assume simple dichotomies: *agencies in disruptive enactments are in flux*. Prior agencies can fade, and new ones come into being. What was once the mute organic backdrop for human social drama becomes the agentic front stage of non-human life (Arnellos and Moreno 2015; Kirksey 2014; de Waal 2009; Paxson 2008; Hribal 2007; Uphoff 2002). And even non-living entities

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(Pickering 1995; Kockelman 2006; Barad 2007; Bennett 2010) can take on the capacity for action in disruptive scenarios.

2.1 A Basic Definition of Agency

One of the keystones of any discussion of justice is the recognition of relevant agents since justice is, at a basic level, meant to be a systemized process that resolves conflicts between entities in a way that adheres to some sort of fairness. In order to measure what is "fair," we need to negotiate a plausible common ground from which to base our comparisons. Communication, whether between humans, humans and institutions, or humans and non-human life forms, is central as well, and these three types of interactions require us to consider not just what we communicate, but how. While Habermas (1985) notes that "[t]he concept of communicative action presupposes the use of language as the medium for a kind of reaching understanding," the need to go beyond symbolic verbal language to forms of communication becomes apparent when there is sufficient difference between entities, such as with institutions and non-human life forms. This also reveals that, while language is important, we cannot merely apply a transmission model that presumes ideas as being discrete packets of information unchanged by the communication process, but instead must

consider a constitutive model that acknowledges that meaning is made as it is being communicated (Craig 2001, in Clarke 2014, and Craig 1999). Rather than a complete rejection, however, this should be considered as a spectrum: generally, the more difference there is in communicative mechanics and style, the more constitutively the interaction ought to be considered.

Although agency will be discussed primarily through a biosemiotic model, it is important to include the influence of cybernetics to this discussion as well, since the two fields are related in that they both offer models for information flow through and across systems/entities. Sharov (2010) draws a distinction between biosemiotics and cybernetics as following the living/nonliving divide; cybernetics includes an assumption that we can control the flow of information throughout a designed system, while biosemiotics allows for some uncertainty and lack of control that comes with studying living entities. However, the line between these two becomes blurred as technologies become more complex and more closely mimic living entities, whether intentionally (biomimicry) or unintentionally, and increasingly commodify and standardize, often on an industrial level, living entities, making them more suited to framing as technologies (Kohler 1994). Therefore, biosemiotics will be a starting point for us to discuss the

agency of nonhuman living entities and cybernetics will be alluded to when discussing the flow of information across systems, whether biological, human-constructed, or hybrids of the two.

Returning to Uexküll's Umwelt model with its sensing and effecting arms, we can begin with a plausible biosemiotic mechanism to explain how biological organisms situate themselves spatially and meaningfully in the world (2010). Each of these "arms" represent a different type of sense or effector and so can be multiplied as appropriate to the suite of abilities afforded to an entity. If we reject a material essentialism that expects carbon-based life, we can see that this model can easily be expanded to non-living beings (like robots and other artificial beings) to recognize their material situatedness in the world as well, so long as they are equipped in some way to sense/perceive and act upon the environment around them as well.

At its simplest, agency then is a way to consider the ways that an entity can both perceive and effect change in and on the particular environment in which it is located; both are needed, as with only perception, one is merely an observer, and with only effector, one is non-responsive. To return to an example using artificial beings, an old-style robot can inspire amusement for its clunky movements and awkward gait when it walks; this is largely due to its lack of sensory apparatuses to give feedback to its

moving parts (its effectors). This is an example of a deficit of agency. Agency can also be relative: an octopus, found to be highly intelligent for an invertebrate, has more ways of perceiving and acting in the world than a seastar; therefore it can be considered to have more agency from its different bodily arrangements that afford more of both.

2.2 Three Levels of Agency

Here, three levels of agency will be described and connected with three ways of engaging with said agency. First, human agency is often framed in terms of moral choices and discourses. Second, nonhuman living agency, such as that found in animals, microbes, and even plants, can better be evaluated through performative means (although some animals can communicate using language). Third, nonhuman nonliving agency can also be considered in some situations, such as digital, computer-controlled characters, or possibly even in materials that respond in surprising ways (see Pickering's "mangle"); this is often expressed materially (but again, depending on the capabilities of the entity, could involve discourse or performance as well).

2.2.1 Human Agency

Agency as applied to humans tends to address individual decision-making capabilities or constraints imposed on individuals or classes of people by social structures. One of its most important forms is moral agency, a foundation of general respect for all humans involved and presumption of the ability to make decisions that matter.

Bioethics is one of the most widely studied intersections between moral agency and scientific changes and so offers a good starting point for framing this dimension of disruptive enactments. Tom Beauchamp and James Childress' *Principles of Biomedical Ethics* (1979) is considered the seminal work grounding bioethics as a professional discipline; it outlines four fundamental principles: 1) Justice, 2) Autonomy, 3) Beneficence, 4) Non-maleficence. These were formulated as a revision to a three-principle framework (which did not include non-maleficence) that arose from the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research that was formed by the U.S. National Research act of 1974 (Jonsen 1998; Ferber 2013). This focus on principles represented a compromise between utilitarian/consequentialist and duty-based/deontological ethical approaches and emphasized guidance in making appropriate decisions in high stakes and high pressure medical and research

situations. Much as the "agency vs. structure" disagreement underlies many key discussions in sociology, the tension between ends-based and intent-/duty-based ethical frameworks forms the basis of many ethical conflicts both in theory and in practice.

From a social science perspective, discussions of gender and race/ethnicity often include considerations of agency in terms of restrictions or limitations of individuals' ability to make choices, especially in oppressive social structures, disrupting the dichotomy of "structure vs. agency" by showing how they flow together and are often inseparable. Alison Piepmeier (2004) refers to Martha Mahoney's definition of agency as "being without oppression" to discuss how women never have true agency in a patriarchal system because of the limitations imposed on them by sexist social structures. In contrast, Serene Khader (2011) challenges binary and absolutist framings of empowerment when she argues that women who appear to support an oppressive regime can in fact be acting from intentionality and agency – "adaptive preferences" – rather than as merely passive objects with no will or desires of their own. By showing that not only could women choose to act in ways that support their well-being based on the given social context, but also perceive themselves as having autonomy to make those choices, Khader's text also problematizes

assignments of “less” or “more” agency without a recognition of types of agency or of subjectivity. This is one example of how feminist scholarship has disrupted clean categories in discussions of human agency, drawing out the importance of an interactive, even *intra-active* (Barad 2007) – where subject and object are ontologically entangled, with only epistemic cuts being made to distinguish them – conceptualization of this dimension, especially when applied to humans.

2.2.2 Nonhuman Agency

Discussions of agency in nonhuman life-forms like animal, plants, and microbes tend towards considering the interactions between the organism and its environment, such as responses to stimuli, ability to affect its surroundings, or tendencies around which humans can develop practices of cultivation. Agency in these contexts often highlights our sense of surprise: if organisms are simply carrying out “laws of nature” then their actions are no more “agentic” than the earth revolving around the sun. But if they act in unpredictable, seemingly creative ways, it would be inaccurate to refuse to recognize their ability to influence their own futures.

Arnellos and Moreno (2015) define agency in a biological context as "any type of functional modification of the environment exerted by an organism." They then identify motility (ability to move through physical structures) as a key factor in allowing an organism to modify its environment, a feature more common in multicellular organisms. Hribal (2007), in a review of historical literature about the agency of animals, defines agency as, "the minorities' ability to influence their own lives," whether that minority consists of cows or people of color, emphasizing the importance of "history from below" as an important form of analysis (much like Sandra Harding's "sciences from below" in Standpoint Theory). Through "acts of resistance," the animals force a negotiation with human handlers – a discourse of sorts – where the humans must recognize that the animals have their own interests, and that meeting human goals will require communication and compromise.

Frans de Waal argues that complex animals, like dogs and primates, demonstrate morality or, at the very least, a proto-morality (2009; 2006; 2001). For example, rescue dogs expressed frustration and lack of motivation (despite repeated offers of toys and food rewards) after hours of failing to find living survivors after a serious disaster, but immediately improved in affect and performance after "finding" a human handler who

pretended to be a survivor trapped in rubble (2001). de Waal uses this to show that animals can feel altruism and benefit from knowledge that they helped others in a way that goes beyond simple rewards and approaches human moral senses.

Although not explicitly described as agency, the framing of rice plants in the System of Rice Intensification (SRI) incorporates a recognition of their agency through interactions and responses to farming techniques. This "low external input sustainable agriculture" (LEISA) growing technique, championed in academic circles by Norman Uphoff (2003; 2002), was attributed to a Jesuit missionary in Madagascar who helped local farmers to plant their rice following inclement weather and noticed increased yields from certain shifts in their techniques that appeared to favor some aspects of the rice plants as they grew. Dominic Glover (2010), in a science studies analysis, centrally locates the agency of rice as it interacts with the environment and growers:

> Key components of the system, such as nurseries and single-seedling transplanting, are not original to SRI. Even as a package, it seems that systems closely resembling SRI in several of its aspects had been discovered or invented and applied elsewhere and at different points in time. This is not entirely surprising when one remembers that at the center of the system remains the **thousands-of-years-old relationship between rice plants and rice farmers, in which rice has quietly gone on expressing its typical responses to different treatments over time.** (emphasis added)

Heather Paxson's *microbiopolitics* derives from Foucault's *biopolitics* as a way to describe the "creation of categories of microscopic biological agents; the anthropocentric evaluation of such agents; and the elaboration of appropriate human behaviors vis-a-vis microorganisms engaged in infection, inoculation, and digestion" (2008). Her research puts cheese at the nexus of various human and microbial activities, from artisanal cheesemakers inoculating milk with microbial cultures to government regulating cheese products with the goal of eliminating pathogenic microbes like *Listeria*. Because of Pasterian ideologies that frame microbes as the cause of illness and thus advocates for their elimination to secure human health, Paxson argues, mainstream thought about food safety regulations oversimplifies processes in ways that reject the agency of microbes.

Evolving from an art exhibit by the same name, *The Multispecies Salon* (Kirksey 2014) covers a wide variety of stories and studies from bioengineered life to microbes involved with food (such as Paxson's microbiopolitics, a contributed chapter) to landscapes as active agents in *intra-actions* with animals. Coining the term "multispecies ethnography," Eben Kirksey and others have used this to challenge the boundaries of anthropology and ethnography, expanding them to include not just humans'

interactions with nonhuman life, but to consider nonhuman lifeforms themselves as agents, as more than being "good to think with" or "good to eat", but also "good to live with" (Haraway, cited in Kirksey, 3).

2.2.3 Nonliving Agency

Another approach to agency draws from semiotics and system theory and emphasizes affordances that a system/entity has to influence its environment. This allows one to consider *agency* of nonliving things like artificial beings such as robots or virtual characters, and possibly even institutions. Kockelman defines *agency* as "the relative leeway one has over the residential and representational modes of meaning that constitute one's environment, and the conditions for this leeway" (2006); this is presented to distinguish agency from similar concepts like *subjectivity*, *selfhood*, and *personhood*, so while it was presented in a human-centric context, the definition itself could be applied to nonhuman or even nonliving actors. Shahram Rafieian (2011) also presents a biosemiotic approach to framing human agency, but his given definition – "agency as the authority or power to direct a stream of semiosis" – not only could allow for nonhuman/nonliving agency, but, by his own admission, does not guarantee

that humans in fact do have agency. This de-privileges human agency categorically and looks instead to agency as a functional measure.

Andrew Pickering's "mangle of practice" turns away from semiotics and towards a performative and "temporally emergent agency," specifically in the realm of scientific experimentation (1995), where nonliving experimental materials can demonstrate agency as scientific practices are developed iteratively. He frames the interaction between human and material as a "dance of agency," with each taking a passive role that allowed the other's active agency to become visible. However, to avoid the dilemma posed by Collins and Yearley (1992) – that one must either frame material agency as a product of human actors, or concede expertise about material agency to scientists and engineers – Pickering favors considering material agency as temporally emergent to recognize its challenge to scientists without granting them sole expertise through scientific accounts of agency (1995, 53). Jane Bennett, in *Vibrant Matter* (2010), similarly recognizes practice as key to agency: arguing that one's ability to perceive agency in nonliving entities relies on one's expertise, practices, and intentions; while a scientist wants to know what a metal *is*, a craftsperson wants to see what the metal can *do*, resulting in the craftsperson or artisan understanding the substance has having a "creative materiality with incipient tendencies and

propensities” that are enacted differently depending on other factors that affect it externally (2010, 56-60). Pickering would reply: that is the representationalist error. We describe science in retrospect, so it appears as if metal's surprising behavior was the testing of a hypothesis that represents what metal is. But scientific experiments are continually tweaked in ways that respond to "what can metal do" kinds of questions, just like a craftsperson.

Karen Barad (2007) offers much at the intersection of materiality, performativity, and technology to enable us to frame the nuances of how they allow us to perceive phenomena and construct a sense of what is real. Through the concept of agential realism, she reconceptualizes the process by which objects are examined and knowledge created in scientific activities. Barad emphasizes that agential realism is not just an epistemological theory but an ontological one, as it describes how reality is actually shaped.

> " [Agential realism] is an epistemological and ontological framework that extends Bohr's insights and takes as its central concerns the nature of materiality, the relationship between the material and the discursive, the nature of "nature" and of "culture" and the relationship between them, the nature of agency, and the effects of boundary, including the nature of exclusions that accompany boundary projects.
>
> Agential realism entails a reformulation of both of its terms - "agency" and "realism" - and provides an understanding of the role of human and nonhuman factors in the production of

> knowledge, thereby moving considerations of epistemic practices beyond the traditional realism versus social constructivism debates." (89)

Agency, according to Barad, “is a matter of intra-acting; it is an enactment, not something that someone or something has” (112). This definition of agency served as the inspiration for a deeper examination of how to define the term in a more useful way for my purposes, and will be explored further in the next chapter. One of the key aspects of Barad’s definition of agency (2007) that is useful is that, in contrast to similar theories, like Judith Butler's *performativity* (1993) or Foucault's *dispositif* (Hardy 2015), *agential realism* is explicitly not limited to human realm, and so potentially includes nonhumans and cyborgs. (108) Additionally, Barad emphasizes that matter is not just passive material that is shaped by agents; it undergoes a process as it “stabilizes over time to produce the effect of boundary, fixity, and surface” (2007, 90), and “[c]rucially, an agential realist elaboration of performativity allows matter its due as an active participant in the world’s becoming, in its ongoing intra-activity. And furthermore it provides an understanding of how discursive practices matter." (2007, 136)

2.3 Agenticide and Agentogenesis

Agency is a key element of social interactions because analysis about what matters and to whom fundamentally relies upon the scheme by which entities are categorized as relevant and deserving of consideration. However, as identified by Abbott (2001), entities are not static over time or through processes, and to assume they are can lead to improper framing inquiry. Therefore, rather than merely ask "which entities in this situation have agency?" it is better to ask, "how does agency change, and how do stakeholders view those changes?"

When considered as a dimension of disruptive enactments, agency can be eliminated (*agenticide*) through any combination of ontological and epistemological means and it can be included, recognized, or even generated similarly (*agentogenesis*). In situations of disruption and change, this serves as a useful starting point for evaluation.

For each case study, agenticide and agentogenesis will be considered through three possible modes: discursive, performative, material. These are not necessarily exclusive or distinct categories; they can overlap or display causal relationships. Discursive agency represents how well someone can participate in meaningful interactions that exchange information: a conversation would be an archetypical example of a discourse, with

participants having discursive agency, but someone who is able to vote in a political election also has discursive agency by virtue of being able to participate in communicating a message of political preference. This draws from discussions of human agency that center on being able to communicate moral choices related to fairness and respect for persons (Beauchamp and Childress 2001) and preferences about moral situations that demonstrate internal agency (Khader 2011).

Performative agency is how much an entity can do to affect their surroundings, whether the environment or other entities. Developing expertise in a practice, such as a crafting technique like cheesemaking, enables one to change something in their environment, potentially generating greater value (see: Generative Justice). This draws inspiration from Arnello's and Moreno's definition of agency of an organism being able to modify its environment as well as from Hribal's definition about animals being able to modify and define themselves through their actions. Knowledge practices can promote both discursive and performative agency, so measuring changes in these modes will depend on what was possible before. For example, a minority scientist who was not included in discussions about research design would have experienced discursive agenticide, and if they were subsequently included, would experience

discursive agentogenesis. On the other hand, if the scientist were to have access to a new scientific technique, such as learning how to operate a new piece of equipment, they would have gained performative agency.

Material agentogenesis/agenticide concerns what an agent is, or has in a material sense. This can be things that are related to the well-being of an organism, such as food, or, at its most simple, a state of being alive or dead. Material agency can also be tied to the intra-action between "things" and "agents"[2] – if one earns more money, then one is able to "do more" with more capital, and if one has more food or medical care, one will be healthier and stronger – flourishing through one's bodily existence – and thus experience greater bodily agency than one who does not have these things. Food itself too can offer more or less agency in the form of microbes or materials that promote beneficial microbial growth in the human gut, as will be shown in Chapter 3: Rich Diversity. If the scientist in the previous example were fired or otherwise bodily excluded from interacting with the equipment – maybe from being shorter than assumed users of the machine – they would experience material agenticide. As with discursive and performative agentogenesis/agenticide, there can be overlap between

[2] while inanimate objects can have a type of agency, as argued by Pickering, Barad, and Bennett, it would be a stretch to consider them to be agents unto themselves as any observable agency always occurs responsively to actions by agents. I am open to the idea given adequate justification, whether ontological, epistemological, or ethical, but such a discussion would go beyond the scope of this work

material and performative modes: in the earlier example of the scientist, they could gain the knowledge to operate the equipment, and they could gain access in the form of a timeslot to use it; these could also be separated – getting training but not having an opportunity to use the equipment – material agenticide would negate any performative agentogenic benefit.

Although these modes tend to increase in intensity and permanence/realism, this does not imply that material agenticide is "worse" than "mere" discursive agenticide. It does, however, recognize that materiality can be a more recalcitrant realm than categories or discourse when attempting to enact or resist change.

2.4 Bees in Three Enactments

The recent surge of interest in honeybees carries within it several shifts in agency that illustrate how agentogenesis and agenticide can occur. First, the agentogenesis of humans as they come to interact with bees will be discussed. Second, the agenticide of bees that has emerged in the case of CCD (colony collapse disorder) will be examined. Third, the emerging agentogenesis of bees themselves in response to increased participation by humans in hobby-level "urban beekeeping," as illustrated by their surprising dietary choices will be described.

2.4.1 Agentogenesis of Humans Through Bees

Bees and beekeeping have carried special meaning for people throughout history. Honey is mentioned numerous times in the Bible and other central texts to represent desirability, sweetness, and rewards for great effort. Michael Pollan (2001) notes that humans desire and crave sweetness, often to our detriment, and honey has been one of the most concentrated forms of natural sweetness we have had before sugar manufacturing. Mormons adopted bees and beehives in their religious and cultural iconography to represent collective effort and welfare (Horn 2006). Bees are even classified as "eusocial" insects - "good/real" + "social" - considered the "highest" enactment of sociality for its apparently harmonious collective society.

In addition to representing desirable social ideals, bees have also served in a symbiotic relationship with humans in beekeeping activities to enrich the well-being of their humans even as the human aspires to promote the bees' welfare. After WWI, it was common for veterans, especially those who had deformities stemming from war wounds, to become beekeepers (Horn 2006). This allowed a group of people who would have faced

difficulties interacting in mainstream society due to stigma to engage in a meaningful livelihood where they would not be discriminated against. It is possible that many found beekeeping, which requires one to interact carefully with stinging insects – finding a balance of performative agentogenesis, to promote inner peace after the traumas of war. The veterans in this case had previously suffered agenticide on a discursive level because their ability to participate in society was hampered by stigma and injuries and on a material level because they had trouble finding work. Through beekeeping, they were able to obtain material agentogenesis through the livelihood of beekeeping, performative agentogenesis through the development of a new set of skills that allowed them to interact positively with bees, as well as discursive agentogenesis by having a reason to interact with society – mostly farmers whose crops they would help pollinate.

This valuable interaction between bees and humans has become a key strategy for organizations that seek to improve the well-being of humans around the world who are suffering from poverty. Poverty broadly represents a type of agenticide, as people in poverty experience disempowerment on many levels and find themselves unable to break out of such a cycle. Ogaba (2002) describes poverty as "not just the lack of incomes, but also the lack of

means to satisfy basic social needs, as well as a feeling of powerlessness to break out of the cycle of poverty, insecurity of person and property." Women in poverty particularly suffer from social disempowerment due to an array of disadvantages, such as restriction from owning property, suppression of public social action, lack of technical training and access, and cultural proscription from engaging in more lucrative pursuits that are open to men. At the same time, humanitarian organizations like the Gates Foundation have recognized that one of the most effective ways to improve agency and standards of living for people is to empower women to escape poverty because of their key social role in raising children, communicating laterally and between generations, and in making household decisions that undergird a society.

Beekeeping has been promoted as an agentogenic option for people, especially women, in societies with systemic poverty. This practice is a low-labor way to not only produce honey, a valuable commodity, for income, but also to increase the value of crops grown in developing regions like Bangladesh (Saha 2013), Nepal (Bhusal and Thapa 2005) and to empower women socially and economically (Ogaba 2002).

Different factors have been recognized as affecting rates of adoption and success of beekeeping activities, such as social mobilization (Bhusal and

Thapa 2005) and effectiveness of participatory research and design activities (Araya, et al. 2007). By targeting populations with training and appropriate technologies, international agencies hope to promote agentogenesis of these people by increasing their social and financial capital. Training organized by ICIMOD[3] in Nepal roughly doubled both the numbers of hives maintained and yield from the hives, and increased income from honey and other products like creams and beeswax by a factor of three (Gurung 2005). Notable in these discussions has been an inclusion of indigenous bees like *Apis cerana* in Nepal and Bangladesh, and *A. mellifera scutelatta*, *A. mellifera adansonii*, and *A. mellifera monticola* in Uganda in addition to the common Western domesticated honeybee, *Apis mellifera*.

Heifer International, a modern charitable organization, is an example of an international aid organization that has utilized the agentogenetic benefits of beekeeping (along with goat milking and other small livestock keeping) to enable women in developing countries to achieve independence and greater performative and material agency. When women are provided with livestock whose products – honey, eggs, milk – are renewable (not requiring the slaughter of the animal to obtain), they are able to increase their material agency by selling or bartering their goods for other needed

[3] International Centre for Integrated Mountain Development

commodities like food, or to secure educational funding for themselves or their children. With this increased material agency, they are also able to become more active in their society, gaining discursive agency, both through increased capital and education that makes able to exist and participate. Finally, they can gain performative agency because they learn practices associated with raising animals and processing their products, giving them increased knowledge capital that can be shared with other members of their community.

2.4.2 CCD and Agenticide of Bees

Despite this significant potential for bees to improve the lives of humans above and beyond already institutionalized uses such as for industrial large-scale pollination of agriculture, there is great concern over the long-term survival of domestic honeybees due to the rise of mysterious colony disappearances observed in the past two decades that in 2006 were grouped together under the term "Colony Collapse Disorder," which replaced the original term "Fall Dwindle Disorder" (van Engelsdorp, et al. 2006). CCD has been a significant problem due to the high loss of colonies; for example, approximately a third of colonies were lost both in 2006-2007 and 2007-2008 in the United States (Ellis, Evans, and Pettis 2009;

Barrionuevo 2007; Stokstad 2007). With such heavy losses of bee colonies, agriculture has been forecasted to suffer greatly (Holden 2006), with a report from the National Research Council (NRC) of the National Academies warning of a looming crisis resulting from excessive reliance on monocultures and honeybees (National Research Council 2007). For example, California's almond industry is worth $2 billion annually (Ratnieks and Carreck 2010) and is entirely reliant upon honeybees to pollinate the crop.

Research on this syndrome has been widespread, resulting in a slurry of research that points to various "causes" such as viruses (Wick, et al. 2010; Johnson, et al. 2009; Maori, et al. 2009), parasites like *Nosema ceranae* (Paxton 2010; Higes, et al. 2008) or *Varroa* mites (Le Conte, et al. 2010), a combination of viruses, fungi, and/or parasites (Fisher, et al. 2012; Emerson 2010; Cox-Foster 2007), diets based on corn syrup or single-source nectar (Mao et al. 2013; LeBlanc et al. 2009), or pesticides, especially neonicotinoids, which don't kill bees but still adversely affect their health (Fairbrother, et al. 2014; Lu, et al. 2012; Wu, et al. 2011), reproduction (Straub, et al. 2016), ability to survive winter (Lu, et al. 2014), susceptibility to gut parasites like *Nosema* (Pettis et al. 2012), and even memory (Farooqui 2013; Stanley, et al. 2015, in bumblebees). Many also identify CCD as not

stemming from one particular cause, but from a more complicated interaction of various factors that weakened honeybees' defenses against this litany of diseases and other harmful factors (van Engelsdorp, et al. 2013; Cornman, et al. 2012; Cox-Foster and van Engelsdorp 2009; Watanabe 2008). Lisa Jean Moore and Mary Kosut (2013) describe CCD best as "an elusive insect syndrome" akin to MCS ("multiple chemical sensitivity") in humans: although it is more accurate to identify a combination of complex interactive factors, it is much easier to point to one singular cause that can be addressed, regardless of efficacy.

This significant focus on every aspect of the honeybee's diet, ailments, lifestyle, sex life, and even cognitive ability represents a newfound interest in their agency, but it emerges only at a time when bees are experiencing a severe infliction of material agenticide: they are dying and disappearing in great numbers. Yet, this agenticide has finally reached a level that it has become the single Who's "Yop!" that was needed to prove that the Whos in Whooville on the speck of dust on Horton's flower indeed existed (Seuss 1954).

