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Strategies Against Progress: New Materialist Models to Resist Obsolescence in Technological Sound Practices.

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by

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ABSTRACT OF THE DISSERTATION

Strategies Against Progress: New Materialist Models to Resist Obsolescence in Technological Sound Practices

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Electronic sound artists and musicians, in their choice of the tools of their craft, have a close, working relationship with a specific form of mass-produced commodity, that of technological audio devices. Like other manufactured goods, they originate from a global production system that is historically exploitative, and environmentally

unsustainable. The nature of electronic and digital technology, however, warrants an additional layer of scrutiny: they are beholden to the expectations of continuous technological improvement and obsolescence. Unlike musicians who perform on a finite number of cherished instruments that are used for decades, electronic musicians' tools are very often subject to the whims and relentless change associated with technologically-driven economic forces. Computer musicians especially, must consistently adapt to and purchase new software and hardware to avoid losing critical functionality and compatibility. The digital musician's position in this process opens questions of principle, regarding the ethical defensibility of self-expressive acts relative to the net negative effect caused by their contribution to technological production methods that promote suffering and global destruction.

To counter these continuing tendencies, I offer a reading of new materialist theory with an eye toward how it may be specifically applied to electronic and digital musicians. New materialism projects a monistic perception of the world, in which the differentiation between humans, non-humans, and objects is called into question. Additionally, matter is seen, not as inert, but as being comprised of action, capable of effecting change in the physical world. This dissolution of boundaries is further extended to broader global systems of culture, capital and

polity, connecting the very small to the very large. In this way, the ethical consequences of larger systems of influence become intrinsic to physical objects.

Applied to technological audio devices, porous boundaries allow a vision of audio technology that is inclusive of all the bodies with which it has come in contact, and urges a limited sense of anthropomorphic identification with its users. This sense of interaction is extended into the realm of audio feedback, in which all audio processors, regardless of their intended functionality, contribute to a common sonic end. Seen in this way, sound technology that was once subject to the whims of constant development, becomes imbued with a personal sense of vitality, making it more difficult to be perceived as a disposable and obsolete.

Introduction

In John O'Keefe's 1996 play *The Deatherians*, the character of Dr. Kratur, a euthanasiast, expounds on the story of Odysseus and the lotus eaters:

> There is this man walking around. He sees this object sticking out of the sand. It fascinates him. He finally realizes what it is… it's the mast of a ship. He suddenly remembers - he came here on a ship. That he is Odysseus. (O'Keefe 199)

O'keefe's take on Homer's tale portrays Odysseus in a markedly different fashion than Homer himself. Instead of the intrepid warrior who casually pulls his crew away from the intoxicating plants, he is positioned as succumbing to them as well. In this state, Odysseus walks aimlessly around the beach for years until he is overcome with fascination at an unknown and uncanny object. Eventually, his encounter with this object compels him to confront his own identity. He slowly remembers

how a ship is constructed and what it does. Gathering his crew, they eventually repair their vessel and leave the island. Contrary to the heroic power commonly associated with the character, Odysseus is instead seen as without the ability to help himself directly. What eventually conveys this capacity is the unexpected and captivating moment of fascination when stumbling upon the forgotten mast of his former ship. This moment of captivation is also one of realization that he and his crew share their fate with this broken object.

Moments like Odysseus' encounter, in which seemingly ordinary objects are suffused with a deep sense of allure, is described by posthumanist theorist Jane Bennett as being instances of 'enchantment.' Within modernity, she argues, the sense of the material world being imbued with a kind of spirited agency, akin to our own, has been forgotten. Instead, the present moment tends toward a view of humanity that, for better or worse, has propelled itself out of a primitive primordial state into a place set apart from the exterior 'natural' world. Feelings of affectation or mystique toward objects became 'disenchanted,' and replaced by scientific and technical mastery (Bennet 59). Bennett contends that enchanted encounters with objects can promote an identification of self and others as being intrinsically connected with objects, binding our fate to theirs; as when Odysseus

identifies himself, his crew, and their future as being connected with that of the ship.

This type of personal engagement with objects has the potential to change our interpretation and relationship with ourselves and the world, by allowing for additional types of interactions with objects. For electronic musicians and sound artists, the relationships in question involve technological objects like computers, mixers, and interfaces. These devices are typically utilized for their sonic and functional properties, often requiring replacement and upgrading to keep pace with model changes, and retain software and hardware compatibility. As such, they are fundamentally different from Odysseus' ship. Barring future damage, once John O'Keefe's Odysseus and his crew had repaired the ship, it was the end of a very localized process. The ship was finished and would remain unchanged, furnishing the needs of the crew indefinitely. Technological audio objects however, are intrinsically linked to larger systems of economic production that extend far beyond the individual artist. As such, they are beholden to the same mechanisms that drive demand and profit as any other commodity, and require a constant influx of newer, presumably better products to replace the older, presumably inferior ones. This cycle of continuous obsolescence and manufacture brings ethical questions to bear on the work of digital artists and musicians. To wit, how can an electronic

musician or sound artist justify their creative output, considering its potential contribution to the devastating effects on ecosystems and laborers inherent in technological production?