One key factor, neonicotinoid pesticides, is a prime example of the agenticide that results from unilateral wielding of definitional and material power. "Pesticide" literally means "something that kills pests," and so

draws from a similar root of antibiosis as do antibiotics used in medicine. Hannah Landecker (2015) describes how the production of antibiotics is driven by the theory of antibiosis: "a human leveraging of substances microbes create in mutually antagonistic battles for space and resources." By virtue of its name – "anti" "biotic" – this substance is antagonistic towards life, usually with limitations on how carefully it can be targeted. Chantal Mouffe distinguishes between antagonism and agonism in political discourses: the former is the process of dismissing the relevance and agency of those with whom one disagrees while the latter is a process of constructive engagement and argument whereby opposing parties are considered sincerely for their merits (2005). In a similar fashion, antibiotics kill microbes outright rather than negotiate with them by limiting their harmful actions, making the deployment of antibiotics an act with finality that cannot be undone. Additionally, antibiotics, especially those labeled "broad spectrum" (which are the most commonly prescribed for general ailments) don't discriminate between harmful and benign or beneficial bacteria. Antibiotics can be very generally targeted or classified based on what types of bacteria they are more effective against, but they deliver their payload in much the same way that military explosive weapons do – with heavy collateral damage regardless of targeting. Different types of

antibiotics could be compared to different types of grenades - one might be incendiary and one might be shrapnel, and so more effective against different targets, but all destroy to some degree.

Just as antibiotics indiscriminately kill micro-life, whether seen as "harmful" or "beneficial" to humans (as will be explored further in Chapter 3: Rich Diversity), so too do pesticides harm creatures regardless of their status as "pests" or "helpers" because pesticides operate on a material level while the categorization of "pests" operates on a discursive one. I use "harm" here because an agenticidal approach recognizes that there is an entire spectrum of agency destruction besides killing: while "pests" only matter if they are alive or dead, a honeybee has many more states that *matter* to us – she can be alive or dead, but also hungry, aggressive, sick, weak, cold, tired, even forgetful. And these nuances of agency affect our relationship with her, whether as an economic technology to improve agriculture, a producer of value in the form of honey, or as a companion for hobbyist urban beekeepers. Yet, pesticides are not tested for these finely textured chemical interactions with a bee's biology because they don't discriminate based on our *becoming with* (Haraway 2008) relationship, only on our domination and eradication of pests. Kleinman and Suryanarayanan (2012) refer to this lack of discrimination when they discuss how

institutionally constructed ignorance prevents effective analysis of the problem of Colony Collapse Disorder (CCD), when whole colonies of bees suddenly disappear or die off. They argue that the classification of insects, including bees, as "pests" makes them all targets of pesticides, shaping the research that is done: there is plenty of research measuring lethality of pesticides on insects, but little to none on the long term health impacts for bees. The research cited above that links pesticides to CCD do not claim that neonicotinoid pesticides *kill* bees (eradicate their material agency), but instead *impair* them, causing *performative agenticide* by keeping bees from being able to effectively interact with their environment and with other bees. The institutionally constructed ignorance described by Kleinman and Suryanarayanan constitutes a *discursive agenticide* by preventing researchers, even those concerned about bees, from even being able to describe or frame their research in terms that recognize that bees have more states that matter to us beyond "alive" and "dead."

There is another *discursive agenticide* that is active, but much less visible in these discussions about CCD. A contrarian position argues that CCD does not matter because it only affects domestic Western honeybees (mostly *Apis mellifera*): since honeybees are technically an invasive species (brought by European colonists to the Americas), saving them is not a

priority, and in fact their elimination would allow native bee species to flourish (Pearson 2015; alexwild 2010). This uncomfortable mirror to the genocide of Native American humans by European explorers and colonists is a bit too disruptive for the many honeybee enthusiasts to feel comfortable engaging with, at least at this time. It is also likely that due to *institutional creep* (see Chapter 6), the adoption of wild and/or native bees for industrial agricultural use is at best a distant future prospect and at worst, an impossibility due to the need for pollinating insects that have been as precisely selected and finely tuned as have the biological technology of laboratory fruit flies describe by Robert Kohler (1994). Finally, this leaves us with questions about whether natural and/or native are in fact better, as well as an uncertainty about whether *Apis mellifera*, like humans born in the United States today, should be considered native-born now, despite having immigrant parents.

2.4.3 Unruly Bees, Rainbow "Honey"

To end this on a slightly less ominous note, I shall describe one more example of agency – this time or surprising agentogenesis literally from the mouths (and stomachs) of bees. The two prior examples have focused on humans who, through working with bees, experience agentogenesis on all

three levels (discursive, performative, material), and on bees who mostly experience agenticide through various human-wrought factors. However, as more laypeople like hobbyist beekeepers have come to interact with them, an increased recognition of bees' agency has made its way into public discourses and awareness outside of expert beekeepers' circles. Ironically, it is likely that CCD was a contributing factor in sparking increased public interest in bees, as noted by Moore and Kosut (2013) in their study of urban beekeepers. However, it is also through the interest by urban dwellers in keeping bees that new recognitions of bees' agency have been made possible.

To return to Jakob von Uexküll's *umwelt* model, a bee has senses that perceive relevant information about its environment that will help it to flourish. Therefore, a bee will see a flower blossom differently than a human, thanks to her ability to perceive ultraviolet light, painting a very different picture of the same blossom that most likely includes information about the food-value of the flower for a bee rather than aesthetic information for a human picking a bouquet for a gift. At the same time, some differences will not matter to a bee: if it has sugar, bees will want to lap it up and take it to their hive to turn it into honey through a messy process of swallowing, regurgitating, sharing with colony mates, and eventually storing in a cell to

ripen. While it is popular today among humans to distinguish between sources of sugars and sweetness – "real" cane sugar soda is considered a luxury over "regular" soda sweetened with high fructose corn syrup and alternative sugar sources like agave, or even non-sugar "sweeteners" like stevia are preferred for supposed health benefits – honeybees don't care as long as it tastes like sugar to them. This indifference to the source of sugar makes it easy for beekeepers to feed their hives in times of scarcity: a bucket of sugar syrup upended over a hive can help a colony obtain enough calories to build up a strong worker base in the early spring before flowers come into bloom (Burlew 2015a).

However, based on common definition, honey must be made of sugars occurring in flower nectar; the U.S. Food and Drug Administration has acknowledged this in a 2014 document providing guidance for industry:

> Reference materials in the public domain define honey as "a thick, sweet, syrupy substance that bees make as food from the nectar of flowers and store in honeycombs." FDA has concluded that this definition accurately reflects the common usage of the term "honey."

This guidance was published after years of petitioning by the honey industry to standardize honey definitions, partly driven by concerns about adulterated honey that was imported from other countries like China, where honey has been mixed with other sweeteners and sold at a much lower price

than "real" honey. The FDA document addresses details like flavoring or other sweeteners added, but does not discuss what happens if you feed bees a sugar source other than flower nectar. In this way, the FDA guidance does not recognize the agency of bees in being able to choose food sources other than flowers to perform a honey process on. Although most beekeepers agree that real honey must come from flower nectar, there is disagreement, as revealed in an email exchange on a beekeeping blog (Burlew 2015b):

> **If sugar and corn syrup and HFCS does not come from a plant, where, pray tell, does it come from???**
> ...We highly discourage ANY supplemental sweetener other than PURE CANE sugar (not "pure sugar," nor corn syrup in any form, because of the pesticides used on those plants, as well as genetic modifications to the plants (sugar beets and corn) used to produce other products.
> We (as well as many beekeepers the world over) feed our bees sweetened water throughout the year, particularly during the early spring and autumn months, for the VERY simple reason that the **BEES (not the beekeepers) need this sweetened water to LIVE**. The **bees are well able to convert this PLANT sweetened water into HONEY**, regardless the pedantic arguments, and the hive utilizes this honey throughout the winter months, to survive and live.
> ...**If sugar water (from plants), did not make honey, the BEES would not be able to survive winter.** The fact that humans harvest the food that these insects produce for their personal survival is secondary, regardless the monetized commercialization of the product. (emphasis added)

The sender of this email argued against the blog owner's position that honey made with sugar water was not only "not honey" but also inferior in quality to honey made from flower nectar. Rather than arguing about the quality of

the honey from a human perspective, the sender framed honey as "something bees need to eat to survive", and therefore anything they make from consuming sugar that they can eat counts as "honey." Although the sender is in the minority among beekeepers, this exchange reveals that even the way something like honey is defined relies upon an agential perspective being assumed that not only prioritizes the needs or desires of a certain subjectivity (bees vs. humans), but also considers *how* such beings would use the substance.

In Utah, a beekeeper crushed up candy canes and fed them to his bees, but because of the openness of bee environments, bees from nearby counties also partook, producing red, minty-flavored "honeylike substances" in their hives. Besides serving as a revelation to non-beekeepers about how bees do not respect spatial boundaries – "robbing" is a concern with any appealing food substance left out near a hive because it will attract bees from other colonies, provoking fights among them – this human practice also speaks to the irony of our industrialized food system today: products that are nearly all sugar, thus almost pure calories, are often considerably cheaper than "real" or "whole" foodstuffs. Perhaps this beekeeper was inspired by news of farmers feeding candy to their cows, as reported back in 2012 (Smith 2012), because it was cheaper than normal cow feed (primarily consisting of corn

and soy), which had doubled in price since 2009. The farmer mixed candy and other snack foods like granola with hay, keeping the candy content to no more than 3% of the total bulk as advised by a nutritionist. But this relatively small supplement was reported to increase milk production and weight gain of the cows significantly. Although it would be difficult to argue that the candy itself had agency of the sort discussed in this chapter, it does seem safe to acknowledge the agency of bees (and cows), who seem to like candy just as much as we do, an upsetting reality for many who idolize "the natural" and are disturbed that bees are no more innocent or pristine than humans in liking artificially concentrated sugar rather than natural sources of food, like flowers.

The lack of discrimination by bee palates achieved worldwide visibility in 2012 when French beekeepers in Ribeauville (a town in northeastern France) reported finding bizarre colors of honey in their hives, ranging from green to blue to purple (Genthon 2012). It was determined that their bees had discovered a biogas plant 4 km away that was processing M&Ms candies, which come in a rainbow of colored candy coatings, and perceived the candy remnants as food, probably in a concentration and abundance that was irresistible to them. This honey-like substance was not sellable and was considered a humiliating loss of profit for the beekeepers.

A similar story occurred two years earlier in New York, but did not receive the widespread attention, although the impacts of the bees exercising their particular flavor of agency had more far-reaching effects for some humans, namely a bust of illegal marijuana growing activities and the suicide of the person responsible. In 2010, urban beekeepers in Brooklyn discovered that they not only had red honey in their hives, but also red bees (Dominus 2010; Rovzar 2010). As with the French bees, the Brooklyn bees found a human-made source of near-infinite sugar: a factory that made bright red maraschino cherries that one commonly finds in cocktail drinks and on desserts. When engorged with the syrup, the bees themselves "glowed red," especially in the evenings, as they flew back to their hives. But it was the owner of the factory, Arthur Mondella, who initiated a conversation with the New York City Beekeepers' Association (NYCBA) because he was concerned that bees could get into the jars of cherries and create negative PR for the company. Andrew Cote, the founder of NYCBA, who responded to Mondella's request, acknowledged that it was a sticky situation, by explaining:

> Beekeepers in Brooklyn sometimes lead a myopic sort of existence wherein only their world view, or their set of needs, is valid or important. ...The factory employed hundreds if not thousands of Brooklynites over half a century—and wished to ensure the longevity of their good name and product (such as it was). The beekeepers were

> annoyed that their bees were drinking run off from a food factory. Everyone had a valid beef (Dominus 2010).

Cote found Mondella to be cooperative and amiable: Mondella had even suggested potential for a line of colored honey, which Cote politely refused (Daly 2015). Together, they identified the source of syrup from which the bees supped: open vats of cherries that were exposed to open air during transfer from one side of the factory to the other. This was easily solved by putting lids on the vats as they were moved. However, an article in the *New York Times* published a few days earlier suggested that dumped runoff was the source of the red bees (Dominus 2015).

This article was the catalyst for the Brooklyn District Attorney's office, which had been working for years to gain access to Mondella's factory based on suspicions that he was growing marijuana. They had previously been unable to secure a search warrant, so when the *New York Times* article was published, they took the "runoff" claim as an opportunity to search the factory in tandem with the Department of Environmental Conservation (Daly 2015). The inspectors were unable to detect any marijuana at the time because of the strong smell of cherries, but they continued with their investigation, using surveillance and informants to collect more information. Several years later, in 2015, they performed

another environmental inspection, and found hidden doors that were sufficient evidence to obtain the search warrant. On February 24, 2015, the DA's office raided the factory, and Mondella committed suicide; in the days that followed, large amounts of cash and growing equipment were found (he had apparently just sold a recent harvest), confirming that Mondella was running a large illegal marijuana growing operation in the basement of his cherry factory (Yee 2015). This remarkable incident was made possible in part through the *intra-active* system of urban beekeeepers, bees with their craving for sweetness, a maraschino cherry factory, and human law enforcement taking advantage of environmental concerns, a system in which the bees, with their surprising performative and material agentogenesis, played a pivotal role.

2.5 Conclusion

In this chapter, I have set the stage for Disruptive Enactments by offering an analytical toolset for identifying and evaluating changes in agency for a variety of entities, from human to nonhuman, from living to nonliving, to remove barriers to acknowledgement of agency that can stem from lack of classification. When change happens, there can be a growth in agency - *agentogenesis* - or a reduction of it - *agenticide* - and it can take

three forms: discursive (whether one participates in a discussion or is recognized), performative (utilizing knowledge/expertise to act), material (physically existing or participating by virtue of physical properties). These are not exclusive categories, but are instead focal types to recognize that some types of agency can increase while others may decrease, or that some types of agency can lead to further enactments.

Through three examples of bees, I have demonstrated the nuances available in analyzing three different types of interactions - people gaining agency through their interactions with bees, the agenticide of bees through our scientific and institutional framings of insects as "pests," and the *agentogenesis* of bees as they show that they share our preference for artificially sweet things over natural sources of sweetness, leading to an institutional *agentogenesis* for law enforcement in arresting the owner of the syrup factory from which the bees drank.

The next chapter will expand from these individual agencies to consider how different entities can relate to each other and to reframe how diversity is recognized and measured.

3. RICH DIVERSITY

Disruptive enactments often change the variety of things, introducing difference into a population that has stabilized into a sense of similarity. "Diversity" is one framework for describing this variation, but it is fraught with invisible baggage and inconsistencies about how to identify and measure difference, and how to consider the effect of diversity on a larger system. To sharpen this vision for seeing why recognizing the quality of diversity matters in the face of change, I will explore in this chapter a concept of rich diversity, and distinguish it from facile versions which obscure more than they reveal.

Before a discussion of "diversity" can occur, a consideration of difference and how it is constructed must be explored. Below we will examine the history of difference in the biomedical construction of immunity as an organism's response to "nonself" agents. Because the body and its environment are in constant states of mutual co-construction, it offers a much deeper understanding of the relations between variety and mechanisms of distinction than typical conceptions of diversity allow.

3.1 Defining Diversity

3.1.1 Immune Theories of "Self/Non-self"

Fundamental philosophies about the "self/non-self" divide drove historical conceptualizations about health, disease, organisms, and environment while remaining ubiquitous themselves. Standard medical practice as we know it is the result of many iterations of cultural development and change over the lifetime of the medical profession. The ways that diseases like syphilis were identified, diagnosed, reported, and treated evolved over time in response to prevailing cultural norms about sickness, health, sexuality, and social class (Fleck, 1979). Definitions of "health" and "disease" also varied over time (Canguilhem, 1991), with ancient Greek theories of sickness reflecting more holistic ideas about the flow of energy in bodies that contrasted with imagery of contamination, invasion, and impurity.

Canguilhem noted that this paradigm argued that "[d]isease is a generalized reaction designed to bring about a cure; the organism develops a disease in order to get well" (1991, 40); this represented a dynamic or functional perspective on health. In contrast to this, the "germ theory" of disease became widely accepted because it offered a more concrete

"ontological representation of sickness" (Canguilhem, 1991, 40) that located the agent of illness outside the body: a contaminant or a toxin. However, both the dynamic/functional theory and the ontological theory reflected a heterogeneous distinction between the pathological and the normal self (41), serving as a foundation for Foucault's later theories on normalization, biopower, and discipline.

The growth of the field of immunology also contributed to the development of conceptions of disease and health (Tauber, 1994a, 1994b, 1999, 2008a, 2008b; Ulvestad, 2007) whereby central competing concepts of "self" and "non-self" (inspired by Cartesian divisions of body and mind) drove different explanations about how the immune system functioned, both in design and in execution. Ilya Metchnikoff, who was awarded the Nobel Prize in 1908 (along with Paul Ehrlich) was originally an embryologist who made landmark contributions to the new field of immunology through his "phagocytosis theory," which provided a mechanism by which multicellular organisms were able to achieve a harmonious balance within.

In contrast to Claude Bernard's idealized *milieu intérieur* (expanded as "homeostasis" by W.B. Cannon), Metchnikoff started with an assumption of disharmony in organisms that had to be overcome in some way (Tauber, 2003). Phagocytes ("eating cells"), he determined, acted with a rudimentary

agency to move throughout an organism and eat various types of cells, brokering a therapeutic "physiological inflammation" This discovery helped to address the gap between evolutionary and developmental biology by showing a mechanism for cells to be coordinated and integrated. The phagocyte became the "purveyor of identity" as a foundation of immunological paradigms (Tauber, 1999). A century later, Francisco Varela, Antonio Coutinho and others from the Paris School supported a similar model of self-determinism:

> "The self is not just a static border in the shape space, delineating friend from foe. Moreover, the self is not a genetic constant. It bears the genetic make-up of the individual and its past history, while shaping itself along an unforeseen path" (Varela and Coutinho, in Tauber, 1999).

This model came about partially as a counter to Frank Burnet's "tolerance theory," of immunity, which posited that during fetal development, immune cells were selected for non-reactivity to the body's cells so that the future immune system would only attack foreign entities (Hyrd, 2009, 81). This relied upon a static and unitary identity of "self" that Tauber criticized as ignorant of the co-constitutive nature of identity that arises from constant interactions within the body among somatic and immune cells (Tauber, 1999). However, Burnet's style of immunity theory

has continued to influence concepts of "self" and "non-self" today, both in medicine and in other life science fields like ecology.

Difference arises from a conception of what is "self" and what is "nonself," and responses to said difference depend on how it is perceived. Perception of difference, however, relies on socially constructed ideas about what reactions are provoked by difference and what factors will be considered to establish a means of measuring it. From understanding this nuanced construction of difference, I will proceed to highlight the tension between epistemological and ontological ways of knowing diversity.

3.1.2 Epistemological and Ontological Diversity

There is the epistemological understanding of diversity, which relies on categories to allow quantification of differences, and the ontological effects of diversity, which manifest in system-wide characteristics, like adaptability, robustness, and depth of functionality. Both are important: inability to measure diversity impedes people's ability to discuss it (including promoting it) and its ontological absence prevents us from having anything to discuss in the first place.

An example of a lack of epistemological diversity would be a university affirmative action program that only sorted based on ethnic

background but not on geographical or economic considerations, potentially entrenching both a genetic construction of race and an institutionalized ignorance of intersectionality and inequality of opportunity by being unable to categorize people appropriately based on their relevant differences. Meanwhile, its material counterpart, a lack of ontological diversity, could be demonstrated in, for example, the extreme algal bloom affecting the US West Coast in 2015 to the present (NOAA 2016).

On August 20, 2015, NOAA scientists recorded the mortality of 30 large whales. This was followed by reports of multiple sea lion strandings, the closure of shellfish grounds, crab harvests, sardine fishing, and so forth. But we only see the tip of the iceberg: charismatic vertebrates like whales and sea lions are crucial to the tourist industry, and categories like shellfish, crabs and sardines are industrial favorites. In other words, ontological characteristics are unknown except through our epistemological categories. A once-stable ecosystem is currently destabilized by human activity: efforts to correct the imbalance are futile so long as hidden relevant factors – the multitude of life-forms and nonliving influences that tourists and fishing industries ignore – fail to be recognized by bodies responsible for policy.

The same situation can be high in one type and low in another. For example, a farmer's market can offer a great deal of epistemological

diversity in showcasing heirloom produce (categorized by names and types through the expertise of vendors) and other locally made offerings that educate people about the diversity of food sources and preparation methods, like fermentation. Customers at a farmer's market can come away with a greater appreciation for this bountiful diversity of foods that have been erased in the modern industrialized diet. But at the same time, there is a lack of social diversity if the market is located in a predominantly upper-middle class White suburban neighborhood that requires a car to reach it. Such a location excludes many people from participating in this distribution of food diversity if they have ways of getting around that are not considered "normal" (walking or cycling in a car-oriented city), do not have cash on hand (although some markets take credit/debit card and may accept EBT), or feel unwelcome in the area (ethnic minorities). This type of diversity of social function is not as apparent, but it has actual material impacts on who is able to access the market and who partakes of the epistemological diversity.

An understanding of both ontological and epistemological dimensions of diversity are therefore critical to analyzing diversity accurately and effectively assessing the impacts of attempts of increase diversity. The next

two sections will explore theories about diversity from biological and social perspectives.

3.2 Biological Diversity

Diversity is a key concept in biological arenas, especially in ecology, although this concept has also become relevant in agricultural settings, where the impacts of monocultures are being increasingly felt through the rise of resistant pests and weeds (a result of overuse of *agenticidal* chemicals), increased vulnerability to disease and environmental conditions (the Great Potato Famine), and economic precarity for farmers dependent on one crop source (such as genetically modified crops from Monsanto). For the purposes of disruptive enactments, I will offer a brief history of "biodiversity" as a gateway to understanding biological perspectives on diversity, but this is intended to later connect to social considerations, not to stand on its own. As can be seen from the above examples, biological mechanisms have social impacts, and therefore ought to be synthesized for a more comprehensive understanding of relevant factors.

3.2.1 History of Biodiversity

The term "biodiversity" represents a multi-stage refinement over the course of decades to develop a concept that could effectively recognize the importance of multiple concerns and ideas. "Biodiversity" first emerged as a more media-friendly contraction of the term "biological diversity" at the 1986 National Forum on Biodiversity, an event intended to bring public attention to the importance of preserving biological diversity (Farnham, 2007, 22). Although the first published definition of "biological diversity" did not appear until 1980, the concept was referenced to varying degrees as far back as the 1960s. From its early usage, biological diversity was deeply linked to conservation concerns, and there were two common qualities to the definitions: all forms of life were recognized and all levels of organization were covered (Hunter, in Farnham 2007, 12). "Conservation of diversity should be the primary aim of conservation," wrote N. W. Moore, in a 1969 article published in *Biological Conservation* (Farnham 2007, 16). Moore used both the compound term "biological diversity" and "diversity" unmodified in the article to emphasize the importance of conserving habitats. This usage of "diversity" contrasted with earlier uses in discussions of diversification in microbiology and cellular biology.

In 1980, the chair of the Council on Environmental Quality (CEQ), James Gustave Speth, seeing increasing concern over extinctions and loss of habitats, called for CEQ staff to report on "the status of life on Earth" (Norse 1996, in Farnham 2007, 17). Elliott Norse and Roger McManus realized in their research for this report that simply covering species extinctions was insufficient; there was also concern for germplasm resources (genetic availability for crop health) and whole ecosystems. Although the first definition only identified two hierarchical levels of biological diversity – genetic and ecological – later revisions included the ecosystem level for completeness. The convention of focusing on three levels – ecosystems, species, and genes – has become the most widely recognized in the literature despite suggestions to include other levels like populations, landscapes and alleles (Farnham 2007, 12). This was due largely to familiarity for professionals across scientific, business, and political arenas, and to already established studies by conservation biologists in those three fields.

Intuitively, the two components of the term – "biological" and "diversity" – implied recognition of a multitude of life forms. But the importance of this concept signified an important shift in how the natural world was perceived and how conservation proponents sought to communicate the idea to the public. "Nature" carries a "taint of association

with bleeding heart liberal tree-huggers." Using the term "biodiversity", on the other hand, "maintains an aura of scientific respectability" (Takacs 1996, 76). Biodiversity won out as a more appealing concept for conservationists over terms like "wilderness" and "endangered species" by finding a balance between overly general abstractions and overly specific itemizations. Wilderness relied too much on idealized images of pristine land and drew criticisms for being used as a tool by rich nations to control poorer countries. Biodiversity allowed parallels to be drawn to discussions of cultural diversity, allowing for an appreciation of environments affected by humans. Meanwhile, the focus on protecting endangered species came to be seen as a reactive process of triage that too easily was reduced to "idiotic dichotomies," like a bird species versus jobs (Lovejoy, in Tackacs, 59). Fears of backlash from strong enforcement of Endangered Species Act provisions (which focused on species-level protection) and the increasing focus of dynamic processes over static types (Tackacs 1996, 64-66) further drove the shift from "endangered species" to "biodiversity." By recognizing the importance of quantifiable factors while keeping sight of interdependencies, biodiversity served the needs of the diverse participants in conservation, economic, and political arenas: "The term 'biodiversity' incorporates the conservation goals toward which many biologists really

aim...while still allowing the public to maintain an emotional grasp on charismatic icons." (Tackacs 1996, 79).

3.2.2 The Panda Paradox

Like many political compromises (Nixon's "southern strategy" tying racial bigotry to republicans, or Reagan's use of the evangelical right come to mind), the coupling of public love for attractive vertebrates – "Charismatic Megafauna" – with conservation, as seen in the World Wildlife Fund's panda logo, while expedient in the short run, has now backfired in the long run. In 2014, for example, German state-owned bank KfW launched a €20-million tiger conservation project. This was great news for tigers, but mounting evidence shows that such gestures focused exclusively on the top of the ecological food chain – the public's epistemological categories for biodiversity – are distracting the public from the ontological crisis concerning the elements that actually *generate* and *maintain* ecosystems. Hochkirch (2016) for example notes that the International Union for Conservation of Nature (IUCN) only lists 394 insect species as extinct. Hochkirch indicates that, to the contrary, there are probably several dozen insect species going extinct per *week*. His analysis might be summarized as follows: public attention is inversely proportionate

to ecological significance. The more "publically insignificant" the organism, the more powerful its role in "ecosystem services" such as pollination, pest control and nutrient cycling. But public attention drives research dollars. As a result we don't even know how many invertebrate species still exist (estimates are about 1.3 million) let alone their conservation status (estimated to be about 30% in danger of extinction).

When we speak of species it is typically with the assumption that we are referring to a set of genetic resources that are inheritable across generations. But a rich diversity perspective would include other factors as well. Eva Jablonka and Marion Lamb (2006) advocate for the consideration of four dimensions of inheritance that *diffract* (in the Harawayan sense) across and through each other: genetic, epigenetic, behavioral, and symbolic. Each dimension of inheritance consists of information transfer between individuals, and each dimension has the potential to affect the other dimensions, not just from the "blueprint" of DNA to RNA to proteins, but the other way, from environment to RNA to DNA, and from the social to the biological and vice versa:

> Today things are working the other way around - the allele is affecting culture. It is changing the ways marriage partners are chosen: because the disease is so common and distressing, many Jewish communities now provide premarital counseling and testing services aimed at reducing the number of afflicted children (297).

Eglash (2013) discusses implications for the conservation of rare species such as the Florida panther in terms of epigenetics; molecules outside of DNA that can be inherited over a few generations but affected by diet and environment:

> Could phenotypic categories like "Florida panther" have roots in the fact that different environments create epigenetic differences? If so, can a subspecies be classified as endangered on the basis of its rare epigene? Wouldn't it make sense to include such epigenetic variation, and thus directly and deliberately link protection for endangered environments and endangered species, rather than limit the legal basis to rare genetically distinct species? And how would such inclusion of the epigene affect our understanding of racial categories and their relation to phenotype for humans? (11)

Similar arguments could be used to consider dimensions of inheritance like behavior. As Doyle and Martin (2012) note, "**Behavioral diversity within a group of closely related species**, despite relative **uniformity in morphology**, is the rule rather than the exception among living animals" (pg 48, emphasis added). Unfortunately the conservation community is locked into a genetic paradigm; that is, a reductive rather than rich view of diversity. Thus when discussions of behavioral diversity arise, they are regarded in only an instrumental role, as something that contributes to genetic diversity and survival of the species. Viewing behavioral diversity as something equally important as genetic diversity would prevent "conservation" efforts based on merely cloning a rare species and releasing

it from labs or zoos. Behavior is transmitted by learning in animal communities, not by DNA.

Another component to measuring biological diversity coincides with the epistemological versus ontological problem: do we prioritize taxonomical (species) diversity because it is established and easy to measure, or should we look towards a more functional measure of diversity? (Petchey and Gaston 2002). David Tilman, et al. (2001) define "functional diversity" as "the value and the range of those species and organismal traits that influence ecosystem functioning." Laureto, et al. (2015) defines "functional traits" as "organismal characteristics that influence fitness and the functioning of ecosystems."

3.3 Social Diversity

It is risky to conflate social and biological systems with each other, or to draw normative direction from one to apply to the other. Plato's *Symposium* famously showed the Greek's problematic conflation of society to a human body, arguing that just as there were parts of the body that performed designated tasks - the feet for standing on, the hands for doing, and the head for thinking and leading the other parts - so too does society need feet, hands, and head. At the same time, it is likewise dangerous to

separate the two realms to the point of idealizing one (usually the biological/natural world) into moral irrelevance (the next chapter will engage further with questions about essentialist divides between natural and artificial). Erika Cudworth (2005) describes Murray Bookchin's analysis of difference and hierarchy across biological and social realms as ascribing hierarchy and domination to social systems while claiming that biological systems are free of domination. However, Cudworth argues that difference in social systems does not inevitably lead to domination and that systems of domination (power) may yet also entail reciprocal practices in line with biological ecology:

> I think Bookchin is referring to difference here when he speaks of hierarchy, and as I argued in Chapter 1, it is not inevitable that social difference becomes implicated in systemic domination, nor that systems of domination are not also characterized by reciprocal practices. Difference amongst humans may be analogous to diversity amongst non-human species and within eco-systems, but it may also be implicated in relations of social domination. **There needs to be an analytic distinction between difference per se and difference-in-domination**. (emphasis added)

Part of the distinction between difference as variation and difference as domination relies both on the context within which difference occurs (ontological diversity) and what the relation of that difference is to a sense of what is "normal" (epistemological diversity).

3.3.1 Functional Diversity

One concept that effectively emphasizes this distinction shares a term already mentioned - "functional diversity" - but in this case arises from disability studies. The term "functional diversity" challenges ideas of loss and lack of function in people with disabilities while shifting the focus of different functioning to the social and material context surrounding the actor. Javier Romañach and Manual Lobato, at the 2005 Independent Living Forum in Spain, presented the term "functional diversity" as an alternative to "disability". In their explanation, they argue that it has been difficult to shift the location of dis-ability from the individual to the environment, and that their term makes more visible the role of the environment (social and material) in framing what is considered to be "normal" functionality.

> Hence, a deaf person communicates through the eyes and by signs or signals, while the rest of the population does so basically through words and hearing. However, the function that these perform is the same: communication. To move around, a person with a spinal injury customarily uses a wheelchair, while the rest of the population do so using their legs: the same function, but in diverse forms.
>
> Hence, the way we construct our environment depends on what we have been taught is "normal" in the statistical sense, and this "normality" changes with time (2005).

To illustrate this, consider the environmental design decisions made to enter a chain coffee shop and order a coffee drink. First, there are doors that must be navigated, and unless they are automatic, one needs to simultaneously open a door and move through the doorway. Then, assuming one does not already have a favorite drink, a menu is consulted, usually posted up behind the coffee counter, with options. Not only are menus almost always in visual format, but they usually require literacy in the prevalent language of the area. An order is placed by communicating to the barista which drink is desired, payment is negotiated, and the finished coffee is announced so that it can be picked up. This simple exercise is what Foucault terms an *apparatus* (in French, *dispositif*) of technological design and social custom decisions: doors that default to closed, rather than open, a visually communicated menu, verbal communication of order, payment, and pickup. All of these presume a type of functionality in customers, for whom such tasks are generally considered natural or simple. But for a person who is impaired in mobility, or who cannot see, hear, or speak, this simple process becomes complex. *In this context*, a person is "dis-abled" because they have trouble functioning. At the same time, a person who was illiterate, either in that particular language or in the customs of coffee culture –

knowing what an “Americano” was, or what the difference between a “dry” and a “wet” cappuccino was – would likewise have trouble functioning.

But if the context were different, such “dis-ability” disappears. For example, at Rochester Institute of Technology, which houses the National Technical Institute for the Deaf (NTID), there is a significant population of deaf and hard-of-hearing students. To support the concept of “deaf community,” there are many social and material design choices that, while often described as “accommodations,” more accurately should be described as “affordances,” or “shifts of context.” For example, some dormitory floors are sign-language floors, where you only communicate through sign language. Fire alarms also have flashing lights, and flashing lights are installed in dorm rooms so students can be alerted in cases of emergency. Many students can order coffee using a smartphone app that shows the barista what drink is desired and shows the correct price to the student so they can pay. This app could be used by others as well; someone with extreme social anxiety or difficulty speaking the language (whether through physical configuration or being a nonnative speaker) could also use this to order coffee. If ordering coffee through such an app was “normal,” then there would be little discernable difference in how these different people ordered their drinks; indeed, it could be seen as odd for someone to insist on

talking about their order when they could have used the app more efficiently. These changes to the environment reveal how choices are always made in design decisions that affect how some are able to interact with it. Because of this, the concept of "functional diversity" opens up more productive discussions about these interactions and contexts.

Philip Patston (2007) takes this concept a step further with "Constructive Functional Diversity," a way of reframing a contradictory portion of the original formulation by emphasizing that *everyone* functions in a different way and thus taking away any sense of a deficit or a "normal." He highlights the tendency to put names and terms to certain conditions seen as deficient, but not to label conditions for the exceptional:

> We do not invent conditions for elite athletes, creative geniuses or beautiful people like Acute Physiological Superiority Syndrome, Ineptitude Imperfecta (Einstein's Disease) or Aesthetic Arrogance Disorder.

Here we see an enactment of the hierarchy referenced by Bookchin and Cudworth - where in this case, difference operates within an assumption of a "normal," prizes the "exceptional" as nonproblematic, and problematizes anything that falls short of "normal." Patston's approach makes visible this implicit hierarchy, thus forcing a reframing that casts all functionality as difference and promoting a non-dominatory form of social physical diversity.

3.3.2 Power and Engagement

Dean Nieusma, in his analysis of experts in the Energy Forum of Sri Lanka (2011), identified the value of the placement of expert activists between many types of organizations and stakeholders:

> The benefits of engaging divergent positions, the Energy Forum learned, extended far beyond the completion — however successful — of any particular development project. The very act of deliberating priorities, negotiating competing perspectives, and responding to imbalanced power structures — and most importantly marshaling expertise in support of alternative courses of action — came to represent for the Energy Forum the core development challenge.

In other words, it was through the engagement with diverse entities that real, underlying challenges were revealed and negotiated as part of the process of making lasting, positive change. Without an appreciation for diverse positions in power structures, subjectivities, and material realities, change can only happen through unilateral exercise of power that rejects difference and enforces monocultures of thought, practice, and being.

Sometimes extra effort is needed to respect diversity, especially when there are material and social elements of disempowerment that contribute to it. To mitigate the difficulty that poor people would encounter in traveling to a public discussion event, the Energy Forum compensated poor participants with funding to cover travel costs. Looked at from a simple economic perspective, money was given to poor people; from a political

perspective, disenfranchised voices were given more representation. However, if one starts from a position that sees functional diversity as a given, then any costs associated with promoting it would be incorporated into any other "standard" costs associated with a public gathering of people: deposits to secure hotel room blocks, conference rooms, audio/visual equipment, food and refreshments, contracted transportation and other services. This is where power can be useful: by reframing the priorities of deliberative activities and applying resources to support such a conceptual reconfiguration, any resulting change can be more lasting and robust.

Even once participants are present, there are other barriers to participation. Nieusma points to epistemological exclusion, whether intentional, such as rejecting contradictory reports from marginalized participants, or unintentional, such as framing a discussion in such a way that it excludes ideas or concerns from less mainstream perspectives:

> Merely inserting diverse participants into the existing process was insufficient; confronting epistemological exclusion required reconceptualizing expertise as well as renegotiating its role in policy deliberations at every level of Sri Lanka's political hierarchy (138).

This is the other prong of rich diversity, not only must the diversity that is recognized and included have functional meaning, but it must also function to diversify discourses, practices, and organizations beyond mere inclusion.

3.4 Rich Diversity

With these different definitions and types of diversity presented that span biological and social realms, one may ask, "is diversity really that beneficial?" Biologically, a richly diverse ecosystem is more robust and resilient towards catastrophic change. Song, et al. (2014) argue that biological functional diversity has a significant positive effect on ecosystem functionality, partly by distributing resource usage and partly because it incorporates consideration of abiotic (nonliving) and other factors besides the lifeforms involved, and that it must balance species richness.

Socially, diversity also holds benefits. Most fundamentally, diversity is the hallmark of a democratic, open society; policies which attempt to diminish diversity such as the US segregation practices or South Africa's apartheid are the signatures of authoritarian ideologies that leverage a fear of difference into social domination, as described earlier by Cudworth. Therefore, an observable lack of diversity or tendency to segregate difference can be a strong indicator for authoritarian, oppressive regimes.

But rich diversity also holds ontological value. Duarte, et al. (2015) and Walter (2014) argue that political diversity improves psychological science research by reducing a unilateral effect of one type of bias and making it less likely that researchers as a community would avoid certain

"unpalatable" topics due to political views. However, the ways that diversity is introduced matter, as many companies have discovered that mandatory training and diversity policies often have the opposite effect, making majorities feel defensive (Dover, et al. 2016).

I have previously written on the importance of interlocking agencies to robustness of social systems and practices as well as the value of *emergent thirdness*, derived from Michel Serres' *parasite*, in guiding us towards better comprehensions of difference as strength (Restivo, Weiss, and Stingl 2014).

> Many types of problems we see today are a result of an epistemic monoculture in its mature stages where resources once considered free dwindle, waste products stack up faster than they can be dispersed, *precarity* has become rampant, and structural collapse is imminent (172).

Examples of the problems that arise from epistemic monocultures include the degradation of the American diet being sometimes attributed to women entering the workforce and leaving the home, the greater involvement of non-expert patients "asking their doctor" about advertised pharmaceuticals, and a decline in effective political volunteerism due to overreliance on housewives (Restivo, Weiss, and Stingl 2014). All of these involved a system that promoted a monoculture: one way of doing something that was

heavily reliant upon one type of agent. When that keystone agent was removed or changed – women leaving the private home and entering the public workplace or restrictions on direct-to-patient marketing – the entire system collapsed and the "cause" could not easily be identified. To address these problems, there must be agentogenic efforts made to include previously invisible or silenced agents as well as not just a tolerance of difference, but an embrace of diversity for both its discursive and material impacts – a rich diversity – that promotes interconnectivity. An example of this is the "6th Man" club for basketball fans (or the 12th Man for American football) to acknowledge that although the fan is different from the players on the court, s/he nonetheless contributes to the goal of winning the game in a meaningful way by cheering and otherwise providing support in a way that only they could provide, not *despite their difference*, but *because of it*.

> It is these interlocking and interdependent agencies that offer a greater strength. A recently discovered species of shrew, *Scutisorex thori*, is thought to be related to *Scutisorex someren*, the "hero shrew," so named because it is able to tolerate an incredible amount of weight on its spine (a researcher stood on its back for a minute and it walked away alive and unhurt). This heroic feat of strength is made possible by a unique configuration of its spine: the vertebrae interlock with each other, resulting in a visual representation of networked multiplicities that support each other in an existential entanglement (ibid 182).

Another example of *rich diversity* is companion planting techniques used in agriculture. One of the most notable traditional practices is "Three Sisters": a stalk of corn provides structure for a bean plant to climb, the bean plant fixes nitrogen in the soil, which is shaded by a squash plant that is able to collect ample sunlight without being blocked by the corn and nutrients from the bean plant's soil enrichment. Again, it is because of their difference that the three plants thrive together; the rich diversity of this system brings together all of their agencies for mutual benefit.

Three case studies will further explore this concept of rich diversity through a lens of hybridization and multiplicity. First, intersectionality and multi-racial identity will be considered through this hybridized social-biological lens. Second, the concept of the ant "supercolony" will be examined in assumptions that are made by scientists about difference (and violence) and by recognizing the role that humans play in providing a non-diverse environment for ants. Third, the impoverished diversity of industrial probiotic supplements will be considered for their future outlook on human health.

3.5 Biological and Social Difference: Intersectionality and Mixed Race Identity

Intersectionality reminds us that difference is not additive, but recursive and intra-active. Yet it is difficult to maintain an awareness of it in non-academic discourses because, as noted by Patrick Grzanka (2014), it is much more likely to see public and media analyses focus on "race *and not* gender" (*Fisher v. University of Texas* - Affirmative Action in college admissions) or "sexuality *and not* race" (Proposition 8) or "race *and not* class" (*Shelby County v. Holder* - Voting Rights Act), resulting not only in oversimplified, but inaccurate assessments of relevant factors in such cases.

Recall from chapter 2 the discussion of agency, where we saw that disruptive enactments require a wider repertoire than the term usually provides. Here we can see the utility of that concept at work. Intersectional analysis allows us to see that is it not merely a matter of treating human "resources" as if they were physical quantities. Affirmative Action struggles to undo centuries of injustice with blunt tools; it cannot help but engage in some kind of discursive *agenticide* of the people involved. Thus, intersectional approaches are *agentogenic* by revealing and emphasizing the *intra-active* elements of social difference.

One example of this type of *agentogenesis* can be shown through examinations of "mixed race" people in different societies. Although "race" is a fraught concept because of its widespread use to promulgate social oppression and reify difference through an implied biological origin despite no correlation existing, there can be value in recognizing its use as a socially constructed category to perpetuate difference and in measuring such effects. Joan Fujimura has engaged with this apparent paradox while considering ways that including geographic genetic origin can be useful or even necessary in biomedical arenas while also retaining a reflexive awareness of the dangers of using such terms lightly (2011; 2010).

King-O'Riain et al. (2014) unpack the concept of being "mixed race" in an international context: not only do people of mixed descent present their heritage differently depending on social histories and power dynamics, but the concept of being "mixed race" takes on completely different meanings. For example, Lily Anne Yumi Welty (2014, same volume) describes the complex layers of Okinawan identity that arose from exclusion of Okinawans from Japanese identity and the later American military colonization of the island. A mixed White-Japanese person in Okinawa represents decades of American military control of that society and therefore provokes tensions simply by their physical appearance. Meanwhile, Miriam

Nandi and Paul Spickard (2014, same volume) explain how German law abides by a "one drop" rule that sharply contrasts with the "one drop rule" convention in the United States that deemed any African heritage as "tainting" one's White heritage (rendering all mixed Black-White people some form of Black, like "mulatto" or "quadroon").

In Germany, this principle - *jus sanguinis* - dictates that any German ancestry grants one citizenship and a passport; the German passport itself is an exclusive indicator of one's citizenship because a holder is not allowed to retain dual citizenship. This law exists in a complex landscape overshadowed by the Nazi regime and doctrines of biological racial purity; even the German language seeks a delicate balance by avoiding apply terms like *Rasse* (race) to humans (it is only applied to animals in current usage). In Germany today, terms like *Auslander* (foreigner) are considered to be offensive terms, and many Germans feel uncomfortable displaying the German flag outside of football season for fear of appearing overly nationalist.

Yet, as demonstrated by Nandi and Spickard, one's ethnic/racial appearance plays a role in how easily one is assimilated; white-appearing people are nearly always accepted without question while non-white appearing people (such as part Asian, Arab, Turkish, or African) experience

ongoing challenges to their German-ness, even if they were born and raised in Germany and perform the culture perfectly. This tension is even present for United States citizens: Aimee Meredith Cox's *Shapeshifters* documents the practices of homeless and poor Black women in shelters in Detroit, Michigan, negotiate and describe their "partial citizenship" that results from the intersectionality of being Black women in poverty. What is shared between these and other cases is that there is always a tension between binary categorizations of people as "inside" and "outside," but that between the lines exist a reality of nuance and performative enactments of identity and being.

3.6 Animals in Human Environments: The Ant Supercolony Debate

It is easy to see how race is at the center of various disruptive enactments that merge social and biological diversity. But such hybridity in the case of non-humans is more complex. In a heated exchange in the *Journal of Behavioral Ecology*, behavioral ecologist Deborah Gordon challenged entomologist Mark W. Moffett's "supercolony" classification as applied to the invasive Argentine ant (*Linepithema humile*) (Moffett, 2012a; Gordon and Heller, 2012; Moffett, 2012b). Moffett, reflecting the self/non-self assumptions of hostility towards "other," argued that ant colonies

typically display hostility towards non-members who are introduced to their territory. Because it has been observed that Argentine ants from different regions did not act aggressively towards each other, he (and others) reasoned that the ants must belong to the same "self" - a supercolony spanning the North American continent (Moffett, 2012b). In response, Gordon criticized the "supercolony" theory for inaccurately characterizing typical inter-colonial ant behavior: "For ants, the absence of fighting is not equivalent to belonging to the same colony" (Gordon and Heller, 2012). Argentine ants in particular, Gordon noted, are less inclined to be aggressive towards members of other colonies; even though they still rely on scent indicators to identify members of their colony (typical for ants), they simply did not normally act with aggression. An exception to this tendency was found by Liang, Blomquist and Silverman (2001) when a specific species of cockroach was fed to one population of Argentines but not to another; in that case, a hostile territorial reaction was elicited from sample Argentine ants due to the presence of particular chemical-olfactory cues. Because ants are often described as a "superorganism," where individual ants are considered more akin to cells than to distinct entities, immunologically grounded assumptions lend themselves easily to related discussions, influencing the ways that

territoriality, invasive species, and ecological interactions are negotiated among scholars.

3.6.1 The Chemical Basis of Communicating "Self" and "Other"

Integral to the forms of communication used by ants is a type of chemical known as a cuticular hydrocarbon (HC), a hydrocarbon located on the cuticle, or outer edge of the ant's exoskeleton. Hydrocarbons are molecular compounds composed of hydrogen and carbon atoms, formed together in long chains or rings. They are also called "lipids," a specialized term for fats, and do not mix with water or other polar (charged) chemicals. Ants and other arthropods benefit from the oily nature of HCs by coating their exoskeletons with them, preventing their bodies from drying out. Through grooming behaviors, HCs are spread around the body from various originating glands.

Besides having useful physical properties, cuticular hydrocarbons also offer a way for ants to "read" or "smell" information about individuals. Ants that encounter each other use their antennae to detect trace amounts of different HCs on the other's cuticle. These mixes can communicate a variety of information, such as the ant's identity as a member of a particular species and colony as well as the type of activity in which it is engaged

(such as foraging or brood-care) (Wagner, et al. 1998). Because social insects like ants engage in mutual grooming behaviors ("allo-grooming") and mouth-to-mouth food-sharing ("trophallaxis"), the HCs produced by individuals are mixed over time, resulting in a shared "colony odor" (Vienne, et al. 1995).

Located in the ant's head behind the mouthparts, the postpharyngeal gland (PPG) plays a key role in nestmate recognition and the development of shared colony identity (Soroker, et al. 1994). The PPG has been described as a "gestalt organ" (Soroker, et al. 2000; 2004), to reflect its involvement as a repository for HCs shared by other individuals in the course of mutual social behaviors. Because of its location near the mouth, the PPG would be involved in trophallaxis and grooming behaviors as it both receives and secretes HCs that entered through the mouth. In research on *Cataglyphis niger*, Soroker determined that the PPG did not actually produce significant amounts of HCs; an organ called the "fat body" was instead identified as a site of HC synthesis (Soroker 1994). Thus, the PPG's role in social communication of ants is not as a producer of signals, but as a collector and redistributor of them.

3.6.2 The Great Argentine Conspiracy: Supercolony Debunked

A related subject of Dr. Gordon's research is on the ecological interactions of the invasive Argentine ant, *Linepithema humile*. Referencing a pointed exchange in the *Journal of Behavioral Ecology* (2012), between herself and Mark W. Moffett, Gordon comments on how the "supercolony" theory reflects inaccurate assumptions about the nature of aggression between ants. Moffett, a supporter of the idea that Argentine ants form "supercolonies" that span vast geographical regions, relies on the assumption that unrelated colonies would display aggression towards each other to support this construction. Because it has been observed that Argentine ants from different regions will not display aggression towards each other, it has been reasoned that the ants in fact belong to the same supercolony.

However, Gordon has observed that Argentine ants in particular, and many other species of ants in general, do not actually provoke serious aggression in most circumstances. Although she acknowledges that a few species tend to be more aggressive towards outsiders, most ants instead opt for less violent ways of negotiating contacts. For example, in her decades-long research on harvester ants in the American Southwestern desert, she has observed that colonies will eventually alter foraging paths so as to avoid

conflicting with the paths of nearby colonies. Argentine ants in particular are less inclined to be aggressive towards members of other colonies. This represents a challenge to conventional biological assumptions about competition and violence towards "other" that draw at least in part from masculinist constructions of science that presume domination and violence (see: Schiebinger 1999; Lykke and Braidotti 1996; Haraway 1988; Bleier 1986), rather than collaboration and nonviolent conflict resolution, as being the primary means of interaction.

But even with a shift in assumptions about the inherent violence towards "other," there are other factors at work. Because of the intimate interactions of ants through their bodies and food, diet plays a significant role in how they identify each other through scent. In one study (Silverman and Liang 2001), German cockroaches were fed to one group of Argentine ants, which were later exposed to another group that did not eat the cockroaches. In this particular case, the groups interacted violently towards each other, and it was determined that ingestion of the cockroach changed the cuticular hydrocarbon profile in such a way that the non-ingesting group detected a difference significant enough to provoke aggression. In an interview with Gordon, she described the dietary impact on identity scents by offering the example of a McDonald's dumpster as a foraging ground for

an ant colony. Since McDonald's has achieved the pinnacle of standardization in look and taste of their food, the contents of one of their dumpsters in one location, Los Angeles, CA for example, will be substantially similar to one in New York City, NY. Two colonies of Argentine ants that eat from these dumpsters will end up smelling the same to each other.

This is an example of how diversity, or in this case, lack of diversity - monocultures - can propagate not only through human social environments (the "McDonaldization of the world") but also through the environments of nonhuman social organisms. And this monoculture can in turn affect the science we do by returning anomalous data that, without knowledge of the effect we have in creating and controlling environments, indicates something about the world that is not so clear-cut, nor is the only logical answer.

3.7 Probiotics and Gut Biomes

As discussed in the previous chapter, beneficial microbes are not distinguished from harmful ones when antibiotics are used because of the *agenticidal* tendencies of such treatments. However, the recognition of the agency of beneficial intestinal microbes can now be measured through the adoption of new technological apparatuses that allow scientists to speak with

more certainty. In 2003, Guarner and Malagaleda argued that "[e]vidence obtained through such studies suggests that microflora have important and specific metabolic, trophic, and protective functions" and recommended that "[a] better understanding of our relations with the microbial world should help in prevention of diseases such as atopy, colon cancer, and inflammatory bowel diseases." The ability to perceive and study these microbes has led us to understand that the diversity of our intestinal microbiomes has an effect on our bodily health (Shanahan 2002; Kinross et al. 2008; Gaboriau-Routhiau, et al. 2009), and the *agenticidal* impacts of antibiotics to ailments of the same. Concerned about the impoverishment of their intestinal diversity, people began to seek ways to restore their internal microbial diversity that had been decimated as a way to improve their health.

The pharmaceutical and supplement industries saw an opening to exploit this new interest in diversity by consumers, and created probiotic supplements that offer a concentrated dose of several beneficial bacteria, usually of *Lactobacillis* and *Acidophilus* species, that have been domesticated in our laboratories and can be produced on a large scale through culturing. Today, probiotic supplements have become popular enough to not just appear on shelves in standard stores (rather than natural or niche markets), but to also manifest in generic store brands. As a result,

being able to take a supplement in the form of a probiotic capsule to reap these benefits is highly appealing, both to the public and to institutions that stand to benefit from this paradigm shift.