In my experience, reasonable responses seem fall into two broad extremes that either completely own up to the responsibility connected with technological objects and cease producing work, or point to the overwhelming enormity of the systems at play and effectively abdicate responsibility. The difficulty for technological artists in gaining a point of entry into this situation is where new materialist ideas, like Jane Bennett's enchantment, have a particularly promising potential to enable an effective practical response to confronting the ethics tied to technological obsolescence. By becoming open to a sense of wonder and affect relating to technological equipment, artists can further a sense of personal attachment to articles of technology, making them more difficult to consider as disposable and obsolete.

This document presents historical and ideological aspects of obsolescence as a specific property of late capitalist technological production that affects digital musicians. It further offers philosophical frameworks intended to promote paradigmatic changes in digital and electronic musicians that may result in actions relative to their creative equipment that can push against the force of obsolescence.

The first two chapters offer a deeper understanding of the history and context of obsolescence within technological production. Chapter one, offers an exploration of telos and progress: the historical ideologies that underpin the development of obsolescence as a practice. The conception of telos as an end cause is an ancient one, and this chapter traces its origins in the West, from Greek antiquity through its syncretizing with Christian theology after 1200 CE. The permutation of this syncretic cosmology is outlined, leading into its influence as a factor in the Scientific Revolution and Enlightenment, where teleological conceptions begin to separate from theological sources, resulting in a more secular faith in human-directed progress. From there, the guiding belief in purposeful end causes is shown as reacting to 20th century man-made atrocities by retracting further into cycles of scientific and industrial production, but now divorced from the responsibility of social betterment. A more detailed explication of obsolescence and its connection with the exploitation and environmental degradation of technological production, is outlined in chapter two. This chapter shows how, from the early twentieth century and the rise of urbanization and mass-produced commodities, industry began actively producing inexpensive, disposable products to cater to the needs of a newly urban workforce. Simultaneously, campaigns were enacted against the popular idea of thrift as a virtue. Instead, an ever-changing sense of

fashionably was positioned as paramount over the more cautious frugality. The descent of the great depression saw the rise of planned obsolescence: deliberately short-lived products seen as a means to impel consumption and spur the economy. Variants of these instantiations of obsolescence continued throughout the twentieth century into the twenty-first, including disposable electronic devices, all of which contributed to the exploitation and increased waste associated with capitalist production.

Although public and private resistance to obsolescence has been present form its inception, with exception of elite boutique vintage items, the electronic music production community, tends toward acquiescence to the requirement to constantly consume new and faster computational and sonic devices. The exhortation to 'reduce, reuse, recycle' becomes exceedingly difficult to find any meaningful traction, and fails to fully acknowledge the contribution that technical audio consumption makes to global devastation and abusive labor practices. To have a genuine effect on consumption, paradigmatic change is necessary. I offer the posthumanist philosophy of Karan Barad, Rosi Braidotti, and Jane Bennett as having the potential to provide an effective ethos that is applicable to digital artists and musicians. In chapter 3, I provide an explication of how aspects of these three authors' perspectives on new materialist theory actively

break down the understanding of boundaries between humans and non-humans, providing a view of the material world that positions the actions and consequences of humans and objects as part of the same comprehensive material. This immanent cosmology is extended outwardly to include complex meta-systems as well.

Chapter four expands on this foundation and further applies them to technologically produced objects. Special attention is given to Jane Bennett's conceit of enchantment, which encourages a type tactful limited anthropomorphism toward objects, widening the potential for human beings to view them as ontologically partially human, and project a type of kinship with them.

This is connected to the specific histories and consequences of particular components within a piece of 'obsolete' audio technology in chapter five: a single low-quality effects processor is dismantled and traced to environmental and health consequences related to its manufacture. Aspects of new materialist theory are applied to gain a sense of distinct connection to the effects of its production, while providing a discourse to enable new modes of expressive purpose, contrary to its design.

These actions are further projected in chapter six, which provides an ethnographic exposition of various sonic artists, whose relationships with their devices exhibit permutations of specific aspects found in new

materialist philosophy. Through their accounting for the agency of technological objects within a discourse of sound performance, recording and installation, we can receive a clearer perception of how new materialist ideas are already being taken into account by some technological artists.