However, our processes of domestication of microbes for these probiotic supplements result in only these two main species and a limited number of varieties/strains (many of which are now garishly patented) being included – a drastically impoverished ecology. Excluded are other microbes that certainly reside in our guts: some bacteria are not as easily cultured in a laboratory and Archaea like *Methanobrevibacter smithii* (Samuel et al. 2007) are institutionally invisible (Kleinman and Suryanarayanan 2012) because they are new to our biological taxonomical system. Dethlefsen, et al (2008) identified over 5000 types of microbes in the intestines of human subjects using newer techniques of RNA sampling that have become more prevalent than culturing methods for their accuracy and convenience; it has been estimated that 80% of the human microbiome has not yet been cultured in laboratory settings yet (Jernberg, et al 2010; Eckburg, et al 2005). Therefore, our ability to promote rich intestinal diversity is limited by our current inability to identify these different microbes and find ways to interact with them gainfully, promoting their material *agentogenesis* in culturing media.

There is an alternative to individually identifying and culturing these microbes, however. By relying on "naturally" fermented foods like kimchi, sauerkraut, and yogurt that introduce a multitude of known and unknown microbes into our guts, where some flourish in our internal environment, we have a way to performatively promote the agency of microbes we haven't yet identified because they come along for the ride. Rich diversity, then, can rely not just on identifying different types of entities and counting their types, but also on the limits of our perception and agency. In this case, "natural" can refer to scales and situations beyond our perception and ability to manipulate, and what would be considered in layperson's terms as a more "natural" approach (like eating food that has been traditionally cultured/fermented) has better potential to include the invisible because it is sloppy and imprecise, because it does not identify and classify and purify through the limited objectivity (Haraway 1997) of corporatized and institutionalized science. Here the distinction is not drawn from any essential aspect of technology, but instead resides in the *bios* (human life) and its relationship with *zoë* (biological life) to offer a rich diversity in both effects and knowledge.

There is another interesting development in gut biome research that benefits from the concept of rich diversity. One bacterium, *Clostridium*

difficile, is responsible for many severe infections in patients who have recently been treated with broad-spectrum antibiotics (sometimes to cure a resistant infection elsewhere in the body). *C. difficile infection* is often the culprit for Irritable Bowel Syndrome (IBS), diarrhea, and life-threatening inflammation and bleeding in the intestines, and because it is already resistant to standard antibiotics, is very difficult to cure through conventional agenticidal methods. However, a recently developed technique has been found to be very effective at curing this type of infection. A sample of fecal matter from a healthy person is put into the patient's intestines, inoculating them with a dose of diverse beneficial bacteria that keep the *C. difficile* in check (Kelly 2013). By rejecting an *agenticidal* approach and instead promoting rich diversity, this procedure ends up being more effective than standard methods. In fact, it has been found to be so effective that clinical double-blind trials were terminated because it was deemed unethical to continue with a control group that did not receive the transplants that would cure them (van Nood, et al 2013). This treatment also displays *cyborg virtue ethics,* the topic of the next chapter, through its highly effective, but technologically non-hierarchical enactment; only simply tools are needed to collect and purify the fecal matter for us, making this a low cost, high access treatment. It is possible that even this virtuous treatment could find avenues

for exploitation in the future, however. Given that the diets of people in developing nations tends to be considered "healthier" or more diverse (Obregon-Tito, et al. 2015; David, et al. 2013; Yatsunenko, et al. 2012) it has become a pursuit, even an obsession, for people in developed countries to attempt to appropriate the gut biomes of these people by mimicking diet and activity level (Leach 2014). How long will it be before capitalism finds a way to literally bottle and sell "Vintage Indigenous Fecal Matter: Enrich Your Microbiome Naturally!" alongside the packages of probiotic supplements?

3.8 Conclusion

The concept of rich diversity, as I have attempted to outline it here, sits uneasily with reductive scientific methods in which diversity is merely a linear statistical measure. And yet it is in conversation with technoscience's disruptive enactments where I believe its profound potential lies. Discovering that the biological world's diversity cannot be captured by genetic sequencing--that it encompasses epigenetic influences from diet, which in turn is influenced by behavioral diversity, both of which are in feedback interactions with environmental diversity--mirrors the failure of social sciences to reduce ethnic diversity to simplistic racial categories. As

we attempt to change our environmental conservation, social infrastructure, medical services and other institutions from their current subservience to economic rationalization to a force for human and non-human liberation, rich diversity will become an increasingly important dimension for the analysis of disruptive enactments.

4. CYBORG VIRTUE ETHIC

As noted in the first chapter, different ethical frameworks have their own foundations. Rather than depend on rules and duties, or consequences of actions, virtue ethics is founded on the idea that "right action" can be guided by a kind of role model approach (for example as in the popular Christian motto, "what would Jesus do?"). The *cyborg virtue ethic* questions our reliance on models of organic purity, concreteness, or simplicity. The best model for how to be a good German citizen is not, for example, to be found only among those with a "natural" German racial heritage. Model athletes should not exclude persons with prosthetic technologies (literal cyborgs), and tangelos, plucots and tayberries are wonderful fruit, regardless of their "unnatural" origins. Thus the cyborg virtue ethic helps us in promoting virtuous actors, processes or artifacts while refraining from judging *a priori* based on the presence or absence of technology. This enables a better focus on activities and actual effects of technology inclusion rather than on organicist characteristics. "Cyborg" draws from both Andy Clark's concept of the "Natural Born Cyborg" (2003) and Donna Haraway's "Cyborg Manifesto" (1991).

4.1 Defining Cyborg Virtue Ethic

Andy Clark's cyborg theory explains, using current neuroscientific research, how our sense of self extends through technologies we use, argues that humans have never existed without technology (2003), and that humans have an *extended mind* that incorporates environmental stimuli to think. To better understand Clark's position, I will provide some background on theories of *embodied mind* to give context for understanding *extended mind* and its significance for cyborg theory. First I return to Jakob von Uexküll's *umwelt* theory (1934) that models organisms as interacting with their environments through senses and effectors (like arms); as presented in Chapter 2, agency relies on these abilities to respond to the environment. Ludwik Fleck identified the experience of perceiving things to be essential to the formation of any ideas or thoughts with perpetuity (1979). The ability to perceive depends on training and experience. This also means that we become increasingly less attentive to see things that contradict or are outside "the form" (*Gestaltsehen*). Thought styles are rooted in our capacity for directed perception: "Visual perception of form therefore becomes a definite function of thought style" (Fleck 1979). Additionally, the way in which one perceives is of utmost significance; there must be some type of filter applied, what Bowker and Star (1999) would call a "standard" that would promote

"classification" of observed phenomena. These ideas contribute to the *embodied mind* concept - that we think with our entire bodies, which serve as sensing and effecting apparatus in the world, and not just with our brains (Restivo, Weiss, and Stingl 2014).

The environment – and objects contained in it – being perceived is also a key part of cognition and thinking. Barrett, et al (2007) discuss the importance of a surrounding environment in providing "cognitive resources" to an entity within it. That environment includes not just other persons but objects that present humans and other animals with "possibilities for action" and "affordances" (Gibson 1979). Understanding affordances in relation to actions can help us understand behaviors in their spatial and temporal contexts. These "cognitive resources" can be used in "epistemic acts," described by Kirsh (1996; see also Kirsh and Maglio 1994) as acts used to re-order or arrange information so that it can be more easily processed. These are contrasted with "pragmatic acts," which actually move an agent closer to solving a problem. For example, the board game *Scrabble* involves placing letter tiles on a board so they form words. Players are provided a rack on which to hold their tiles; this rack can be used to physically rearrange the tiles to facilitate the cognitive process of forming words (or parts of words). These epistemic acts, actual physical actions in the

environment, position objects with symbolic meaning in a way that they can be made sense of more easily. Andy Clark's advocacy of "extended mind" theory draws from these ideas to argue that we not only utilize objects in our environment to help us to perform cognitive tasks, but that we actually think through them. One example he often cites is of putting an empty beer can by the front door to remind himself to buy more beer. The positioning of an object, as well as the object itself, holds cognitive meaning for him and triggers the thought process he wanted to spark for himself, making the beer can part of his cognitive apparatus.

Haraway's cyborg figure challenges essentialist boundaries between natural/artificial, organic/technological, and human/nonhuman and offers a self-aware challenge to the public, technological *polis* based on radical changes in the private *oikos* (1991). Rather than the "how" of our relationship to technology that is explained by Clark, Haraway helps us to embrace the "why." The categories (Bowker and Star 1999) that we use to delineate things and people, whether natural, racial, gendered, even human are constructions of our limited objectivity, a result of what Haraway calls the "God's eye trick" that lets us think we are pointing to natural categories when in fact we are merely playing God and creating them for our own comfort. When even our understanding of reality is iteratively realized

through multiple performances of actions and material-discursive enactments (Barad 2007; Butler 2006), we must become like the cyborg, who is no longer naive about the clean-cut boundaries between us. Rather than autopoeisis, we must embrace our inherent sympoiesis (Dempster 2000) that leaves us open to being defined by others and prevents us from ever standing completely independently in our identities.

This embrace of the muddled and transgressed boundaries, not only between human and nonhuman life, but also humans and our tools/technologies generates both the "why" and the "how" we need to approach the problems emerging in the realm of food in empathetic and inclusive ways. It is important to emphasize that "cyborg" is not meant to make us technologically agnostic; to the contrary, we must consider seriously the ways in which technology (indeed, why we label some things as "technology" and not others) is involved while not simply essentializing its presence or absence as a strict binary that is sufficient.

"Cyborg" is also evocative of cybernetics, the study of the flow of information in constructed systems. As mentioned earlier, there is a fine line between biosemiotics and cybernetics, and this largely hinges on distinctions between life/nonlife and *natural*/technological; with the lines becoming increasingly blurred, we must become more willing to embrace this *queering*

of categories and include perspectives across fields where appropriate. Engagement with these three theories serves a permissive role in the virtue ethic: "cyborg" not only allows, but invites us to challenge assumed boundaries between humans and animals, life and non life, social and technological with an interest in better modeling complex emergent systems, such as cheesemaking and its accompanying policy morass.

"Virtue Ethics," the third branch of ethical philosophy (alongside Consequentialism and Deontology), has a process/means focus (see: Greco and Turri 2012; MacIntyre 2007; *Nicomachean Ethics* by Aristotle), and is highly compatible with Karen Barad's *agential realism* theory. Stacy Alaimo emphasizes the ethical component of Barad's *intra-action* framing when she characterizes Barad as advocating "an ethics of 'mattering' and 'worlding,' … Barad's theory of intra-action supplants the human subject as the locus of both "knowing" and "ethicality" (Alaimo 2007, 111). This hearkens back to Aristotle's quote, "Virtue is a habit." We ought not ask, "What would the virtuous person do?" (a common application of Virtue Ethics) but instead must ask, "How might we become more virtuous?" as a way towards understanding and *being together* (Haraway 2008) better in our relationships with others and Others.

These themes of a more fluid and agential world view are not unique to postmodern era scholars; rather they are providing an alternative voice that has been raised in different ways at different times. As Graeber (2001) explains in a brief history of philosophy:

> The debate between Parmenides and Heraclitus is at the source of the Western philosophical tradition. For Heraclitus, everything is always in flux, in a process of becoming, whereas for Parmenides, everything is fixed and change is really an illusion. Parmenides won the argument in the Western tradition, leading to Pythagoras (math and science) and Plato (ideal forms). And in fact science could not have been created without the Parmenidean moment because things have to be in some way fixed for us to be able to understand them, to seize them with our intelligence (50).

This also aligns with Barad's focus on the iterative process needed for things to become real: iteration is "repetition with revision" (Gates 1988 explaining an African version of the iterative perspective) in which the Parmenidian moment alternates with Heraclitan flow. A similar framework is deployed by Butler's gender performativity: it is only through repeated but not identical actions that a sense of what is real is formed. We can never clear our ethical tab with one choice; it must be considered as a larger process over time whereby each iteration emergently affects future choices and actions.

There are two principles inherent in the Cyborg Virtue Ethic; my contention is that each principle draws on this unique synthesis of Parmenidian and Heraclitan frames to help us overcome dualistic tendencies, as illustrated here through case studies. First, our distinctions between "low-tech" and "high-tech", or between "soft" and "hard" technologies do not reflect anything other than a type of categorization drawn from industrial, technocratic, and capitalist value systems that force a hierarchy between options. Approaching a choice between two of these technologies from Cyborg Virtue Ethics instead weighs their appropriateness based on efficacy – not just in accomplishing the desired task, but also in promoting interconnectivity between participants, challenging entrenched power structures, and encouraging lasting social arrangements that continue to generate hybrid value (see Chapter 6). This principle will be explored through an examination of "disruptive enactments" in medical devices; in particular: cochlear implants in Deaf culture, and Clementine oranges as laparoscopy practice subjects among others.

The second principle is that distinctions between "natural" and "unnatural" or "artificial" ought not solely dictate our valuation of a technology or practice, but instead should inform us to inquire as to relevant factors regarding agency, diversity, virtue and value. Something that is

“unnatural” is not necessarily bad, and something that is “natural” is not necessarily good; at the same time, there may in fact be relevant factors that contribute to one or the other being more or less appropriate within a context of an expertise community. To illustrate this principle, I will describe the controversy and reception of the Flow Hive, a technology developed to make honey harvesting from beehives easier.

4.2 Low-tech and Soft-tech Have Value

The first part of Cyborg Virtue Ethics recognizes that all technologies extend our agency by allowing us to perceive and act beyond our original capacities. Therefore, distinctions between “high-tech” and “low-tech,” or “hard” and “soft” technologies are merely essentializing categorizations that unnecessarily put different technosocial options into exclusive binaries and hierarchies of power. To illustrate this, I will use two cases: the “soft” technology of sign language and the “low-tech” solution of practicing surgery on oranges.

4.2.1 Deaf Cyborgs: Cochlear Implants and Sign Language as technologies

In the previous chapter, I described a case of “functional diversity” with deaf students at NTID/RIT where the environment was intentionally

altered to change deafness from a disability into yet another type of functioning. This was not possible in a vacuum: without the strong presence of Deaf culture at NTID/RIT to offer a way for deafness to be normalized, any use of "hard technology" like smartphones for ordering coffee would have been seen as mitigating a disability, not as augmenting. Deaf culture was a term that originated in the 1980s (Padden and Humphries 2006) as a way to reframe the use of sign language, among other practices, not as a compensation for not being able to hear, but as part of a rich culture of its own among Deaf and Hard-of-hearing people. Paddy Ladd (2003) emphasizes the preeminent importance of culture in giving a group of people dignity and identity in the face of oppressive power:

> For culture is the key held in common with other colonised peoples and linguistic minorities. Political and economic power may or may not be the driving forces behind language oppression. But both the key and the lock in which it turns is culture. A people may exist without a living language unique to themselves, but without a culture there is no 'people' (8).

Deaf culture utilizes practices like sign language as a "social technology" - an *apparatus* of people, their bodies, and social coordination to accomplish the same effect as a material technology (Restivo, Weiss, Stingl 2014). Another example of this is the "People's Mic" social technology that was used during the Occupy Wall Street protests in 2011:

many cities banned the use of electronic amplifies of sound like microphones at these rallies, so protestors coordinated among themselves to amplify messages. First, the speaker would say a phrase, then the people nearest to the speaker would repeat it in unison; from there, each successive ring of people would repeat the message, increasing the volume and spatial reach each time. Because there was no "material technology" used, this could not be stopped by police through legal means. Unfortunately, there has been a history of attempting to suppress the use of sign language in Deaf people (Ladd 2003; Padden and Humphries 2006), and the advent of cochlear implants has introduced another conflict as the combination of a device considered "high tech" paired with the imposition of the hearing majority to "fix" the "disability" has resulted in increased pressure to deny young children access to Deaf culture through sign language (Sparrow 2005; Christiansen and Leigh 2004; Tucker 1998). Ironically, there has been much celebration about the potential benefits of teaching hearing babies sign language to communicate basic states like hunger to parents and to build early language skills (Kirk, et al. 2013; Doherty-Sneddon 2008; Pizer, et al. 2007), resulting in hearing babies being encouraged to learn sign language while deaf and hard-of-hearing babies are discouraged from learning it to

“better acclimate” to cochlear implants, resulting in their own “language disability” that alienates them from Deaf culture.

Cyborg virtue ethics helps us to de-emphasize a preference for “high-tech” solutions in favor of understanding the context for the technology’s use: a communication technology does not merely transmit information, but allows for people to connect and, hopefully, assimilate into a culture. At the same time, different technologies do not need to be exclusive: at NTID/RIT there were students who both had cochlear implants and used sign language. Their hybridity embodied the tension between the positions advocating for either one or the other and often made people uncomfortable: hearing people had to learn how to speak so that a person with an implant could hear them optimally (often using lip-reading to augment the imperfect sound transmission), people in Deaf culture saw people with implants as “not really Deaf.” Although they had to navigate a politically charged landscape similar to those experienced by the mixed-race people discussed in the previous chapter, their access to both technologies - the “hard” tech of an implant and the “soft” tech of sign language - situated them uniquely as a type of dual citizen in both cultures. Indeed, one of my students performed a research project where they interviewed both hearing and Deaf/hard-of-hearing people about technology augmentation, and realized that the two groups

interpreted his questions in completely different ways. Through the project, he realized the importance of code-switching (Heller 1992) between these communities to even open up a discussion about his topic of research.

4.2.2 Carving Clementines: High-Tech/Low-Tech Cyborgs in Medical Domains

Sometimes, a "low-tech" solution can not only be cheaper, but also effective at decentralizing power, expanding access, and opening opportunities for people. For example, Pamela Andreatta, a medical educator, began using clementine oranges to give her students practice with laparscopic surgery (Andreatta, et al. 2014; Hsu 2012). Laparascopic surgery has become standard practice for many types of surgeries involving the abdomen, such as tubal ligations, gallstone removal, and colon cancer treatment because it is considered "minimally invasive," with much lower mortality and higher success rates (Giger, et al. 2006; Steiner, et al. 1994. Rather than opening up the patient's abdominal cavity, potentially exposing them to infection and other complications, laparascopic surgery requires several small incisions into which tools are inserted. These tools extend the agency of surgeons, turning them into cyborgs in Clark's conceptualization,

but require special training to become familiar with the techniques needed to use them effectively.

Usually, surgical simulators are used to train surgeons; they have been shown to significantly improve the technique of surgeons and the success rate of operations they perform (Banks, et al. 2007). Normally, high-tech simulators are expensive and limited in use, restricting access to a limited number of users based on ability or social position. But a bushel of oranges is relatively inexpensive, and, as Andreatta argues, a reasonable simulation of the material concerns in laparascopic surgery: oranges have different layers of different densities and materials that need to be cut and sutured differently, offering students a surprisingly realistic training subject. The exercises required students to cut into the rind and remove as much of the albedo - white material - as possible, then suture the orange back up into a condition as close as possible to its starting arrangement. Andreatta found that not only did trainees benefit from practicing on the fruits (showing significant improvement as evaluated by external observers), but they also were required to engage in "clinical decision making" - in this case, evaluating whether a piece of albedo (the white material in oranges) could be removed without excessive damage to the pulp. The success of this "low-tech" option does not mean that oranges replaced simulators completely, but

instead could hybridize and supplement training programs by increasing access to hands-on training activities and reducing the load on the few simulators.

The health industry is peculiarly susceptible to overly expensive solutions; in part because the high risk, liability and expertise intersect in ways that discourage lay involvement. As a counter to that tendency, José Gómez-Márquez at MIT developed the "MakerNurse" program (Wilmont 2014). This supplies nurses in developing nations with resources such as a platform for sharing ideas, as well as DIY hardware tools that has resulted in several nurse-made innovations. Williams (2013) documents cases of innovation from low-income areas of the developing world involved in "avoidable blindness". These examples are more institutionalized but offer additional insights as an exemplar of the Cyborg Virtue Ethic.

In 1973 Dr. Govindappa Venkataswamy, an Indian medical college dean, founded Aravind Eye Care Systems to serve low-income populations. Reinventing what was originally high-tech surgery restricted to Westernized contexts, ophthalmologists at Aravind created their own version of a phacoemulsification technique. Intraocular lenses, however, were expensive, at 150-200 US Dollars each. Manufacturing the lenses locally at low cost was not physically challenging, but rather bureaucratically, with both

national and international regulatory bodies doubting that low-tech contexts would be creating high quality lenses. Williams points out that one reason for their success was the philosophical perspectives motivating Aravind: "Dr. Venkataswamy was heavily influenced by Aurobindo's spiritualist Integral Yoga . . . which combines elements of Hinduism, Buddhism, Christianity, and Judaism. He speaks of Gandhi being an influence on his medical practice . . . (Williams 2013, 465).

All three examples--Clementine surgery, MakerNurse, and Auravind eye care--illustrate the importance of avoiding *a priori* dismissal of low-tech artifacts and contexts for high-tech purposes. But the important point here is not the "gee whiz" of surprising applications; rather it is observing how social justice issues have become so smoothly integrated into technoscience that they are made invisible, to the point of blinding our abilities for innovation. That income levels can control the quality of health care seems ethically outrageous in the abstract, and yet it has become common sense in context. The cyborg virtue of artificial meeting natural--implicit in surgical steel on fruit, DIY nurse innovation and Ghandian ophthalmology--should be a welcomed means of jarring our ethical senses back into focus on what matters.

4.3 Artificial is Not Essentially Bad (and Natural Not Essentially Good)

The second part of Cyborg Virtue Ethics challenges essentialist ideas about "natural" and "artificial" inherently holding moral value. These words rely on a judgement of measuring human intervention, with "natural" carrying connotations of being free of such involvement, while "artificial" implies an unwholesome lack of character. Through the story of the Flow Hive, I will demonstrate how discourses of expertise and laypeople reflected different assumptions and values about the practice of beekeeping and concerns about "artificiality" and "naturalness," as well as cyborg virtues held by people who are beekeepers. First I will provide background on the Flow Hive and discussions around its promotion, then I will focus on the way that one beekeeper blogger, Rusty Burlew, enacts cyborg virtue ethics in her commentaries, and third I will present the growth of a new beekeeper, Jim from Vino Farms, who shared his new Flow Hive Beekeeping experience through social media and eventually adopted similarly cyborg-virtuous values.

4.3.1 The Flow Hive

In February 2015, Stuart and Cedar Anders, two Australians, developed a new technology for harvesting honey from a beehive. It

consisted of a frame made of plastic in a honeycomb shape, but each cell was bisected; this allowed the comb to be "broken" apart with an inserted tool while it remains in place in the hive, creating channels for honey to flow downward and out through an inserted spout. The promotional video claimed that this technology would make it easier and safer for people to harvest honey and would reduce the disturbance to the bees. To fund this project, the father-son team began an Indigogo campaign.

The Flow Hive's Indiegogo campaign exceeded its initial $70,000 goal within 8 minutes of launching in February 2015, and raised $2.18 million in the first day. The campaign broke the Indiegogo record for the most funded campaign a week later. By the end of the original campaign, it had raised over $6 million from over 14,500 backers (Khosrowshahi 2015), and as of September 2016 had exceeded $13 million counting preorder and order pledges.

This technology drew large amounts of enthusiasm and skepticism from people interested in beekeeping, from aspiring bee enthusiasts to experienced beekeepers. It is likely that this high interest built upon years of public concern and discussion (both online and offline) about bees and their observed decline in many parts of the world as well as discussions about

pesticide use, Colony Collapse Disorder, and other issues, like exposés on adulterated honey from China.

Discourses about this technology tended to be highly polarized (Gillespie 2016), with most online forums and blogs taking either a position for or against, and commenters displaying similar rhetorical tactics as in other controversial subject areas like politics and social justice, but with these leaning towards discourses about expertise, exclusivity, and accessibility.

Because the Indigogo campaign began in February 2015, but the actual Flow Hive product did not ship for a year, there was a long time that people were able to discuss and debate about the technology without any opportunities to definitively test anything. As a result, the promotional videos released by the Flow Hive campaign were the basis for many evaluations. The "Flow™ Hive Full Reveal" video, released February 22, 2015 has the description:

> It's the beekeepers dream, turn a tap right on your beehive and watch pure fresh honey flow right out of your Flow™ hive and into your Jar! No mess no fuss and the bees are hardly disturbed.

Observations of the video by experienced beekeepers included:

- Materials used (plastics) could be harmful or unattractive to bees
- Incorrect honey harvesting technique
- Focus on harvesting honey as the "hard part" of beekeeping

- Focus on honey production rather than care of bees

Plastic as the construction material for the Flow Frames caused a great deal of concern, from off-gassing to the bees "not liking it." But there were also equations of "plastic = unnatural" by some. A commenter on a forum put it simply:

> plastic frames (plastic =! nature) (epicmoe 2015)

...to which someone responded:

> You understand that beekeeping =! nature, right? (epicmoe 2015)

This exchange reveals that some concerns about the plastic frames and cells derived from an "unnatural is bad" essentialist framework, which was sometimes challenged by identifying that the human practice of beekeeping was also unnatural, thereby negating that assertion.

Maryam Heinen expressed concerns in a blog about off-gassing of the plastic that could chemically disrupt the bees, a concern shared by other beekeepers, as well as a recognition of the bees' agency in rejecting plastic:

> This newfangled honey collection system is comprised of plastic. It's basically the **Langstroth hive on steroids** . . . **Bees don't particularly like plastic**, Ask any organic beekeeper. They don't need it. They fashion wax –a living substance – out of their own abdomens. Wax is where they store their food (nectar and pollen) and house their young. Wax vibrates and changes temperature… But instead of working with the wax comb they've created, the **Flow Hive forces bees to deal with hormone-disrupting plastics that off-gas**. (Heinen 2015, emphasis added)

Other discussions revealed similar expressions of agency by bees in rejecting the plastic frames:

> I wondered why the bees took so readily to the flow frames when I personally found the bees are not all that keen to work on plastic initially (Liz 2015).

Some commenters suggested coating the plastic frames in wax to make them more appealing to bees; this solution was met with mixed results. Others urged users to remove regular frames so that the bees only could use the plastic frames; this approach acknowledged the bees' "preference" for the non-plastic frames. Some mocked concerns about off-gassing of plastic, such as in the forum post titled, "Hilarious pseudoscience attacking the Flow hive" while others expressed concern but after research felt safe using it:

> I've done a little bit of research into the different kinds of plastics, there are some plastics that are generally considered safe and have been used for food storage for many years, it is one of these plastics we will use (flytation 2015).

It is worth noting that not all bees are opposed to working with plastic; a *Megachilid* bee has been observed using plastics as nesting materials (McIvor and Moore 2013), but it is not closely related to our honeybees. And as was seen in Chapter 2, honeybees do not distinguish between "natural" and "unnatural/artificial" the way that humans do, and are

perfectly content to consume manufactured candy and syrup from factories with gusto.

Although effects like offgassing and bee preference remain to be seen in the long term, there are other interactions between the material of the Flow Hive combs and the bees that are tangible and real while not relying on an abstract "unnatural is bad" essentialism. Some beekeepers have observed their bees filling in the small gaps of the Flow Hive combs with propolis, a type of sealant that is used to seal up the hive for winter (gasdoc 2015). Propolis hardens into a cement-like consistency, making it impossible for a user of the Flow Hive to crack the cells to harvest the honey. This recalcitrant agency of the bees has yet to be understood, and the reasons for bees using propolis instead of wax are not known.

Another concern expressed by beekeepers concerned the legitimacy of the Flow Hive creators' expertise and knowledge about working with bees. The video showed siphons from the hive pouring honey into open jars during the narration describing the ease of harvest with the new frame technology. However, beekeepers said that this is not only incorrect, but potentially dangerous because of "robbing" and possible transmission of disease.

> Robbing is a term used to describe honey bees that are invading another hive and stealing the stored honey. The robbing bees rip open

> capped cells, fill their honey stomachs, and ferry the goods back home. They will fight the resident bees to get to the stores and many bees may die in the process (Burlew 2015).

Open jars of honey can attract others bees and promote this robbing behavior, which often leads to violence and fighting, not just among bees of different hives, but also including other species like wasps and flies who are attracted to the activity of bees.

A worse threat could lie within the honey itself: spores of severe diseases like American Foulbrood can be transmitted through honey from an infected hive to a non-infected hive. American Foulbrood (AFB) is a serious bacterial infection that targets the brood, or young bees still in their larval state (Ratnieks 1992; Lindström, et al. 2008). Infected larvae turn into a mass of goo that is hard to remove from the cell in which it develops, making it more likely that spores can reinfect other young. The general consensus among beekeepers is that hives with AFB must be burned to prevent infection of others hives, as there is no cure for it. It is extremely frowned upon to feed bees honey, since honey sold for human consumption could contain spores (they do not affect humans) that could infect hives and cause catastrophic damage to local bees. This explains the irony of beekeepers feeding sugar water and not honey to their bees despite honey being the "natural" food source for bees. In this case, "natural" is not only

not desirable, but it can cause serious harm to bees. Recall in the previous chapter the discussion about "natural" processes sometimes involving agencies that people cannot (yet) detect or influence; although it can be beneficial in the case of naturally fermented foods, it can be dangerous in other situations like beekeeping.

In response to initial feedback on the promotional video, more information was released to promote traditional beekeeping values and habits, as was discussed in this forum exchange.

> **I keep seeing the myth that Flow didn't encourage good beekeeping habits.** They very much stress the importance of hive inspections, maintenance, and why you should join your local beekeeping groups. It's is all the literature when you buy it that you still must properly inspect the hive for the health of the colony (killian1009).
>
> (response) **That stuff was added only after numerous complaints about it not being there.** Watch the initial video again. They make a big deal about going in the hive to get the frames like its not something you do every week anyway and truthfully in Australia it isn't because they lack the pests and diseases everyone else has. They did not stress inspections and maintenance they stressed making life simple and easy. **Their target audience is people who are not beekeepers and don't understand or know the importance of inspections** (killian1009).

Some beekeepers expressed concern that people excited about trying beekeeping with the seemingly "easier" Flow Hive would be disappointed because the literature did not include adequate information about the rest of

beekeeping. One homesteader in Central Florida who used to do urban beekeeping in Southern Florida explained that there is a distinct difference in the needs of beekeepers in the two areas due to weather and other conditions (De La Portilla 2015) and argued that such knowledge was important before starting the practice of keeping bees.

> My biggest worry is that people invest in a Hive and then with dreams of easy use, abandon them when they realize they require more care or work or knowledge than they might have (De La Portilla 2015).

Online discussants tended to split into two "sides," with one group advocating strongly for the Flow Hive, and another skeptical, cautious and/or curious about the passionate support for it before it was released. Some commenters expressed interest in starting beekeeping, but admitted to little practical experience:

> Well for me (**as someone who only has book knowledge on beekeeping, but no real world experience**) this system is a way for me to **harvest a hive in my urban environment in an exponentially easier way**. I know from my other hobbies I would enjoy the rest of what is included in beekeeping, but harvesting is prohibitive to me. As such I really want this product to succeed so that I can share it with my urban farm, my neighbors and family. **Beekeeping is really cool, but it simply isn't feasible for those of us with long hours at work and little to no storage space for equipment** (carefreeams 2015).

> My parents have 5 acres and gave me the ok to use some of it for beekeeping if I wanted, I just started reading up on everything involved and know very little. I remembered a while back seeing a video on facebook for the flow hive and thought that **it seems fairly**

> **low maintenance and maybe good for a beginner** (killian1009 2016).

One reddit user expressed interest in learning beekeeping, and was hopeful that the Flow Hive would allow them to be less destructive when harvesting honey:

> I'm interested in bee-keeping and have been drawn to it by this product. It does make for a more 'clinical' approach to bee-keeping as **it limits the mess and destruction** I feel I might cause attempting harvesting (Banemorth 2015, emphasis added).

Another user responded:

> **There's not really that much destruction** in harvesting honey the traditional way if you're not in a rush. I do see how **this tool will cut down on a bit of the effort**...particularly if your hives are not at the same location as your extracting equipment. While it will **provide some new options** in terms of management techniques, **this tool will also impose some important new limitations** of how one manages their bees (Banemorth 2015, emphasis added).

Others were excited about the potential technological innovation, even if it wasn't perfect, citing an interest in ongoing progress and technological development:

> Its[sic] important to note that this is a novel idea. The first automobile wasnt[sic] competitive with the horse and buggy, in terms of cost, reliability and performance, until the Model-T came along (Banemorth 2015).

Commenters in the second group expressed a range of concerns, from skepticism about whether the Flow Hive would work, to whether it would actually save time and labor, to whether it would introduce inexperienced beekeepers into the activity without adequately preparing them for the work that would be involved.

> **Why are so many so quick to defend this technology** when they don't even have first hand experience with it (and **many strongly defending it don't even keep bees or understand the process well**)!? I did start thinking of solutions to this point right after i posted. It is completely a secondary point to the main one about the fact that **they sell this as something that will give beekeepers more time to take care of their hives, which it most certainly isn't** (carefreeams 2015).

> **My knee jerk reaction is to be skeptical of these things.** Especially because no matter what type of hive you use, you still need to take care of your bees, feed them, inspect for mites, etc. and I can see people thinking they can just set this in their yard and the honey just starts flowing (Banemorth 2015).

In response to Flow Hive skeptics, some pro-Flow Hive supporters felt that they couldn’t openly support the new technology lest they experience negative social pressure:

> Hello! I am finding that I want to keep our purchase of Flow Hive a secret for now, simply because, as a newbie to bees, I can't answer the criticisms of the Flow. I never know who I should tell and who I shouldn't. Forgive me if it was answered somewhere because I can't find it. Could someone help me please? (swflbee 2015)

In response to these concerns, many commenters advocated for more insular social networking to increase the presence of like-minded people who supported the Flow Hive:

> Don't concern yourself or waste your time. They don't care about the truth. They're just mad because they didn't think of the invention. **Use this forum to find like-mided [sic] people just like you** who has a flow hive or 2 on the way (swflbee 2015).

This tendency to avoid conflict and cluster with others of similar opinions is not a new phenomenon in social media, and many blogs and discussion forums tended to have large numbers of users who leaned one way or the other, thus reinforcing those views in their discussions (Colleoni, et al. 2014). However, there was also some "brigading," a term used to describe a large group of users "invading" an online space to promote a contrary view or to attack someone with whom they disagreed. Supporters of the Flow Hive also framed the opposition as "Luddites" who were opposed to technological advances:

> I read some stuff on one forum and they are a pack of Luddites. The laugh will be on the other side of the cheek when we are Flowing are they are not. (swflbee 2015).

> Awfully brave of you to post this here, OP. This subreddit is full of grumpy old baby boomers who love to shit on and rip people apart who purchase and enjoy the Flow Hive (alltheinterwebs 2016)

Some pointed to the success of the Indiegogo campaign as a referendum against resistance to it:

> Negativity towards Flowhive seems to be a wide-spread and international phenomenon - at least with some 'old school' beekeepers. However, the exceptional success of the Indigogo campaign belies their claims of a lack of universal support! (swflbee 2015)

Concerns about the Flow Hive also included less tangible issues, like a lack of connection with bees or an impoverished appreciation for beekeeping as a care activity, rather than as a means of honey production. Many beekeepers who were critical of the influx of new participants to the beekeeping community drew distinctions between "beekeepers" and "bee-havers", using language to illustrate a split in priorities or motivation for working with bees.

Heinen wrote, "The point of beekeeping is to commune with the bees, not to further remove oneself from them." Erik Knutzen, aka Mr. Homegrown, wrote about similar concerns in a blog post titled, "The Flow Hive: a Solution in search of a problem"

> Conceptually, the idea that a **beehive is like a beer keg you can tap** is troublesome. A beehive is a living thing, not a machine for our exploitation. I'm a natural beekeeper and feel that honey harvests must be done with caution and respect. To us, beekeeping is, at the risk of sounding a little melodramatic– **a sacred vocation**. We are in relationship with our backyard hive, and feel our role is to support them, and to very occasionally accept the gift of excess honey (2015, emphasis added).

The "honey on tap" imagery was used by other commenters as well:

> I agree with the concerns of turning a beehive into the **equivalent of a beer keg**. The Flow (to the unwashed masses) speaks to a lot of us as consumers, **not as people or scientists or caregivers**, but as someone with something to gain. "**Turn a tap, fresh honey**! Straight from the bees, what could be simpler?"

4.3.2 Rusty the Virtuous Cyborg Bee-blogger

Rusty Burlew, who maintains a blog called "Honey Bee Suite" focused on how the Flow Hive would only affect harvesting of honey, a small part of beekeeping:

> No matter what anyone says, the Flow™ hive does not revolutionize beekeeping. Not even close. If the system works as the creators claim, it could **perhaps revolutionize *honey harvesting***. But the rest of beekeeping—the daily caring for bees—does not change. The idea that anyone can have **honey on tap** without having to mess with bees is a myth.
>
> **Extracting honey has been one of the least controversial aspects of beekeeping.** This website, for example, has well over 1200 posts about beekeeping, yet there's hardly a mention of extracting—and that's simply because no one ever asks. The Flow™ is very cool—and certainly entertaining—but **extracting is something most beekeepers do for a day or two every year. It's the other 363 days that are problematic.** (2015, emphasis added)

Burlew's analysis demonstrates a cyborg-virtuous concern for the place of extraction in the larger practice of beekeeping, regardless of the specific tools used:

> **Whether the extractor is in the super or in the barn**, the beekeeper must still deal with Varroa mites, tracheal mites, viral diseases, zombees, small hive beetles, wax moths, chalkbrood, foulbrood, and

> Nosema. Beekeepers must still deal with bee nutrition, especially in agricultural areas or in places devoid of flowering weeds and natural habitat. Beekeepers must deal with pesticides in the environment, scarce water supplies, Africanized colonies, cranky neighbors, nectar dearths, and local laws and regulations. (2015, emphasis added)

This perspective does not outright reject an "artificial" or "high-tech" technology simply because of its characteristics, but instead considers how it fits into the ethos of beekeeping as a whole. At the same time, Burlew demonstrates a skepticism against the idea that "natural is better":

> From what I've heard, the "let the bees be bees" camp are "beekeepers" here and abroad who advocate laissez-faire beekeeping. They capture colonies, hive them, interfere with swarms, but otherwise ignore the bees' needs. They dismiss pathogens, parasites, and predators by avowing a belief in "survival of the fittest" and "letting nature take its course" (2011).

Burlew's comments reveal another political divide among beekeepers that aligns roughly with Lisa Jean Moore's and Mary Kosut's "backwards beekeepers" and "scientific beekeepers" - who take a hands-off and active treatment approach with mites and other parasites, respectively (2013). Burlew's position originates from an ethic of care, that when a beekeeper captures a swarm or buys bees to start a colony, they have accepted responsibility for caring for these creatures: "Being a caretaker means you tend to your charge, look after it, and keep it as comfortable as possible."

She self-identifies as an advocate of scientific approaches, suggesting that she aligns more closely with the aforementioned "scientific beekeepers":

> **I believe in scientific inquiry and research.** I believe in carefully designed experimentation with controls, data collection, statistical analysis, and peer review. But if you are not doing research, if are going around half-cocked pretending you are Darwin and preaching "survival of the fittest," if you are letting your bees die from Varroa mites, you are just plain lazy (2011, emphasis added).

Her post ends by challenging the very idea of a pure, untouched nature:

> The "nature" we provide our animals is not the nature they evolved with. We have added all the optional extras, including pesticides, pollution, contamination, urban sprawl, climate change, and introduced species that include pathogens, parasites, predators, and billions of humans. **Seriously, how can nature take its course when there is no nature left?** (2011, emphasis added)

Although Burlew is only an individual beekeeper, it was common to see sentiments similar to hers among other beekeeper bloggers and forum posters, with diverse opinions that still stayed within a similar range on ideas about nature, the use of scientific inquiry and interventions, responsibility towards bees.

4.3.3 Jim the Flow Hive Novice

Although experiences with the Flow Hive technology have been diverse and varied, I will highlight one user's story to show that the material technology of the Flow frames is but one component of the larger

technosocial and technoscientific system, one where virtuous understandings can be achieved regardless of the technological decisions made.

Jim, the owner of Vino Farm, posted a series of videos on YouTube to share his experience using the Flow Hive. He was a new beekeeper and documented every day of his interactions with his bees in candid detail, including mistakes made. His "Day 5" video focused on a mistake he had made when pulling out the frames with new comb on it: because the comb was only attached to the top bar of the frame, it fell off onto the ground. Panicked, Jim picked up the comb and laid it gently in the beehive, hoping that the bees would be able to salvage the honey and brood on it. When he returned to the hive later, he found that the bees had started to reconnect the comb to the rest of the comb in the hive, creating "cross-comb", a bad thing for the structure of the hive because it made it impossible to pull out vertical frames of comb without disturbing the rest. His error had multiplied, creating more work as he had to correct the bees' correction. It is worth noting here from an agential perspective that the bees were not particularly bothered by the comb breaking off and were content to reconnect it on their own, but the reconfiguration posed a trouble to the beekeeper's preferences to engage in their performative agency.

Because Jim left comments on his youtube videos open, he was able to interact and respond to viewer comments, and his later videos incorporated the suggestions he had received. Despite his inexperience, his demeanor in the videos is optimistic yet humble; his appreciation for the community guidance was apparent as he tried new techniques as they were offered. This experience mirrors what was found by Cohen and Kahne (2012) in their study on participatory politics, that youth can be exposed to more divergent viewpoints and learn through interaction in social media, offering alternative outcomes to Colleoni, et al's (2014) findings.

Some users had expressed disappointment with the lack of Flow Hive frames or of any honey harvesting, even challenging Jim's authenticity as a Flow Hive owner. This suggests that some participants in online discussions about the Flow Hive had a strong interest in watching honey harvesting using the new technology and placed high value in identification through the device. In response, Jim created a video (dated July 8, 2015) specifically to address the comments, prove that he was a backer of Flow Hive, and show that his hive was in fact a real Flow Hive. He then gave background information for new viewers to explain why he did not yet harvest honey, revealing that he has begun to internalize values from traditional beekeeping and has gained knowledge about the practice to propagate to others:

> If you want to learn how to be a beekeeper, thinking about getting a Flow Hive, you're going to have to go through all this stuff too. Everyone has to build a brood first before they get the Flow Frames in there. **You can't just get a hive and start getting honey;** you have to, the bees have to build a brood, they have to build a nest and their home, then you can get honey after they are strong and healthy (transcribed from video, emphasis added).

In his "Day 69" video, Jim revealed an important decision about his Flow Hive: he was not going to install the Flow Hive frames before the winter. He came to this decision because his bees had not been able to produce enough regular comb on their own and fill it with sufficient honey for their own needs. Although his original plan was to use the Flow Hive frames in the super (the upper box meant to just hold honey), he was concerned about the well-being of his bees and their ability to survive the winter.

> There's not gonna be any Flow Harvest this year… I know you guys wanted to see it work, and they will come eventually. I wanted to see it… **I'm in this for the bees, I'm not in it for the honey.** I wanted to learn how to be a beekeeper, and I'm learning every day. It's going really well, and I'm not bummed about not using the Flow Frames (transcribed from video, emphasis added).

This statement reveals that the process of learning to take care of bees has led Jim to virtuously embrace the "bees, not honey" value system of beekeeper like Rusty. Jim's transformation from a new Flow Hive user into an amateur beekeeper who learned through trial and error offers an

optimistic outcome of growth and acceptance of community values, accelerated through social media. His position on the Flow Hive has developed nuance and virtue through his experiences; responding to a user interested in trying the Flow Hive as a new beekeeper, he took a cautious approach that resembled the position of many established beekeepers:

> I would have second thoughts about a Flow Hive if you are in a place with long winters. I think this system is ideal for a place with mild or relatively short winters or as a super for an established hive.

I posit that his connection to viewers through the YouTube video comments and otherwise open forum he provided contributed to this by inviting both Flow Hive supporters and more traditional beekeepers to give feedback and advice helped him to develop this sense of responsibility to his bees. His candid videos that revealed both his successes and his failures demonstrate an acceptance of reality as it is, much as Haraway's cyborg accepts messy reality over clean ideologies. And his decision in the end revealed the growth of his cyborg virtue in his realism and prioritization of the value of interconnectedness and co-becoming with his bees over the material value of the honey he wanted to harvest.

In this case, it was because of the Flow Hive that Jim attempted this daunting endeavor and came to appreciate the messiness of the practices across the spectrum of "natural" and "artificial" that beekeepers use to care

better for their bees. And so, on a social level, a new technology like the Flow Hive has the potential to bring in more users to become beekeepers if they, like Jim, are open to the potential connections they could develop with their bees, regardless of what type of hive they use.

4.4 Conclusion

In this chapter I have presented the Cyborg Virtue Ethic as an evaluative mechanism to better approach situations that require us to compare technologies and techniques that are disparate in some way, whether in having a "high-tech" and a "low-tech" option, a "soft" or "hard" technology, or a question about the value of "natural" or "unnatural" approaches. By negating the primacy of these categories and instead cutting to the important questions: does it promote *agentogenesis*? Does it recognize or encourage *rich diversity*? Does it facilitate better relationships and interconnections through shared values, informative discourses, and disruption of existing power structures that exclude and silence? The debate about cochlear implants and sign language ought not be able which is more "high tech" or which "fixes" a disability more, but instead about how to better enable a person to interact with their community and feel like they are understood. Using low-tech oranges in tandem with high-tech simulators

enables more people to practice their virtue as surgeons, not just in physical skill, but also in clinical decisionmaking. The Flow Hive does not exist in a vacuum, but in an entire constellation of the relationships between bees and humans, scientific practices of expertise and tradition, the values of beekeeping, social media conversations, and the environment; the question is not whether it should be used, but how it can be used in virtuous ways.

5. INSTITUTIONAL CREEP AND PERCOLATION

Institutions have been alluded to in the previous three chapters, and as such play a significant role in both the change created by disruptive enactments, as well as the social resistance or tendency towards stasis that they sometimes enable. Either role can involve institutions as agents or as sites of change, and it is the ways in which institutions are able to take on these multiple roles that undergirds the topic of this chapter. Recall from Chapter 1 Ottinger and Cohen's concept of "ruptures," in which institutions play a central role as the setting in which change happens as scientific experts either intentionally advocate for or unintentionally respond to activist efforts in social justice endeavors. This is a valuable contribution to existing perspectives on institutions as unitary forces of change or concretization because it recognizes that institutions themselves are not homogeneous nor monolithic at all times, and that in many cases, it is worthwhile to identify internal dynamics and system-environment reactions to outside pressures.

5.1 Institutions and Change

Haraway (2015) describes her preference for sympoiesis, rather than autopoiesis, as an analytic framework, and that distinction will be useful in

our discussions. Autopoiesis was introduced by leftist Chilean cyberneticists Humberto Maturana and Francisco Varela (1973/1980) to define the ways in which biological systems created a closed, self-maintaining chemistry. Haraway suggests that this diverts us from the fact that all systems have some interaction with their external environment, and prefers the frame of "sympoiesis" to emphasize that exchange. In attempting to understand the concepts of institutional creep and percolation I find both to be valuable perspectives. Institutions are important factors in social change precisely because they embody both autopoietic (self-defining, self-producing, organizationally closed) and sympoetic (not self-defining, collective-producing, organizationally ajar) characteristics.

Beth Dempster contrasts sympoetic systems with autopoietic ones to offer a better heuristic for understanding complex systems that does not adhere solely to the autopoetic organismal metaphor and that incorporate an understanding of socially originating influences:

> Research must focus on biological and ecological systems, but also social, economic, political and cultural systems, and the interconnections among them (Dempster 2000).

Dempster defines autopoietic systems, a popular way to characterize systems across many disciplines, as having two attributes:

> First is the ability of these systems to continuously and recurringly produce relations among their components through a dynamic process that allows them to continually reproduce the same pattern of relations. ...The second characteristic attribute of autopoietic systems is their ability to produce their own boundaries through "preferential neighbourhood interactions" (Maturana and Varela 1980).

This results in autopoietic systems as having autonomy (self-governance), but not full independence from their environments. Clemens and Cook's definition of institutions (1999), drawing from a political perspective, reflects this autopoietic character of institutions:

> Institutions exert patterned higher-order effects on the actions, indeed the constitution, of individuals and organizations without requiring repeated collective mobilization or authoritative intervention to achieve these regularities.

In this conceptualization, institutions are seen as self-defining and closed actors that cause change in more malleable agents in their environment.

In contrast, sympoietic systems focus on the interactions of components, with greater permeability and interaction with the environment:

> I propose the conceptualization of boundaryless systems and have constructed the term *sympoiesis*, from the Greek words for collective and production, to describe such systems. In contrast to autopoietic systems, they are characterized by cooperative, amorphous qualities. Sympoietic systems recurringly produce a self-similar pattern of relations through continued complex interactions among their many different components. Rather than delineating boundaries, interactions among components and the self-organizing capabilities of a system are recognized as the defining qualities. 'Systemhood' does not depend on production of boundaries, but on the continuing complex

> and dynamic relations among components and other influences. The concept emphasizes linkages, feedback, cooperation, and synergistic behaviour rather than boundaries (Dempster 2000).

An example of a sympoietic conceptualization of institutions is Vivien Schmidt's Discursive Institutionalism (2010), which defines institutions as:

> simultaneously constraining structures and enabling constructs of meaning, which are internal to 'sentient' (thinking and speaking) agents whose 'background ideational abilities' explain how they create and maintain institutions at the same time that their 'foreground discursive abilities' enable them to communicate critically about those institutions, to change (or maintain) them.

In this theoretical context, institutions are not merely external-rule-following structures but rather are simultaneously structures and constructs internal to agents whose "background ideational abilities" within a given "meaning context" explain how institutions are created and exist and whose "foreground discursive abilities," following a "logic of communication," explain how institutions change or persist (Schmidt 2010; 2008).

To evaluate how change is caused by or generated within institutions, both the *pattern of organization* and the *structure* of the system must be considered. Dempster (2000) distinguishes these two concepts thusly (emphasis added):

> The pattern of organization of a system is the **relations among components that define a system** as a specific type of system. The pattern of organization of a tree, for example, is the relationship

> between the leaves, trunk, roots, and other components. Different types of system, have different patterns of organization, such as an herb (with no trunk) or an elephant (with no leaves).
>
> The structure of a system is the **actual relations and components that constitute a particular system** in a particular domain. A tree, for example, exists in the physical domain, so its structure will be the actual physical arrangement of the components that make it a particular tree. A spruce has a different structure than a maple.

Dempster relates structure to what is "real," in other words, material, and pattern of organization to a conceptual understanding (2000), much like my distinction between ontological and epistemological understandings of diversity in Chapter 3:

> As used here, structure more closely represents vernacular usage, which typically refers to a physical entity – something present and 'real.' To some extent, pattern of organization correlates to a blueprint, and structure to manifestation of that blueprint in some domain. Any pattern of organization can be manifest in many different structures

The pattern of organization determines the "organizational closure" of an organization - what degree of self-containment a system has. Meanwhile, the "structural coupling" of an organization concerns its material needs with relation to its environment. The level of organizational closure will impact the permeability of the organization to change from within that conflicts with its internal way of defining values and actions while the amount of

structural coupling with the environment will affect how aggressively it works to change what is around it.

Change can be then be caused by institutions (autopoietic) or be effected within them (sympoietic). Clemens and Cook (1999) identify three prescriptions for analyzing institutional change:

> disaggregate institutions into schemas and resources; decompose institutional durability into processes of reproduction, disruption, and response to disruption; and, above all, appreciate the multiplicity and heterogeneity of the institutions that make up the social world.

Meanwhile, Óscar García Agustín applies the concept of *institutionalization* to analyze how discourses question and transform institutions through collective activism (2015); this is an example of change in the pattern of organization. Key to his approach are several arguments: 1) that discourses are not separate from institutions (Dryzek), 2) discourses can both constitute and challenge institutions, and 3) institutionalization is a process of questioning institutions when power structures shift. Instead of looking at institutions and how they constrain the production of discourses, Agustín's main interest consists of the ways in which discourse challenges existing institutions (upon which the existing social order relies) and initiates new processes of creation of social meaning and collective action.

Institutionalization is not a matter of adapting institutions, but rather the opposite, i.e. institutionalization questions institutions.

Ottinger and Cohen (2011), referenced in earlier chapters, classify their ruptures based on whether transformative pressures originated among the ranks of experts within the institution or were applied from outside the institution by other entities interested in promoting environmental justice concerns. They also distinguish the subsequent changes based on intentionality: the former is "invited" change, while the latter was not invited. This inside-outside binary is not always clear, nor is it always accurate. For example, in Dean Nieusma's "Middle-out Social Change: Expert-Led Development Interventions in Sri Lanka's Energy Sector" (2011), a class of experts described by Scott Frickel as "expert activists" in the Energy Forum of Sri Lanka constitute a middle category between "top-down" programs spearheaded by policymakers working through experts and "bottom-up" grassroots initiated by non-expert citizens enlisting the aid of experts to support their concerns. The characterization of "invited" and "uninvited" change also is less clear than starting with the type of *poiesis* of the institution as described by Dempster: a sympoietic institution could be more responsive to change from the outside, but it may not necessarily be unwelcome, and an autopoietic institution could change more from the

inside out, but it may not all be welcome (although the information would have been adapted to fit the internal logic of the organization).

5.2 Power and Change

Piven and Cloward (1979) emphasize that activists naively assume that the high energy of a disgruntled lower class can be sustained to build lasting organizations. "Organizers do not create such moments… but they are excited by them and the signs of the moment conspire to support the organizer's faith" (xxi). This strong affect is described by Protevi (2009). Manuel Castells argues that one reason that protest movements embody large amounts of anger is that it is one of the few emotions that can overcome fear, an emotion for which humans have been selected in order to live socially and engage in compromise rather than fights to the death (2012). One factor, identified by Piven and Cloward (1977), that determines whether a new organization originating in a protest movement continues to exist in a stable configuration is usefulness to entities that control resources:

> As for the few organizations which survive, it is because they become more useful to those who control the resources on which they depend than to the lower-class groups which the organizations claim to represent. Organizations endure, in short, by abandoning their oppositional politics (xxi).

Power, as defined by Piven and Cloward, is both control of the means of physical coercion and the means of wealth production. These are in a reciprocal relationship with each other: coercion can seize the means of wealth production, and wealth can buy the means of coercion. They separately consider the control of beliefs, seeing the two types of power as shaping beliefs. In a similar vein, Renée Marlin-Bennett (2013), a political scientist, defines power "in terms of control of the flow of information, where flow of information refers to content, velocity (direction and speed), and access.

Foucault shows that there is also power, a "softer" power, in framing discourses: when people are able to speak only through certain words and concepts, they are limited epistemically in their ability to communicate. This can be a contributing factor to a "creep" of discourse, where limitations in language end up limiting thoughts that are communicated over time. While physical coercive power certainly can control discourses, such as the United States' coercive and systemic extermination of Native American language and culture through reservations and assimilation, and wealth can likewise control discourses, as with Texas' monopoly over grade school textbooks, there are other ways to control discourses.

Dean Nieusma's (2011) analysis of the Sri Lankan Energy Forum's project testing community-scale wood-fueled power plants in the village of Bohitiya suggests that despite power differentials in the framing of discourses and significant difference in *degrees of influence*, it is entirely possible for an organization at the high-power end of a relationship with grassroots activists can still have positive results. In this case, there was an active assumption that extended, respectful engagements could promote shared understandings on both sides as well as increased cognitive and political empowerment of villagers through gaining voice and representation as well as learning tangible skills. So even though the Energy Forum had control over project decisions and the way that community discussions were framed discursively, this power was implemented to develop activities that not only encouraged voluntary participation but that also were able to receive critical feedback from villagers. Instead of advancing a particular outcome, Nieusma argues, the Energy Forum aimed to "open up" deliberative processes; this represents the earlier described shift from an ends-based ethic towards a process-, or virtue-based ethic, even a Cyborg Virtue Ethic (as in the previous chapter).

In many cases, institutions utilize expertise to obscure connections between generated environmental hazards and health concerns. Kleinman

and Suryanarayanan (2012) point to the ways that the gross classification of insects as "pests" prevents effective research measuring non-mortality effects on beneficial insects like bees from pesticides and other chemicals used in industrial agriculture. However, expertise and knowledge practitioners are not always the barrier to recognition of harms or moves to positive change: it is also possible for scientists or other experts to reveal causal chains of harmful developments but be stymied by other institutional dynamics, such as by government. Mona Hanna-Attisha et al, in their research on Flint, Michigan's contaminated water supply (2016), raised national awareness of the connections between degraded infrastructure and public health. Yet, despite clear evidence that 1) local governmental officials' decisions to change the water supply had resulted in catastrophic degradation of the water delivery system of Flint and 2) the degraded water system exposed the populace not only to excessive and drastically unsafe levels of lead contamination but also to a host of other ailments through bacterial and other types of contamination, change has been slow to come to the city. Despite media reports of offers from across the country, such as plumbers' groups offering to change piping out for free or minimal cost, the institutional power of local officials has prevented grassroots and other types

of relief from happening, leaving Flint residents in a precarious and unsafe situation.

By approaching case studies with a simultaneous appreciation for power differentials but also for the ways in which said power, whether discursive, material, political, or expertise, are used, namely to *generatively* empower those without or with less, while also respecting agency and *rich diversity*, a more nuanced analysis can be produced that better identifies institutional leverage points that can result in more effective and lasting change with a "softer" but more directed application of resources.

5.3 Institutional Creep and Percolation

In this case, change (or lack thereof) will be measured in two ways: *institutional creep* and *institutional percolation*.

Institutional creep draws from Dempster's autopoeitic conceptualization of organizations, and describes how an institution, through functions like rule-setting, professionalization, knowledge production, and enforcement of the aforementioned, works change beyond the scope of its purview, shifting the cultural and normative landscapes by establishing what people see as "normal." This is inspired by "institutional momentum" as described by Hughes, but ascribes more agency to institutions as insidious

and lively beings, especially when fueled by capitalist ideologies. “Creep,” as in the term “mission creep,” evokes fingers probing the landscape looking for opportunities to invade further, like water fanning out across a delta. It also acknowledges contributions of factors like technology without going so far as to advocate technological determinism.

Institutional percolation, by contrast, represents Dempster’s sympoietic concept, and is the process by which change can be made to happen from within an institution. Much as a coffee pot starts the brewing process by heating up the water and letting it trickle through the grounds, with several moments elapsing before the result in the form of infused water is seen dripping out, the percolation through institutions can take time before results are seen. Such change seldom happens in a steady, proportionate relationship, but instead builds up pressure to a tipping point (like an inflection point in graphic equations, or equivalence point in chemistry when the buffer capacity is exceeded in a buffered solution). Institutions in this case are sympoietic systems (Demptster 2000), being structurally ajar (as opposed to fully open) because they can be influenced by outside information:

> Sympoietic systems regulate the input of organizational information through internal structural coupling: information must be contained in

> a suitable structure in order to be integrated into the system even though such input is not regulated by a boundary (Dempster 2000).

This means that any information from "outside" the institution must be framed in such a way that is compatible with the structural organization of the institution. So if a hiring manager wanted to promote more cultural diversity in hiring, rather than argue for social justice, they should present it as increasing the pool of creativity that could spur innovation.

Two examples will illustrate the concepts of *institutional percolation* and *institutional creep*. First, the *institutional percolation* of acupuncture as an accepted treatment in some Western medical contexts will be examined. Second, the *institutional creep* of Pasteurian ideologies will be examined in their effects on milk and cheese regulations in the United States, with a consideration of a failed process of *creep*.

5.4 Institutional Percolation: Acupuncture

The increasing coverage of acupuncture by medical insurance companies represents a type of *institutional percolation*. Although acupuncture is considered an "alternative" treatment in Western societies (it was part of standard medical practice in Eastern countries like China and Korea for centuries), it has widely gained acceptance by patients and

medical professionals in certain contexts, such as pain relief. There is still controversy over whether it is effective or even "real," as many skeptics argue that the placebo effect outweighs any benefit from many practitioners. Additionally, this practice represents a spectrum of "legitimate" practitioners, usually those who are more "authentic" to Eastern belief systems and advocate acupuncture in tandem with standard practices, and "sham" charlatans who do not have any cultural, historical, or medical backing and offer acupuncture as an alternative to standard medical practices. While it is not the inclusionary/exclusionary division that marks effective versus ineffective practitioners[4], this often can serve as an indication of the practitioner's attitude towards standard Western medicine: is it mostly valid, with a few blind spots that can be alleviated by alternative healing techniques like acupuncture, or is it mostly invalid, requiring a full alternative system of treatments and cures since it fails in the eyes of some to address health concerns?

It is valuable to contextualize this issue in the current concerns about pain management and pain medication as a public health issue. In recent years, heroin addiction has become a prominent health concern, not just among "deadbeat" adults, but among school-aged adolescents. Experts point

[4] Indeed, there is an argument for valuing benefits from a treatment, regardless of whether they are "real" or placebo.

strongly to the overprescription of opioid painkillers such as Oxycontin to adults, resulting in greater access by children to their parents' medications. From Oxycontin, heroin can be obtained more cheaply at times from alternative sources. An institutional perspective reveals that this is not only made possible by the increased use of DTC (Direct-to-Consumer) marketing of pharmaceuticals to potential patients and relaxed regulations regarding incentivization by pharmaceutical companies towards physicians to prescribe and distribute free samples of medications, but is also a symptom of an inadequate health care coverage system with insufficient support for preventative and early-intervention screening and treatment, economic stress on workers resulting from lack of sick leave and medical coverage, and social stigma against people who are in pain. As Keith Wailoo (2014) describes, a "politics of emotion" drove much of medical and drug control policy in the United States after WWII, drawing on Christian moral judgements about the virtue of experiencing pain and suffering and shaming of people who sought relief from that pain, especially through medications. This prevented open discourses about medications and pain management in many venues, allowing issues of addiction and dependency to be blamed on individual moral failings rather than on systemic flaws. Every social demographic has unique struggles with pain relief as well. Women's

complaints of pain sensations are routinely dismissed by physicians as being "all in their heads," Black people are underprescribed medications for pain due to historical beliefs that people of African descent don't feel pain as much (because they are more primitive or bestial), and men are significantly less likely to go to a physician, especially for preventative care, but also for acute conditions like injuries unless they are serious or have become chronic. All of these factors are examples of social dynamics that influence the efficacy of medical institutional capabilities to effectively treat pain from material, social, and discursive angles.

Additionally, with any drug, there are always concerns about addiction, increased tolerance with extended use, and possibilities of drug interactions since a majority of Americans who take medications take multiple drugs at once. Publishing in *Mayo Clinic Proceedings*, Zhong, et al. (2013) identified 70% of Americans as having one type of prescribed medication, 51% as having at least two different groups of medications, and 21% as having five or more different types of medications prescribed. Kantor, et al. (2015) supports this by showing that polypharmacy (using five or more medications) nearly doubled from 8% to 15% in the general population between 1999-2000 and 2011-2012, with overall prescription drug use having increased the most in people ages 40-64 (57-65%) and 65+

(84-90%). Opioid painkillers were overall the third most prescribed type of medication, after antibiotics and antidepressents, with highest usage in young and middle-aged adults (Zhong, et al. 2013).

With this in mind, there is an imperative to consider alternative ways to treat pain that either do not involve pharmaceuticals, make seeking care more approachable for demographics reluctant to see physicians, and/or reframe discourses and attitudes about pain in ways that reduce shame and stigma. Because medical insurance coverage is a significant factor in most people's medical treatment choices, the acceptance of acupuncture as a treatment that can be covered to some extent by insurance was a huge shift in policy that has far-reaching repercussions. However, this did not happen overnight.

There has been considerable debate about the efficacy of acupuncture as a complementary or alternative treatment for a variety of conditions, primarily for pain, but for other conditions and more nebulous ailments, such as fibromyalgia. Prominent members of the skeptic community in the United States, such as Steven Novella, a neurologist at Yale University School of Medicine and a cohost of a popular podcast called "The Skeptics Guide to the Universe", have taken an active role in arguing against not only the efficacy of acupuncture, but also in framing acupuncture as a treatment

whose efficacy cannot be scientifically proven. In a point-counterpoint debate in *Anesthesia & Analgesia* (2013), Novella, along with David Colquhoun, argued against acupuncture primarily from a scientific procedural perspective, such as by saying that it is impossible to do a double-blind control study (the gold standard in scientific studies) since both patient and therapist would know that they were inserting needles. As a result, many studies have incorporated the use of "sham" acupuncture, which involves needles being inserted either randomly (not on identified meridians, or "chi points" used in Chinese acupuncture) or inserted but not manipulated during the treatment, to control for patients knowing whether they were being poked by needles. A study published in *The Lancet* in 2005 (Witt, et al.) utilized this type of study design (along with a control of no intervention; all three patient groups could use over-the-counter painkillers like NSAIDs as needed). It demonstrated significant benefits from acupuncture in relieving knee pain for the first 8 weeks of intervention (with efficacy tapering off from that point); although there was some improvement in patients with the "sham" acupuncture as well, Witt and colleagues described the effect of "real" acupuncture as significant in reducing pain.

Novella and Colquhon also contested the veracity of acupuncture by claiming that it has not been used in China and other parts of East Asia (like Korea and Japan) for the thousands of years that practitioners have claimed, but only for a few centuries.

At the same time, the interesting story is not just how acupuncture came to be accepted, but what the downstream effects of its coverage will entail. People who may not have been in favor of acupuncture themselves may now become educated about it, physicians who were supportive of the procedure but who previously could not suggest it as a possible treatment now can include it in the list of treatment options, and people who are outside of a specific group who were both culturally inclined and financially able (such as upper white middle class liberals) could now access this technique. The use of pain medication could be reduced, both because there are options besides medication (or options that can be used to reduce medication use when applied together), and because there are significant concerns about painkiller addiction that stems from excessive availability of prescription painkillers.

5.5 Institutional Creep: The Microbiopolitics of Cheese

In this section, I will present the process of *institutional creep* of the Pasteurian norms of sterility regarding dairy products, show how it has infused most of the ways that Americans consume milk, then present a case where the creep failed in the FDA's attempt to ban wooden cheese aging boards out of Pasteurian concerns.

The Pasteurian worldview, as described by Heather Paxson (2014), framed microbes *agenticidally* as hazardous things to be eliminated in any way possible. While attempts to kill microbes in the body needed the technology of antibiotics to target them while not damaging the human body, substances outside a living organism like milk could be subjected to less precise processes, like heat pasteurization. While pasteurization (the heating of milk to a particular temperature to kill pathogenic microbes) certainly improved public health in a past time when milk was carried, unrefrigerated, through streets that moonlighted as open sewers (Valenze 2011), this technology has come to obfuscate the importance of wholesome husbandry practices with dairy cattle. Because the milk could be "purified" and "cleansed" after collection, industrialized techniques became more widespread, practices that promoted quantity and not quality, illness and not health, and an authoritative mythos of raw milk as not merely unruly, but

toxic, dangerous, and deadly; we see here a materialized enactment of the purification (Douglas 1978) and de-naturing of food through cooking (Levi-Strauss 1964). There are many small-scale farmers who refuse to subscribe to this train of ideologies, and instead focus on improving the health of their cows (to reduce pathogen count in milk that is harvested), maintaining cleaner conditions (to reduce reinfection of individuals through exposure to waste), and smaller batch processing (to make tainted milk easier to trace) to offer safe milk that is not pasteurized ("raw milk") (Gumpert 2009); this mirrors the ethos of other so-called "artisanal" food producers who don't simply refuse new technologies, but resist the ethical slide that accompanies unconscientious use of them (Pollan 2006). The result, in the United States, is a patchwork of state-based laws banning or allowing raw milk; a survey of an interstate border, such as that between New York (illegal) and Massachusetts (legal), reveals a line of raw milk sellers on the Massachusetts side who likely see their fair share of New York residents arriving with coolers.

In this case, the *institutional creep* was fueled by a combination of factors: *agenticide* of naturally occurring microbes in milk that needed to be killed, economic encouragement (through subsidies and economies of scale) to produce milk in larger quantities, and practices that increased illness of

cows like massive feedlots, persistent antibiotic use, and growth hormones to increase milk production. As with the first example of antibiotics ultimately being self defeating because they promoted antibiotic resistance, the Pasteurian worldview paired with the technology of pasteurization enabled an *institutional creep* that not only has affected the quality of milk, but also the ethics of how people treat dairy cows, how Americans view milk by default (as a toxic, hazardous substance in its raw state), and policies that are both paternalistic and protectionist by denying people choice in food purchasing options and favoring large industrial dairy producers that perpetuate these harmful practices over a diversity of smaller, more accountable farmers who would check this institutional momentum by reframing milk as a substance whose virtue depends on the process by which it is produced.

Sometimes, institutional creep is resisted; this happens when the reason enabling the creep is outweighed in public power and opinion by other concerns and values. A 2014 controversy over the FDA's intention to restrict the use of traditional wooden boards for aging cheese because of concerns over bacterial contamination illustrates this.

In early June of 2014, the U.S. Food and Drug Administration (FDA) issued a statement suggesting a shift in policy and enforcement regarding

cheese (Anderson 2014; Metz 2014). Specifically, a concern was raised about the potential hazard presented by traditional wooden boards used to age cheese because they could not be completely sterilized to remove harmful bacteria like Listeria, which has been responsible for many cases of foodborne illness in the United States. Interpretations and implementations of this statement could have gone so far as to disallow the use of wooden boards for artisanal cheese making in the United States and to even ban imports of traditional European cheese, like Parmigiano-Reggiano, that still use the original techniques involving wooden boards. This prompted an immediate backlash across communities: besides artisanal cheesemakers and food enthusiasts (Carpenter 2014), both liberal (Ledbetter 2014) and conservative (Watson 2014) voices howled in outrage at the further undermining of "real food" culture and the government overreach (respectively). Although it was clear that many people took issue with this approach, based on conventional harm-prevention ethical standards the FDA was acting in a reasonable manner to prevent food-borne illness.

This decision left a bad taste in the mouths of many across the political spectrum because it felt like an unjustifiable intrusion on a means of food transformation that is rich with historical and cultural meaning as well as with knowledge claims of efficacy and safety. But more importantly, it

represented a further *creep* of institutionally defined concepts of sterility based on the traditional Pasteurian microbiopolitics.

Paranoia about "bad microbes" fuels current American regulations regarding staple foods like milk and cheese, long part of our cultural heritage, as well as our biomedical perspectives on health and hygiene (as we have seen with the *agenticidal* use of antibiotics). At the same time, many of the processes we use produce cases of microbial infection that are accepted as inevitable due to our refusal to change those processes; for example, many pre made foods, like frozen "TV dinners," bagged salad greens (including spinach), and even hospitals themselves all contribute to large numbers of serious, even life-threatening infections in people. Yet, only certain sources of infection are seen as correctable; this results both from an ethical choice (active or passive) about what can and ought to be changed and, as described before, from discursive power structures that limit what we talk about and how. This results partly from the *autopoeisis* of institutions related to public health – they define risk based on the presence of microbes, and address the problem only *agenticidally* by eliminating them.

The culturing of cheese with traditional microbial cultures represents a post-Pasteurian worldview, as described by Paxson, and challenges the

institutionally defined ideas about health and hygiene by engaging in *agentogenesis* of microbes, recognizing that not all microbes have the same impacts on human health and that they exist in a *richly diverse* ecology of their own. As described in Chapter 2, microbes like *Lactobacillis* and *Bifidus* are not only benign, but helpful and necessary for our health; they also bring benefits by preserving dairy products (and other foods like vegetables) so that they don't spoil. Humans have been able to encourage and nurture these microbes through techniques like salting (which inhibits competitive bacteria while leaving beneficial strains untouched) and providing already inoculated vessels (Mollison 1993) like jars or, in the case of cheese, wooden boards that have been used to age cheese for years. Through these indirect, *natural* practices, humans have been able to engage in both a performative and material *agentogenesis* of our cohabiting and co-mensal (eating together) microbes, enlisting their aid to do our work for us at the microscopic level, a level beyond our direct capabilities to influence. It is this virtuous cyborg process that makes traditional preservation methods like cheesemaking so effective.

How do the microbes actually protect our dairy products from infestation by disease-causing microbes? They do this through several mechanisms: first, they simply fill up the niche environment so others

cannot grow; second, strains like *L. Acidophilis* ("acid loving") excrete lactic acid that lowers the pH of their environment, making it hostile to many microbes that could cause illness to us. Additionally, these beneficial microbes can partially digest nutrients like sugars to make them more digestible and nutritious for us; people with lactose intolerance can sometimes eat cheese that has been aged enough for all of the lactose to be processed by microbes, and fermented foods generally have greater bioavailability and nutrient value (especially in B vitamins). Clearly, promoting the *rich diversity* and *agency* of these microbes is desirable! What is even more astounding is that they are already present in raw milk before it is pasteurized, although cheesemakers will supplement the native culture with specialty cultures of their own. Prior to the days of pasteurization, cheese was considered to be a safe way to consume dairy products that were not drunken fresh from the cow as milk because of these material benefits. However, when pasteurization became the standard way to process dairy products, the *creep* of fear of bad microbes extended into cheesemaking.

Currently in the U.S., raw milk cheese is allowed to be produced or imported only if it has been aged for 60 days or more; this is a standard that is supposed to reduce the risk of contracting pathogenic microbes like

Listeria because the beneficial microbes are supposed to displace it during that time. This reasoning is the same that forms the basis for guidelines warning pregnant women (perennial subjects of scrutiny) to not eat soft cheese like Brie or Camembert (raw or pasteurized). These rules have seen the growth of communities of cheese aficionados who smuggle young raw cheese back from Europe in their suitcases. The implementations of these unidimensional and unilateral regulations based on Pasteurian ideologies are revealed by Paxson (2013) to be not merely ineffective at preventing the harms identified, but actually counterproductive in that they exacerbate the problem. For example, the 60-day aging requirement for cheeses made with raw milk upheld by the FDA is counterproductive when applied to certain types of cheeses - bloomy-rind (like Camembert style) or mold-ripened (like blue cheeses) - because these types become **less** acidic over time and thus have less protection against pathogenic bacteria (recall that *Acidophilis* produces more acid to make the environment hostile to harmful bacteria - this activity is reduced as some cheeses age). Additionally, most bloomy rind cheeses are considered ripe before 30 days; one of these cheeses aged to 60 days is effectively impossible because the cheese would be so overripe as to be inedible (Paxon 2013, 169). Even the use of pasteurized milk could result in less safe cheese since there are fewer native microbes present to

fend off secondary contamination by Listeria in the packaging, transporting, or handling stages. Seeking sterility through these *agenticidal* means reduces safety because the *rich diversity* of cheese microbes is threatened.

Paxson similarly describes the disappointing outcome following dreams of creativity in cheesemaking expressed by biologists like Herbert Conn, who "speculated that microbial seeding could lead to 400 to 500 varieties of cheese" (163): instead of greater diversity in types of bacteria used to cultivate cheese from milk that was pasteurized (thus effectively purged of 95% of native bacterial cultures), there was increased uniformity as only standard cultures and processes were used. Today, we see our cycles of utilizing antibiotics followed by probiotic supplements echoing that cycle of broken promises and impoverished cultures – literally and figuratively – as we in our hubris standardize a menu of select domesticated microbes without the inclusion of those invisible and inaudible to us.

The upset over the scrutinization of wooden boards used in cheese aging, then, is not merely a fuss over a change of tradition. Considered through the Cyborg Virtue Ethic in the way that the Flow Hive was considered in the previous chapter, it is not simply that "wood is natural and therefore good," and "plastic is artificial and therefore bad," but instead a concern about the material *agenticidal* effects not just of choosing a different

material, but of the larger *creeping* Pasteurian ideology that "sterile is better" and that a safe harbor for any microbes is a risk, not a source of *rich diversity* that can protect us. Banning the wooden aging boards is a disruption of a co-evolved process between cheesemakers, microbes, and wood, where the wood offers a substrate (Mollison 1993) that selectively has promoted and still promotes cultures (human and microbe) of cheese through means beyond our manufacturing. The wooden boards resemble Aliass' mother's milk in that they are useful **by virtue of** being porous and non-sterile, not **despite**, because they allow better interrelationships between relevant agents in ways that are currently too complex for us to effectively measure with standard science.

In attempting to win a myopic war against one microbe, the FDA threatened to decimate the entire artisanal cheese community as collateral damage. Worse yet, for those concerned about social justice and the ever-increasing corporatization of America, the large-scale corporate producers of cheese-like products, like Kraft, would have been unaffected and, like an unbalanced *C. difficile* infection, would have no checks and balances in the cheese economy. Ironically, the war against one pathogenic microbe would have spoiled the entire American cheesemaker ecology by rendering

conditions inhospitable to the artisanal culture while leaving more room for industrialized cheese to take over.

Fortunately for American artisanal cheesemakers, shortly after the release of the FDA's comment on the cheese aging boards, online petitions from various groups were signed and sent demanding a retraction of this interpretation of food safety policy. The scientific evidence and expert reasoning used had been contested across food blogs and discussion forums, often by those experienced in cheesemaking. A few days later, the FDA issued a subsequent statement implying that they would reconsider this position, demonstrating that while powerful, *institutional creep* is not always inevitable.

5.6 Conclusion

In this chapter, I have expanded on the general concept of institutions to characterize two types of change that involves them - *institutional creep* and *institutional percolation*. In order to successfully consider these two different types of change, it is important to recognize that institutions are not monolithic or impermeable, but instead should be conceptualized as dynamic entities that not only exercise *agenticidal* and *agentogenic* capacities, but that also can exist along the spectrum of *autopoietic* and

sympoietic, with the results being less or more openness to their surrounding contexts, more or less self-determination and definition, and more or less authoritarian interactions with other actors. *Institutional percolation* can be an effective avenue for change in even the most powerful institutions, like medicine, but it can take a long time before results are seen after a diversity of interactions and attempts at advocacy. *Institutional creep* can be insidious in its exercise of power, shaping discourse even as it controls materials and regulates performative expertise, but it is not inevitable, as shown in the case of the cheese aging boards. When evaluating or modeling change, these two mechanisms together add nuance and invite more textured considerations of agency, rich diversity, and cyborg virtue ethics.

6. HYBRID GENERATIVE VALUE

The preceding chapters have explored four dimensions of disruptive enactments: agency, rich diversity, cyborg virtue, and institutional creep/percolation. Along the way the concept of value generation has been a recurring theme. Loss of agency, reduction of diversity, lack of cyborg virtues, and over-reach of institutional control commonly occur in some relation to the ways that those who generate value--human and non-human alike--are denied the fruits of their efforts and interrupted in perpetuating sustainable cycles of value creation. The theoretical framework of Generative Justice (Eglash and Garvey 2014; Eglash 2016) is particularly useful for understanding this relationship. Beginning with Marx's concept of alienated labor value, they extend the concept to alienated ecological value (e.g. soil depletion) and alienated expressive value (a semiotic category that includes arts, discourse, sexuality, spirituality, and so on). The theory works well to explain how phenomena ranging from open source software to organic gardening embody emancipatory goals. But their dependency on the three restricted categories of labor, ecological, and expressive value make it difficult to apply in cases where the phenomena are strongly hybrid. This chapter will examine just such cases, and show that greater insight can be

derived from hybrid conceptualizations that do not presuppose distinct categories of value, nor force them into a restricted geographic boundary.

Thus my core questions for this chapter, expanding on Generative Justice, are: how can unalienated value be protected against extraction, especially when the generators are not human or the value does not come from natural material resources? What sociopolitical barriers exist to overcoming the binary of natural purity versus technological efficiency, and instead reconceptualizing ecological value generation as a hybrid in symbiosis with the political economy of human value circulation? And how can such localized unalienated circulations scale up to embody the vision of "alter-mundialization" -- a just and sustainable future for the planet as a whole? To do this, I will first provide background on appropriate technologies and the diversity of scale at which enterprises can occur. Then, as an example of a significant type of hybridization relevant to generation of value, I will explain the term "glocalization" as a hybrid of "global" and "local" in the context of disruptive practices that no longer cleanly fit into hegemony or assimilation. Vegecultural practices will demonstrate the disruption of centralized agriculture and the cyborging of humans and plants cultivated through this method. The "Korean Wave" of culture (*Hanryu*) will be explained through a convergent media analysis of the viral song

"Gangnam Style" and a decolonial sympoetic propagation of culture through Korean televised shows (*sageuk*).

6.1 Appropriate Technology and Diversity of Scale

> Fossil fuels are merely a part of the 'natural capital' which we steadfastly insist on treating as expendable, as if it were income, and by no means the most important part. If we squander our fossil fuels, we threaten civilization; but if we squander the capital represented by living nature around us, we threaten life itself (Schumacher 1973, 17)

Schumacher emphasizes the centrality of permanence as a standard towards which economic thinking should be geared; it challenges conventional thinking about science and technology because outcomes that result in a polluted environment or degraded social structure are typically dismissed as temporary conditions needed to achieve some future utopian stage of the technological perfection (Beckert 2016). Rather than perfected technologies in a never-arriving future, he called for appropriate technologies in the here and now: technologies which are economically accessible to all, small-scale in their applicability, and compatible with human creativity. As a ballpark, Schumacher suggests that a cost about equivalent to a worker's annual salary is reasonable to set up one's own workplace with necessary technologies; this helps to prevent concentrations

of wealth and power among a privileged few and to reduce the risk of people becoming destitute trying to set up their own business or enterprise.

The preference for small-scale enterprises derives from Leopold Kohr's analysis that small scale operations cause less harm to the environment than large scale ones because they don't outpace the ability of the natural world to recuperate from stress.[5] Yet, he acknowledges that this is largely due to the imperfect knowledge under which humanity operates (what would be currently known as the "precautionary principle" in environmental discourses); when we utilize new technologies with unforeseen effects, like nuclear energy, chemical agricultural tools, and mass-produced and used vehicles, it is without full knowledge of their potential and future impacts that we make them mainstream.

Schumacher's concern with the erosion of human creativity mirrors Marx's concern with alienation of the worker from what he produces: even Pope Pius XI was cited as speaking against the "perversion" of man's body and soul, "for front he factory dead matter goes out improved, whereas men there are corrupted and degraded" (38). If we broaden Schumacher's concern with creativity into a hybrid that can encompass the generative

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[5] This intrinsic link between human well-being and the health and welfare of the environment has also been explored extensively by Aldo Leopold's famous essay "A Land Ethic," in *A Sand County Almanac* (1966), and later by Van Rensselaer Potter in *Global Bioethics* (1988)

justice categories of both labor value and "expressive value," our analysis can better accommodate some of the restrictions that appropriate technology has encountered.

Winner (1986), writing a eulogy for the appropriate technology movement, notes that as different versions proliferated, researchers such as Robin Clarke attempted to bring order to the chaos by rigidly defining lists of characteristics for "soft technologies". He cautioned that "Inevitably, Clarke's typology and all similar ones were bound to fail. Nothing in Western philosophy-or in all of human experience for that matter-suggests that we can arrange the good and the bad in simple lists" (p. 73). History has borne out this caveat. Odumosu (2009) for example documents the "appropriation" of the cell phone in Nigeria. Local engineers had to adapt switching circuits to adjust for the more communal behaviors such as "flashing" (calling and then hanging up, to signal a social connection without payment). The Nigerian Telecommunications Consumer Parliament (TCP) allowed ordinary citizens to directly question corporate representatives, who would then be held accountable for issues in quality of service--a practice he linked to Ibo indigenous traditions. And appropriating the ability to exchange phone credits as a kind of monetary exchange, lay citizens created their own economic system completely outside the banking

world (an innovation that has now been formalized in Kenya's Mpesa and others). In other words it was neither the universalism of mainstream techno-optimists, nor the (sometimes paternalistic) low-tech alternative envisioned by Schumacher's followers, but rather a hybrid appropriation that revolutionized the democratization of communications in this case.

6.2 Glocalization

The terms "glocal" and "glocalization" refer to a blending of local and global. Glocalization is often attributed to Japanese marketing strategies in the late 1908s, which attempted to localize product marketing. The concept in Japanese discourse references the technique of *dochakuka*, defined as "blending into the landscape" (Maynard 2003; Rudolph et al. 1988), which originated from the practice of adapting farming methods to local terrain (Martin and Woodside 2007). Although it did not use the precise term "glocal," an article by James A. Lee published in Harvard Business Review in 1966 addressed many of the challenges facing companies that took a "glocal" approach based on the concept of "self-reference criteria" (SRC) that influenced how people in different cultures weighed problems like worker conflicts, product features that held different value across cultures, and adaptations of different institutional features to work between cultures.

Glocalization is disruptive, because, as observed by Robert Govers and Frank Go, "the reconfiguration of 'glocal' virtual and physical identities forces a reflection on the need for greater balance between commercial space and public space" (2016, 2). Technologies like the Internet serve not only as public spaces that overcome geographical distance, making people more interconnected, but also as an information-driven marketing tool for promulgating, among other things, extravagant images of places that are personalized to drive consumption. This disruption of binaries was also identified decades earlier in 1998 by Hubert Hermans and Harry Kempen in three elements: 1) cultural connections leading to hybridization, 2) emergence of a heterogeneous global system, and 3) increasing cultural complexity. These disruptive enactments called into question a basic assumption of cross-cultural psychology – the idea of culture as geographically localized – as well as starting points for research that relied upon clear binary distinctions, such as the divide between Western and Eastern cultures.

Cultural imperialism, at one point, was a clear tool for critique. The appearance of a McDonalds in Paris, for example, offended French sensibilities. But in 2002 they replaced Ronald McDonald with a figure of Asterix the Gaul; allowing French locals the illusion that they had somehow

defeated American capitalist hegemony while surrendering to its logic of value extraction. Similar disguises can be found elsewhere: a distinctive local style of noodles became “McSpaghetti” at McDonalds in the Phillipines; and so on. Glocalization thus challenges our ability to apply tools such as the critique ofcultural imperialism or globalization because it gives the false appearance of starting from the inside out, i.e., a process that begins with a high regard for the local (Maynard 2003).

In the parlance of Generative Justice, Ronald McDonald and Asterix are forms of expressive value, a category cleanly separated from labor value produced by the fry cooks or the ecological value, which is extracted in the form of beef. Since the marketing icon, the worker and the food are all in more or less alienated forms already, it would matter little what configuration they take. But there is a Paris that still exists in artisanal form. Lackman (2012) describes a group of Paris hackers, UX (for “urban experiment”) that have worked to restore its traditional monuments using contemporary DIY technologies. In 2006, after a year of secretive work, they restored the Pantheon’s 19th- century clock, which had not worked since the 1960s. Embarrassed that a group of lay youth had exposed 50 years of professional neglect, authorities destroyed the restored mechanism. The example fits the pattern we have seen in previous chapters--the pervasive

overreach of institutional control; the "mangle" of human love for arts and non-human artifacts; the virtue ethics in performance of cyborg deeds. Such phenomena highlight the need to distinguish true generative justice -- the bottom-up value circulation of unalienated value -- from the illusory pretensions of glocalization.

Other scholars have recognized the need for a framework that can clearly distinguish between more authentic forms of hybridity and the illusory character of glocalization, with its imperialistic ambitions to exploit resources in localized disguise. George Ritzer attempted to refine glocalization by coining a complimentary term "grobalization" (2003) to describe systems which are even worse: they not only spread globally, but are essentially "the proliferation of nothing". Grobalization merely focuses on its own growing profits, "a social form that is generally centrally conceived, controlled, and comparatively devoid of distinctive substantive content". Much of the banking world, for example, from ATMs to credit cards, is merely a means for proliferating debt (Graeber 2011).
Thus his analysis allows for two orthogonal axes. In contrast to the production of nothing, he describes "the production of something"; when locally controlled they are often cases of what I would call generative hybridity: "a social form that is generally indigenously conceived,

controlled, and comparatively rich in distinctive substantive content" – and thus stands in opposition to the spread of nothing. Here Ritzer acknowledges the importance of unalienated value that arises from maintaining connections to local and indigenous producers (citing, for example, Oldenburg's (1989) "great good places" such as locally owned taverns and cafes).

These relationships constitute an "elective affinity" between elements of the pairs that imply there is not necessarily a causal, lawful relationship, but one of tendency or affinity. Although his stance is primarily negative--Ritzer cites Barber's "McWorld vs Jihad" as an example of why neither grobalization nor glocalization are necessarily offering solutions--his focus on the more surprising formations that arise through hybridity offers some hope. He notes, for example, that "the influx of fast food into South Korea gave impetus to the rebirth in chewing Betel nuts." While never proposing a fully positive vision for what Haraway and others call "alter-globalization," his analysis does allow a more nuanced critique rather than a rigid classification scheme that impoverishes the discussion.

6.3 Vegeculture's Disruptive Politics

In this section I will examine the gains possible in generative hybridity when considering the contrast between mass production forms of

agriculture--in particular the grain economy, a kind of food equivalent to the fossil fuel economy--and the alternatives offered by vegeculture. In order to do so, we need to consider the social dimensions of human-plant relationships.

The development of agriculture is often viewed as one of the most significant sociotechnical developments in human history because it dramatically changed the way food was obtained and because it allowed greater differentiation and specialization (which could itself be discussed using this model) of people in social roles. Mithen (2007) argues that the "cognitively fluid mind" of humans contributed to an unexpected degree of social connection between humans, their crops and their tools:

> The minds of modern humans appear to be quite different: **ways of thinking and stores of knowledge about the social, natural and technical worlds flow unconstrained into each other**, enabling us to live within a world of metaphors and analogies. **This is a cognitively fluid mind which arises, I believe, from the evolution of compositional language and the role of inner speech.** It is one in which natural objects, plants and animals can become understood in social terms as members of one's kin, such as the polar bear by the Inuit (Saladin D'Angulure 1990). We see this in all traditional societies, whether in terms of specific understandings of particular animals or general attitudes to the natural world which are frequently – perhaps universally – imbued with a sense of will and purpose. (emphasis added)

Mithen also cites Nicholas Humphrey's *Consciousness Regained* (1984) in which Humphrey suggests that the connection farmers feel to their crops are based in sociality and not dissimilar to familial connections:

> The care which a gardener gives to his plants . . . is attuned to the plants' emerging properties . . . True, plants will not respond to ordinary social pressures (though men do talk to them), but the way in which they give to and receive from a gardener bears, I suggest, a close structural similarity to a simple social relationship.

As a result, the "fortunate misapplication of social intelligence" may have been integral to the development of agriculture as we knew it. This reframes the tendency to personify nonhumans as not only not a negative trait, but a potentially valuable one that promotes creative and prosocial ways of thinking and intra-acting.

Now that the depth of this sociable connection between humans and plants has been explained, vegeculture can be understood. I will begin with Barton and Denham's accounts of the social impact that plant propagation has had on cultures in the Global South, such as in parts of Africa and Southeast Asia, Australia, and Papua New Guinea (2016).

Vegeculture is defined as a type of plant cultivation that is contrasted with agriculture by the practice of propagating parts of the plant, rather than the seed, to grow a whole new plant. This practice connects the agency of the plant(s), rich diversity of human-influenced ecosystems, virtuous

technoscientific "cyborgness" of plant propagation, and sociopolitical dynamics both at the level of vegeculturists and of those who study or classify the activity.

Plants used in vegeculture are a distinct group from those commonly used in agriculture: while agriculture is usually considered from a Global Northern and Western perspective that focuses on annual cereal grains and legumes like wheat, barley, corn, and soybeans which grow in a temperate climate, vegeculture involves food plants found in the Global South, such as in parts of Africa and Southeast Asia like taro, banana, sorghum, and yam, which thrive in a tropical ecosystem. As observed by Barton and Denham:

> The biology of these plants – in particular the capacity for clonal reproduction and an ability to physically endure, seemingly indefinitely, as opposed to an annual that dies and must be reconstituted from seed – are material properties that have profound social implications for the Ankave and other groups across New Guinea.

These crops are easily propagated through transplanting of cuttings from the fully-grown plant, from areas like the stem, vines, or roots/tubers/rhizomes. This requires an intimate understanding of the plant's propagative agency that differs from seed-based cultivation, since the goal is to end up with two (or more) plants: the parent and the new plant(s). So removal of a part needs to be sufficient to generate a new individual while not being fatal or

detrimental to the original. Although from a biological perspective this method of propagation would be considered to be cloning – generation of a genetic duplicate through asexual reproduction – changes in phenotype (observed developmental traits of an organism) are evident in both the parent and child. New plants can eventually revert to a wild type trait pattern if it grows outside a cultivated area, indicating their potential to re-adapt to a nonhuman environment. Parent plants also can display changes over time:

> Long-term in situ management of these palms, successively cutting and encouraging new starch-bearing trunks, has created plants with heavily thickened bases, quite unlike the form these palms take in 'cultivated' stands (Barton and Denham 2016).

The distinction between "cultivated" and "wild" stands of these crops becomes blurred then, through the high malleability of the plants' characteristics, but also in the humans' participation as boundary-crossing agents who transport and spread these plants. This practice also has influenced, as argued by Barton and Denham, the cultural development of people in these regions who practice vegeculture:

> …amongst vegecultural traditions what it means to be human may have emerged from long-term relations with plants and their reproductive materiality, not from economic decisions about foraging choices.

This leads to the political and power dynamics arising both from the actual practice of vegeculture and from the epistemological distinction between vegeculture and agriculture by experts. Because many of the plants used in vegeculture are perennial plants that persist after a single season, they become heritable property for a community, rather than just a resource to consume at the end of a growing season, the way that annual grains and legumes have been used. This contributes to a closer link between humans and plants in these systems:

> In the highlands of Papua New Guinea, the Kawelka at Kuk are horticulturalists who articulate their kinship relationships with reference to vegetative propagation. The original people, or principal landowners, are 'ground-root-men' [mae pukl wua in Melpa] [Strathern, 1971; Ketan and Muke, 2001]; they are the people who 'hold onto the ground bone' (mae ombil amborom) [Strathern and Stewart, 1998: 87e88]. The root binds the people to the ground, like plants. New generations, lineages, and sub-clans emerge from the original clan 'root' through time, as stems, shoots, and cuttings emerge; like transplants, people are adopted by or married into other groups [Muke and Mangi, 2006: 42e62; John Muke, personal communication, 2007] (Barton and Denham 2016).

But the distinction between agriculture and vegeculture stem not just from a biological difference, but a power difference: growing crops from seed is associated with being "civilized" and is a way to exercise total power not only over the plants, but also over other growers through control of the seed supply. A look at controversies over genetically modified crops, where

seeds have become the battleground for property rights, shows the pivotal role that seeds play as the connection between successive generations of annual crops. Percy Schmeiser, a Canadian canola farmer, was sued by Monsanto for patent infringement when genetically modified plants were found in his fields of conventional canola. Schmeiser claimed that GM seeds had blown into his field from a truck carrying them but Monsanto claimed that he had attempted to replant seeds from crops grown from Monsanto's seeds. Many farmers, as a form of resistance against the control over seeds held by biotech companies, have saved and reused seeds, which is forbidden by the contracts they signed. Their argument is that seeds, by their nature, are meant to be replanted, and any agreement otherwise is contrary to their nature. This monopoly of power over plants is possible because seeds are easily transportable and storable, and genetic markers can easily be tested for to trace ownership.

By contrast, the propagation of plants through vegecultural means does not allow such a concentration of power and control. Eglash (forthcoming) describes the food crisis created by agricultural production in Venezuela during the early 2000s, and the contrast between agriculture and vegeculture in their solution:

> In contrast to the seed-based agriculture typical of the US, which requires enormous space, irrigation, and machines or mass labor force

> (slavery in the past and migrant exploitation today), African traditional food gardens were typically based on "vegeculture" in which one root is cut up and propagated into many plants.... Some evidence suggests that the prevalence of vegeculture in African American gardens of the American south was influenced by this tradition; the ties are even stronger in the case of the Caribbean.In 2004 the United Nations Food and Agricultural Organization worked with the Venezuelan government to bring urban gardening to its largest cities. Rather than import experts from Harvard and Cornell, it brought urban gardeners from Senegal and Cuba. This is not simply a "retention" of African tradition, but rather the ongoing innovation for generative technologies that combines indigenous practices from both Africa and the Americas with contemporary developments like an organic nutrient solution delivered to raised tray (7).

It is fortuitous that resistance to central, linear authority by means of decentralized propagation is described by Gilles Deleuze and Felix Guattari as a "rhizome" (2008), inspired by the rhizomatic propagation of plants like ginger (indeed the part we eat is in fact the delicious rhizome of the plant and can be found sprouting if left on the counter long enough). They describe their theoretical *rhizome* as having certain characteristics, including connection and heterogeneity, because there is no longer a singular, linear, downstream flow from orthodoxy, but many options along the entire heterodox network. This results in a radical and aggressive connectivity: "A rhizome ceaselessly establishes connections between semiotic chains, organizations of power, and circumstances relative to the arts, sciences, and social struggles" (Deleuze and Guattari 2008, 7). Because there is more than

one way to connect, there is also a shift towards multiplicity, as well as a robustness in recovering from ruptures: "A rhizome may be broken, shattered at a given spot, but it will start up again on one of its old lines, or on new lines" (Ibid, 9).

Whether in a theoretical conceptualization or in a material one, this type of vegetative propagation is powerful in its disruption of power: it is harder to trace the lineage of a child plant because so many of them are offshoots of a parent, there is no central control point as with seeds, and successful cultivation through this method favors an appreciation of the agency of the plants. This does not mean that vegeculture is immune to externally applied power. The hegemony of Northern agriculture in pushing "standard" cereal grains and legumes to countries in the Global South. Whether genetically modified or otherwise, corn, soybeans, and wheat are being adapted for growing in hotter climates as part of global agribusiness imperialism.

But this is not just a North-South issue. Historically, the Irish, displaced and oppressed by the English in the 19th century, became dependent on potatoes as a staple food until the Great Famine in 1845. Potatoes, unlike wheat, were easy to cultivate in the land they had access to, and did not require arduous toil to grow from seed, instead being reproduced

vegeculturally. Paired with milk and other dairy products, potatoes were a complete food source for the Irish, allowing their population to grow and a surplus of food to be exported at the same time. Yet, because of their disadvantaged status, the Irish were seen as lazy because of the ease with which potatoes could be grown compared to wheat. Similarly, while the distinction between agriculture and vegeculture has some biological backing, there is also a power dynamic when experts dismiss vegeculture as "not real agriculture" or a more primitive form of it.

As noted by Barton and Denham, "many are reluctant to define such practices as 'agricultural', preferring instead more neutral terms such as 'management' and sometimes 'cultivation'." However, at the same time, they argue that societies with an established cultural history of vegeculture are more resistant to the introduction of seed-based agriculture: "it is equally plausible that the social and material contexts of vegecultural practices created a resilience, or resistance, to the introduction of seed-based cultivation practices." So even as vegeculture can be downplayed as lesser than agriculture, it is because of the different material and discursive engagements with plants that power is not only diffused, but also disrupted.

6.4 Hanryu - the "Korean Wave" as Hybridized, Self-Parasiting Value

The so-called "Korean wave" of culture – *hanryu* or *hallyu* – has become a distinctive international phenomenon in recent decades that represents a novel third type of globalization, with "discourses that identify cultural hybridity and investigate power relations between periphery and centre from the perspective of postcolonial criticism" (Shim 2006). This surge of cultural exports from South Korea is embodied in the forms of K-pop (Korean pop music), *sageuk* - Korean drama (and comedy) television shows - and food culture. Wu Sok Cho contrasts the Korean wave with more focused international cultural phenomena like India's Bollywood (portmanteau of "Bombay" and "Hollywood"), or Nigeria's "Nollywood" movie and musical productions, or Japan's J-pop and anime by emphasizing that the Korean wave encompasses many aspects of culture, not just movies or music, but also food, and, more centrally, a shared history of resilience that is social, not genetic:

> Do the charms of Korean culture come from some superior cultural gene, as is often said here in Korea? If you were to take the wave as an ethnic virtue, you would veer into obsolete nationalism. I believe that the power of the Korean wave emanates from the pain, tension, and wounds inflicted upon modern Korea. Is there any other nation that went through as dramatic a change as Korea did in the past century? (Cho 2013)

Cho quotes historian Soo-young Park in the concordant sense of pride the country has for overcoming these challenges:

> Koreans have lived in an era of identity crisis over the past century. They could watch only their self- portrait worn out with colonialism, war, division of the nation, and dictatorship. Then, this depressive shadow began to be rolled up in the late 20th century. Getting out of this shadow and the feeling of being victimized, they can now finally talk about democracy, progress and modernization too. (in Cho 2013)

Because Korean has a long history of constant invasions and colonization, it is difficult to identify one genetic or geographic heritage as in other countries, so the legacy for Koreans lies in this shared struggle and the emancipatory possibilities that might come from international recognition. From this basis, there is more permeability to accepting and even embracing foreigners who seek to naturalize and immerse themselves in Korean culture, a point that will be explored further later.

6.4.1 "Gangnam Style" and "Bean-Paste Girls"

The song "Gangnam Style," by Psy, achieved worldwide fame and popularity through broadcasts on youtube and other social media, breaking records for view counts in 2012. Spawning countless imitations, tributes, and transformations, Psy's iconic "horse dance" and catchy lyrics are perpetuated through transmedial circuits: Psy has danced with morning news

hosts in New York City's Rockefeller Square, people of all ages post videos of themselves doing the horse dance, people sing along to the lyrics, shouting the impact words like "*yeoja*!" (woman) without knowing what they actually mean. Its popularity is even more surprising given that Psy looks nothing like "conventional" K-pop stars,with carefully chiseled looks deriving from a meticulous combination of makeup, fashionable clothes, and cosmetic surgery. In fact, Psy more closely resembles singers from *teuroteu* (Koreanized from "trot") music, also known as *ppongjjak*, a genre that grew during Japan's rule of Korea in the early 1900's, with middle-aged men in Western suits in tacky colors and styles. It is notable that Psy's atypical look is considered to be part of the reason for Japan's lack of enthusiasm for "Gangnam Style" compared to other K-pop music (Lie 2013). But this look is intentional, as Psy utilizes imagery that implies fake wealth, such as the opening scene, which depicts him lounging on a beach chair on what at first appears to be a luxury beach but turns out to be a playground.

A look at the lyrics reveals many culturally specific idioms and imagery that only make sense to someone familiar with Korean culture. Overall, the song is about the materialism and fancy self-image perpetuated in rich areas like Gangnam, a very rich district in Seoul, South Korea. As explained by Dana, a blogger for *Seoulbeats*, a Korean media culture blog,

parts of the song refer to girls who like to get coffee and guys who drink their boiling hot coffee in one gulp. While this does not seem unusual to Westerners, this refers specifically to fancy coffee from a prominent chain like Starbucks, where a single coffee could cost upwards of $6 (in equivalent currency) - definitely not something one would gulp down unless one were rich! To afford this, many young women cut corners in their spending – living at home with their parents and eating cheap food to save money for conspicuous capitalism. This phenomenon is referred to as *dwenjang-nyeo,* or "bean-paste girl": *dwenjang* is Korean miso paste (more heavily fermented than Japanese miso), used with tofu and vegetables to make a nutritious, comforting, but humble stew (*dwenjang jiggae*) that is one of the cheapest dishes one can get at a restaurant ($2-4 in USD worth).

> "Bean paste girl" has come to be associated with a variety of definitions, none of which can likely be declared official; a casual asking of three Korean friends yielded three completely different responses. However, what all definitions have in common is an emphasis on a noted preference for luxury goods and the finer things in life. The essential gist of the bean paste girl is that she is consumed with the thought of consuming, and her consumption trends tend towards the pricey, the designer, the imported, and the Western. She drapes herself in brand-name finery — and no, imitations do not count (perish the thought!). (Dana, 2012)

For someone familiar with Korean culture, this type of lifestyle is referenced in the song and serves as a critique of the superficiality of high Korea's

glamours conspicuous consumption. At the same time, Dana notes that "some valiant defenders of the bean paste stew girl will offer that she is something of a feminist icon, a girl who makes wise fiscal decisions and doesn't rely on the help of parents or boyfriends to purchase the fancy playthings she desires." So the trope of the *dwenjang-nyeo* is not merely a static symbol, but a nuanced, living conversation that is active in Korean culture; somewhat parallel to Angela Davis' contention that blues lyrics allowed a conversation about gender and sexuality for African Americans that ran counter to white middle class sensibilities.

Dana's original analysis was linked and referenced in *The Atlantic's* "Gangnam Style, Dissected: The Subversive Message Within South Korea's Music Video Sensation" (Fisher 2012), which became the primary source for other mainstream American online blogs, such as Gawker's "Someone Finally Explained That Insane Korean Rap Video 'Gangnam Style'" post. Although it did not reference these sources, an article in *The Guardian* by Arwa Mahdawi also examined the video, albeit more superficially – "Gangnam Style's lyrics may be in Korean, but its visuals are in clear American." – focusing more on the universality of its imagery in communicating opulent consumerism. Both *The Atlantic*'s and *The Guardian*'s articles were referenced in a blog post by Ben Norton titled, "1

Year Later, Bourgeoisie Still Don't Realize 'Gangnam Style' Is Anti-Bourgeois" that focused on the political activism and piercing satire of Psy in his wildly popular video.

This network of cross-references is an example of *media convergence*, as introduced by Henry Jenkins (2006), where a combination of top-down institutionalized media combines with bottom-up grassroots social media to propagate ideas with new potentials. In this process, actual authorship and intellectual-property ownership can become obscured, as with the analysis of *dwenjang* girls from Dana, but the idea still propagates throughout media venues, producing discursive value for South Korea in drawing outsiders into a popular idiom in their culture. Additionally, the propagation and explanation of this idiom raises awareness of Korean food as well, another point of pride for Koreans, who enthusiastically welcome foreigners to daytime talk shows like "Chit-chat with Beautiful Ladies" to share their love of Korean food and other aspects of culture in their adoptive country.

6.4.2 Sageuk as Hybridized Self-appropriation/Decolonialism

Similarly, *sageuk*, Korean dramas, have become popular around the world, with high viewerships not only in the United States, but also in growing economic powerhouses like India and Saudi Arabia. These media

productions reflect a wide array of topics and settings, from ancient Joseon-era historical retellings to modern-day stories about *chaebol* (family-run corporation) politics. Many popular shows involve hybridized settings though; time travel is commonly used to juxtapose historical and modern characters and settings, taking them out of place as a way to comment on or highlight important features.

Two shows – *Rooftop Prince* and *Faith: the Great Doctor* – involve a character traveling through time; in the former case, a prince from a time long past comes to the present, and in the latter, a modern day doctor goes back in time to the founding of Korea. Another popular show, *Sunkyunkwan Scandal*, is a Harry Potter-like school drama set in historical Joseon-era Korea, but is presented using modern camera techniques (like the fast-slow camerawork used in movies like *300* and *Sherlock Holmes*), character personalities, and tropes. Much like the song "Gangnam Style," these media productions are interesting and engaging for viewers even if they do not have much grounding in Korean culture and history. Instead, they invite viewers to celebrate Korean culture with the displaced characters – to share in the awe of an ancient prince who looks out over nighttime modern Seoul for the first time, or to reflect on the hyper-modern cosmetic surgery

industry in modern Korea simultaneously with highly effective practices in ancient acupuncture and herbalism from times past.

At the same time, many of these shows incorporate modern social dilemmas around gender, social class, and family obligation. *Sunkyunkwan Scandal* is set in the late 1700s in Joseon-era Korea and features a young woman, Kim Yoon-hee, who passes as man to enter Sunkyunkwan, the first and most prestigious university in Korea, to become a government official. At the time, it was forbidden not only for women to attend school, but for them to learn to read and write, reflecting the strongly Confucian ethics of Korean society - that women and men are distinct genders with complementary social roles that must be maintained - a social norm that permeates the culture even today. Yoon-hee enters Sunkyunkwan not for personal gain, however, but to provide for her family, her mother and sickly younger brother, demonstrating a commitment to cultural values of familial loyalty.

Shows set in the modern era often engage with questions about inheritance of a family corporation (*Chaebol*) or even dating outside social norms. It is conventional in Korea and many other Asian countries for women to try to marry before their late 20s, with 28 being seen as old; China's concept of "leftover women" is also present in Korea. To return for

a moment to "Gangnam Style," one word that appears frequently is *oppa*, which literally means "older brother" (of a girl[6]) but also is used by a woman to refer to her boyfriend, constructing their relationship as one of an older male mentor with a younger female protegé. Thus, it is expected for women to "marry up" to a man with greater status and age. However, there has recently been a shortage of such eligible men for women to marry, partly because women as a demographic have pursued more and longer schooling and have established successful professional careers in esteemed sectors like law, business, and medicine, exceeding the qualifications of men of appropriate age.

As a result of these disruptive enactments, many of these women are "dating down" – pursuing relationships with men who are younger and/or less professionally established. This type of relationship has been seen as taboo, but is seen as necessary by many to attempt to counter South Korea's falling birthrate. As media both reflects and shapes society and culture, so too have *sageuk* engaged with this issue. Series like *My Lovely Samsoon* (present such "older woman-younger man" romances and help viewers to process this uncomfortable topic, where a Bridget Jones-like woman who is

[6] Korean words for family relationships are strongly relative, relying on the speaker's identity as much as the referent: for example, a girl would call her older sister *eunni* while a boy would call his older sister *noona*. A girl calls her older brother *oppa* while a boy calls his older brother *hyeong*.

a gifted pastry chef faces pressure to "find a man before it's too late," and finds herself in a growing relationship with a young man who is a reluctant heir to the family company.

While these subjects are interesting to Western viewers, they have strong impacts on viewers in Eastern countries, especially those with growing economies in high-earning professions like science, technology, and business, and that struggle with gender disparity and social norms emphasizing communitarian and family obligation. Countries like Saudi Arabia and India are becoming global centers of commerce while also struggling socially with challenges to rigid gender hierarchies, and Korean media have found warm receptions among their populations because of these compatibilities. This represents one of the largest intercultural, transmedial conversations between significant world powers that has not involved the West, and heralds a change in power in cultural discourses.

But Westerners are not excluded from the Korean Wave. As mentioned earlier, South Korea's identity rests not on heritable genetic purity, but instead in shared cultural and historical experience. Once again, *sageuk* serve as a vehicle for assimilating and normalizing non-native Koreans into visible popular culture by including acting roles for them. For example, historical dramas may including "Portuguese" explorers or traders,

played by an actor who looks "white enough" – an interesting reversal of the "generic Asian" casting that is common in the United States. Modern settings might present a scene where international business colleagues meet and speak a few lines of English or Korean together as a greeting; perfect language skills are not required, so the Westerner could manage with a simple Korean greeting, or the Korean actor could speak in heavily accented English to demonstrate their worldliness. While somewhat appropriating of the foreign actors, these roles importantly become methods of inclusion for people at any skill level and introduce a somewhat realistic heterogeneity to Korean media, making such faces more visible and "normal" to viewers as they nonthreateningly display their assimilation into Korea's international landscape. Many of the nonnative actors in these roles became celebrities through the aforementioned talk show circuit and so their casting on popular shows are viewed with great anticipation.

Michel Serres' concept of the parasite (2007) is useful here in two ways, first in the conventional sense of something gaining value from another in an exploitative way, but second in a literal sense of para-site: other-site through displacement temporally and spatially - both for characters in the shows and for the media itself as it is shared around the world, subtitled by fans into different languages, and sometimes discovered

years later by new fans. Unusual in the discussions about cultural appropriation, Korea "parasitizes" its own culture, offering it as a payload delivered by their exported media as part of the new cultural hegemony called *hanryu*. Yet Korea's media exports are welcomed by countries with similar cultural values emphasizing family and community obligations; Arabic and South Asian countries share these values with East Asian cultures and find resonance with stories focusing on these types of issues. They share a conversation that the West is not even a part of.

6.4.3 Asian Americans and Rap

To make this more comprehensible for American audiences, let me shift to Asian Americans. The usual stereotype is the model minority: wealthy, college educated, and politically silent. But wealth inequality is just as severe in the Asian American population as anywhere else. The average is high but that is actually a small elite. Ramakrishnan and Ahmad (2013) found that half of the wealth goes to the top 20%: the bottom 40% share only 13% of the wealth. Current estimates by the federal Initiative on Asian Americans and Pacific Islanders show 12.6% of Asian Americans living in poverty (compared to 9% for non-Hispanic whites). The poverty rates for

subgroups with some relation to Vietnam war geopolitics is especially high: Hmong: 37.8%; Cambodian: 29.3%; Laotian: 18.5%; Vietnamese: 16.6%.

Thus the emergence of Asian American hip-hop, in particular South Asian, "was conceived in resistance to oppression and mobilized a brown liberation movement" (Sreenivasan 2008). Some scholars see this adoption of a black music genre as simply the result of an experience that mirrors black low-income, urban experience (Wang 2015; 2013). The parallels sit uncomfortably, however, with black critics complaining of cultural appropriation (Farrow 2004). As a result, Asian rappers have developed a wide range of hybrid positions (Bernier 2014). Far East Movement, for example, have created ties to high-end marketing (appearing on the soundtrack for *Tokyo Drift* and other mainstream movies), and regularly tour Korea and China, but also keep local connections in Los Angeles through benefit concerts for inner city drug rehab. Queens rapper Awkwafina, of Chinese-Korean heritage, has combined rap's traditional sarcasm and violation of middle class norms with human rights issues in racism and sexuality. MC Geologic, a Filipino-American activist, teamed up with DJ Sabzi (Iranian-American) and Filipino hip-hop artist Kiwi to create the Stop the Killings Tour, which brought international attention to the human rights violations and extra-judicial deaths in the Philippines. For activist Asian

American musicians, the hybridity offered by international connections such as the Korean Wave offers new channels for the circulation of unalienated value.

6.5 Conclusion

Generative Justice, as originally conceived, included rigid categories for value as well as assumptions about the preference for localism and self-sustainability. As we have seen in the above cases, that analysis can be greatly improved by removing those restrictions and recognizing that not all hybrids are equal in their potential to support generative circulation.

In the case of the international circulation of Asian cultural forms, the liberating potential is not found in hyper-local adaptation--Asian Americans merely imitating or adoption Black musical idioms--but rather in global circulations where justice issues and youth culture create new hybrids. Despite its widespread acceptance around the world, "Gangnam Style" remains a subversive commentary on the materialism in South Korean culture while also gaining traction as a vehicle of cultural assimilation through convergent social media. Korean dramas have found enthusiastic audiences in growing countries that have more in common on a cultural value level with East Asian culture, and together they explore changing

norms like those concerning gender roles while celebrating a prominent world culture that is based not on a genetic heritage, but on a shared history of perseverance.

Other cases we have examined offer new future directions as well. Vegeculture, not agriculture, is better positioned to allow rhizomatic distributions of productive power, but because of the institutional creep that prizes agriculture as more sophisticated, it faces an uphill battle in being recognized not just as a means of food production, but of cultural enrichment. Rather than a strict binary of local vs global, certain hybrid forms of glocalism, such as Odumosu's Nigerian cell phone appropriations, can advance the democratization of technology without paternalistic restrictions on purified local forms of manufacture. Generative hybridity should be regarded as an analytic tool for not only engaging disruptive enactments after they occur, but piloting their future course as well.

7. CONCLUSION

This dissertation has explored the concept of Disruptive Enactments through five dimensions of change: agency, diversity, cyborg virtue ethics, institutions, and hybrid generative value. Each of these dimensions has been expanded into a diffractive (Haraway 1997) layered conceptualization that better encompasses the social, technoscientific, material, discursive, and human-nonhuman dynamics that intertwine in both obvious and obscured ways. Each dimension also builds on the previous ones, roughly from individual to structural scales, to incorporate important elements from each level. Lastly, change in all of these has consisted of a disruption of an old way of doing something, followed by a new enactment, perhaps not new on all levels, but new in some significant way that relied on changes in the social, technological, epistemological, or relational landscape.

7.1 Agenticide and Agentogenesis

The first dimension of agency examines how agency is generated (agentogenesis) or diminished (agenticide) on three different levels: discursive, performative, and material. Although these do not exist in a traditional hierarchy, it is useful to consider appropriate or relevant levels of agency based on the capacities of the entity: material agency is something

that is shared from inanimate objects through nonhuman life to human life by virtue of having physicality and material interactions as well as an existence, such as the agential materials in Pickering's Mangle; performative agency manifests as behavior, as with bees collecting candy syrup because it is sweet, to practices of expertise that require knowledge and training, such as cheesemaking through a post-Pasteurian microbiopolitics, as described by Paxon; discursive agency is relevant when the ways that ideas are communicated affect the epistemological existence of something, or our ability to recognize that an entity is relevant to a concern, such as Kleinman and Suryanarayanan point out with the institutionalized blindness to bees as something other than "pest" insects and scientists resultant inability to accurately measure effects of pesticides beyond "killing" or "not killing." By recognizing the actors on stage and how they can be involved, their relationships with each other - their types of rich diversity - can be discerned.

7.2 Rich Diversity

The concepts of agenticide and agentogenesis paired with the tri-level material/performative/discursive framing allows for a discussion of agency that not only recognizes difference, but embraces diversity. Diversity is the

way that difference is negotiated and put into context among many entities that are not identical. It is important to recognize that how we conceptualize difference is heavily influenced by historical perspectives based in medicine and science - that difference and violence or hostility are linked, or that antagonism rather than agonism is the default expectation in situations where there is difference are socially determined, not a natural fact. Deborah Gordon's challenge to the ant "supercolony" idea is both an example of feminist science critiques of masculinist science that assumes violence is the default mode of interaction and a challenge to the reasoning process that has been used in science to measure similarity - through a lack of violence. By showing that diversity affects us at all levels - from the McDonald's humans inadvertently share with ants to the ways that individuals identify "self" or similar individuals (through scent, for ants, based on their diets) - Gordon shows the importance of convergent homogeneity, where behavior can override genetics.

The challenge presented by Romañach and Lobato, as well as by Patston to reconceptualize disability as "functional diversity" upends the assumption of a "normal" human functionality and instead forces us to start from a place where nothing is a given, but every difference is part of the larger human diversity of agency. Additionally, as shown in the example of

NTID/RIT students, it is as much the social environment and context that generates an understanding of disability as the physical configuration of a person; this reveals the design and structure decisions made to create a human environment as assuming functionality of participants, but that this too can be disrupted and re-enacted as a richly diverse environment that de-normalizes hearing.

This leads us to see the need for distinguishing between epistemological - what we know - and ontological - what is there - diversity: there are differences that we may perceive or recognize that are not actually relevant, and there may be differences that we cannot perceive that do have an impact on the diversity of a system. The challenge is to help those to align so that rich diversity - diversity that is both recognized and relevant - can be encouraged. New research in intestinal microbes, enabled by technologies that better allow scientists to perceive microbes that couldn't be cultured in laboratories, helps us to have an improved understanding of the many varieties of microbes involved, calling into question the value of industrially produced supplements that have limited diversity and functionality.

7.3 Cyborg Virtue Ethic

With these concepts of agency and diversity, it becomes necessary to identify courses of action, policy, or discussion that can promote agentogenesis and rich diversity. However, it is easy to get tripped up by assumptions about technology, especially "low-tech vs high-tech" or "soft tech vs hard tech" dichotomies that can make approaches with more institutionally designed and developed technologies, or more material technologies seem more sophisticated than less developed or hierarchy-laden technologies and coordinated social practices that constitute "soft technologies." On the other hand, some people, as a way to push back against imbalanced power structures, favor "natural" approaches and reject more developed technologies or artificial materials. Both of these perspectives are flawed, relying on essentialist traits rather than actual effects and iterative cultivation of virtue in the form of agentogenesis, rich diversity, and better relational connections with others.

There are two main arguments that the Cyborg Virtue Ethic, drawing from Donna Haraway's and Andy Clark's complementary conceptualizations of the cyborg, makes: 1) Low-tech and soft-tech are not necessarily less effective or virtuous and 2) Unnatural is not essentially bad, and natural is not essentially good. When training surgeons in laparoscopic

techniques, it is important for them to develop skills through haptic simulations that let them physically feel the material they are cutting into and stitching up; this makes them into better surgeons when they can feel what they are working with. Using Clementine oranges not only increases the number of surgeons who can be trained at the same time, since they do not need to wait a turn on the expensive simulator, but increases the understanding of what makes a good surgeon - the ability to make quick clinical decisions about whether a piece of tissue/tumor (in the case of oranges, pith) can be effectively removed or not. Thus the use of this low-tech training tool improved the understanding of a virtuous surgeon even as it enabled them to receive training, all without excluding or preempting use of the high-tech simulator when appropriate. To explore the tensions about "natural" and "unnatural," the Flow Hive technology was examined through the lens of online discourses about its value or threat to beekeeping. Many proponents valued its "high-tech" appeal while also seeking to disrupt the expertise of established beekeepers, and opponents expressed concern about disruption of the bee's natural wax surroundings and the enticement of inexperienced and misinformed new beekeepers. But there were also people like Rusty Burlew who promoted an Ethic of Care that focused on the relationship between the bees and the beekeeper with little preference for the

type of technology used, so long as it was used in the interests of improving that relationship by enabling beekeepers to fulfill their responsibilities to their bees. Even social media was shown to potentially have a positive effect when used virtuously: Jim of Vino Farms facilitated an open discourse with his viewers by sharing his learning experiences as a new beekeeper, responding to questions and feedback and incorporating suggestions from experienced beekeepers. His Youtube channel promoted discursive agentogenesis by supporting rich diversity among participants, avoiding the "online brigade" and "echo chamber" pitfalls of other discussion forums that speculated on the Flow Hive before it was released. This series of exchanges contributed to his embrace of a similar care ethic to Burlew's and was revealed when he decided not to use the Flow frames to collect honey, but instead chose to help his bees to build up their stores to help them survive the winter because "I'm in this for the bees, not the honey." Although he has much to learn to approach the level of experience of Burlew, his appreciation of the care ethic and embrace of many technologies - online videos, the Flow Hive, beekeeper expertise - demonstrates a Cyborg Virtue Ethic of his own.

7.4 Institutional Creep and Percolation

Institutions are significant entities in social change (and stasis), but relying on only one interpretation of their arrangement and behavior restricts analysis to only a partial perspective (Haraway 1988). Using Dempster's concept of *sympoiesis* as contrasted to *autopoiesis*, I identify two simultaneously active framings of institutions as porous and redefinable from extra-institutional sources and as power-wielding agents of assimilation in their surrounding environments. The former is *institutional percolation* and the latter is *institutional creep*.

Change can happen within an institution if enough pressure originating from the outside - whether in the form of discursive, performative, or material agency - works its way inwards in a form that is compatible with the organizational structure of the institution. This change is not always visible in a way that is temporally aligned with the infusion of change; not only does it take time but the pressures from different sources must together reach a sufficient threshold for the breakthrough, much as a coffee percolator does not drop brewed coffee immediately when you turn it on or when water flows into the grounds. New data must be presented in a way that is compatible with the interests of the institution and actions must be proposed that are within its scope. The example of acupuncture being

adopted as a covered treatment by many medical insurance providers shows how more refined scientific studies generated enough compelling data to overcome skepticism while at the same time, concerns about the overprescription of and addiction to opioid painkillers have driven a need for alternative treatments for pain relief. To make change happen effectively through percolation, an awareness of the larger societal context must be included in efforts that recognize different capabilities of involved agents, opportunities for solutions to arise from richly diversifying the pool of participants and solutions while evaluating options based not on what kind of technology they involve, but on effects that promote greater virtue over time.

Institutional creep, meanwhile, calls attention to the environment-changing and value-assimilating effects that can occur as institutions establish themselves beyond one field or policy area. The creep of Pasteurian ideologies that promoted sterility over microbial balance began in medicine but expanded into food safety as well, as described by Paxson's microbiopolitics. On the one hand, foods like raw milk have been categorized as hazardous, with pasteurized milk becoming "normal," and on the other, our centralized industrial food production is epistemically blind to the cross-contamination that happens in many foods like hummus and

spinach. When a concern about food contamination is raised, the solution is usually an agenticidal technology, like irradiation, rather than an inquiry into the sourcing of the food, an anti-cyborg view that prioritizes a high-tech, absolutist solution over one that improves soft technologies like training of food production workers and decentralization of food collection and processing. Institutional creep is not inevitable, however, as shown by the public outcry against the FDA's proposal to ban wooden cheese aging boards. As with institutional percolation, successful opposition to the creep came not from one source - political or otherwise. It was a rich diversity of perspectives, including anti-government organizations and artisanal cheesemakers, that spearheaded the resistance. These perspectives were paired with a virtuous cyborg science that was able to recognize the value of a rich diversity of microbes in not only making tastier cheese, but in promoting safer cheese, as well as appreciating the material agency of the cheese aging boards that, because of their porosity, not despite it, offered a safe haven for beneficial microbes like *Lactobacillus* and *Bifidus* that extended our own performative agency to exclude harmful *Listeria*, the target pathogen of the FDA. It was because of the cyborg virtue ethic that allowed us to see that in this case, it was not because wooden boards are "natural" that they are good, but because they promote a more virtuous

relationship between cheesemakers, microbes, and milk-cheese substances that they are preferable to plastic; that said, there must also be an infusion of good practices of food handling, beneficial microbe-human interactions, and haptic science practices to monitor conditions to maintain them in healthful ways. In this way, institutional creep, much like percolation, can not only be understood, but also be steered in ways that liberate and challenge power regimes.

7.5 Hybrid Generative Value

Another running theme in previous chapters has been the production of value, whether expressive, ecological, labor, or otherwise. Beginning with the framework of Generative Justice, developed Ron Eglash and others, I explored how the categories of different types of value are not always distinct, and to deny overlap or hybridity can miss important generations of value or innovations of processes. To help expand on this embrace of sympoietic hybridity, I drew from Schumacher's emphasis on a rich diversity of scale, that we need a mix of small- and large-scale enterprises, along with everything in-between, paired with appropriate technologies to enact value generation. Focusing only on localization of value generation, as Eglash has, similarly can cause tunnel-vision and mistake local

production as an ends, rather than a means. The new term "glocalization" disrupts this division brings nuance to current developments in international enterprises by challenging the public-private and corporate-public binaries. It also allows for the epistemological diversity of a foreign business setting up a mutually beneficial endeavor that respects and promotes local cultural agency while also generating value through a cyborg virtue ethic. By contrast, "grobalization" recognizes the opposite - a company that prioritizes its own profits at the expense of local culture. This de-essentializes the "local-global" dichotomy much as Cyborg Virtue Ethics disrupts the "high-tech/low-tech" binary, forcing us to actually consider the effects, rather than essential characteristics.

Vegeculture represents a disruptive form of plant-food cultivation that challenges the preeminence of agriculture from the soil up. Materially, different plant types are involved, such as bananas, taro, and yam, which grow better when propagated through cuttings of the adult plant - stems, tubers, rhizomes - rather than from seed, which defines agriculture. Besides representing a different diet that is indigenous to many societies in the Global South, this form of cultivation is viewed as "less sophisticated" than agriculture by experts and uses food plants that are not considered profitable enough to be engineered by biotech corporations like Monsanto. At the

same time, these plants challenge institutionalized ideologies about evolution of plants across generations, since plants can adapt to their environment in ways beyond the genetic - through phenotypic and epigenetic change. Lastly, the relationship between the plants and humans who cultivate them develops into a rich cultural legacy, as parent plants are often inherited or perpetuated as part of a family's collective value or as part of the community's land value because they are perennial, unlike most cereal crops in the Global North.

The Korean wave, known as *hanryu*, shows the power of hybridization of cultures on a global scale. As a nation that draws identity not from genetics, but from a shared historical heritage, South Korea is able to aggressively market its culture in appealing ways to other countries, whether in the form of the subversive "Gangnam Style" or *sageuk*, Korean dramas. In order to fully appreciate these media productions, one must learn more about Korean culture. This process is facilitated by Jenkins' convergence culture, which integrates many forms of social media communications and decentralizes discussions across a rich diversity of platforms like blogs, discussion forums, news articles, and videos. As fans seek to learn more about the shows and music they like, they are drawn into deeper discussions about Korea's history and social values. Meanwhile,

foreigners are actively welcomed when they come to Korea, being praised for assimilating into the culture and being given visibility through their media as part of a glocalizing social message. These cultural outreach efforts have attracted the attention of countries that are growing in prominence on the global stage, including Saudi Arabia and India, where shared communal values and prioritization of familial duty resonate strongly without interference or hegemony from the West.

Framing value generation through this hybridized model that integrates the prior four dimensions - agency, diversity, cyborg virtue ethics, and institutions - produces a richer, more useful analysis that invites further interdisciplinary collaboration while also enabling more focused discussion on specific aspects of change.

7.6 The Future of Change

It has been my goal in this writing to provoke more useful ways to integrate interdisciplinary and multidisciplinary analysis across topics areas. While the case studies may appear disparate on first look, the commonalities they share - changing agencies, epistemological and ontological measures of diversity, ethical questions about cyborg technologies and appeals to nature, institutions as both generators and subjects of change, and hybridized value

creation - can be found in all complex issues today. While postmodernism, poststructuralism, and other moves to challenge entrenched authority and power have done much to protest and shake up traditional ways of researching, communicating, and acting within society, we have been left with few examples of positive approaches to untangling the knot of questions we now must answer. How do we know what we do not know so that we can investigate it more? How do we include all relevant stakeholders in discussions while also maintaining a productive trajectory towards social and political action? How can we understand people who have an entirely different valuation system than ours? How can we disrupt power while also controlling the direction of change with foresight and nuance? By recognizing that change does not end with a revolution, but is only in its infancy, we have better opportunities to enact improvements after disrupting oppression.

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