Chapter 1: Progress and Telos

The idea of progress can be understood as the perception of history to be a pattern of improvement that is cumulative and irreversible; a method of thought that consistently looks forward to an ever-receding end in perfection (Lasch 229). Although the notion is, with good reason associated with modernity, the bedrock cosmology that activates progressive ideation is actually quite ancient, and stems in a large part from the Greek conception of the telos, or end cause. The following is an account of the connections of this idea from its ancient roots to the mindset of the present day. Although presented in chronological fashion, it should not be understood that temporality assumes causality. Additionally, the discourse surrounding these developments are extremely complex and, although I will be highlighting specific aspects relevant to the expansion of the progressive telos, it should not be assumed that any conceptual

tendency under examination was exclusive to any specific cultural discourse.

Broadly, telos can be translated directly from the Greek as an end cause, or a goal that is associated with purposefulness of either natural or divine origin. Ultimate historical provenances of ancient epistemologies tend to be difficult if not impossible to pin down. There is however, evidence of telos as a mode of thought beginning to appear in Greece around the 8th century BCE. Many scholars advance that repetitive circular, rather than linear teleological conceptions of time were more dominant during this era. Others, like Robert Nisbet, paint a more complex picture of temporal ideation in the ancient West. Nisbet points to a number modes of conceiving time existing simultaneously at this moment, and that circular conceptions of time existed alongside variations of teleological views. Nisbet presents these mixed frameworks as persisting from the ancient Greeks to the Roman empire and beyond, but locates the earliest documented expression of teleological belief in the Greek world with the works of the poet Hesiod (Nisbet 10).

Hesiod's texts *Theogony* and *Works and Days* provide two views on the development of the perception of time as being associated with continuous, purposeful change: his conception of the 'ages of man' and the myth of Prometheus. In *Works and Days*, Hesiod describes humanity as descendent from previous contiguous states of being. The

exact phraseology is often translated as 'ages', but Nisbet cautions that the translation is closer to 'races of man' and that this is how they should be understood. Hesiod lays out five of these races temporally: golden, silver, bronze, a race of hero-men, and iron. The golden race for Hesiod was pure and blissful, but ignorant of the nature of the world. Because of this they did not survive. The subsequent silver and bronze races were brutal and warlike, and were killed off by divine will and self-annihilation, respectively. The next race of hero-men, were similarly fond of martial concerns, but also had a strong sense of justice. Due to this latter quality, they were gifted by the gods with an afterlife for when they, too eventually killed each other off. The race of iron beings Hesiod identifies as contemporaneous with his own era, and portrays them as having a tendency to be unjust and cruel, but also having the ability of self-betterment through arduous labor and self-restraint (Nisbet 14).

The image of humanity that Hesiod paints is often considered as a pessimistic teleology, or an understanding of incremental change over time as being increasingly worse, descending from a state of perfection to a telos of ultimate destruction. One can make the claim that Hesiod held such a pessimistic view, which was reflected in his portrayal of the subsequent decline of the ages from a rare and precious 'golden' state to an 'iron' state of presumably lesser worth. Nisbet claims this pessimistic view of Hesiod is misnomer, however. He

points up traits of positive teleology in Hesiod in that, although the names of the ages reflect metals of lessening monetary value, the *actions* of the subsequent ages or races seems to improve over time. Hesiod culminates his teleology with a view of his contemporary environment as fundamentally flawed, but still containing the capacity for self-repair and an improved future (Nisbet 13).

Thus, Hesiod can be viewed as demonstrating elements of cyclical temporality (the recurrent creation and destruction of the races of man), but also of linearity and qualitative purposeful teleological change (Nisbet 15). The notion of purposeful self-improvement is furthered in his authoring of the myth of the titan Prometheus. Prometheus (literally fore-thinker) took pity on a humanity that he perceived as suffering from want as a result of ignorance. To better their state, Prometheus subsequently brought the flame of knowledge to humanity (Nisbet 17). Taken along with the cumulative possibility of betterment implied in the ages of men, Prometheus would seem to bolster the position of Hesiod's consideration of a progression of humanity from an inferior primordial state of affairs, to an improved present with the possibility of a perfected future. The progression implied is purposefully enacted, either by the actions of the gods, or by humanity. The propagation of the Promethean myth also stands as evidence for the acceptance of the rudiments of purposeful progress.

The story was shared and extended into the 5th century BCE by Protagoras, and continued into the 4th by Socrates and Plato.

The conception of telos becomes more clearly defined in Plato's cosmology. In his work *Timaeus*, Plato's eponymous character exercises the author's intention to complete Socrates' unfinished work of defining just causes for everything in the physical world in order to demonstrate that the structure of human life was based on universal order. For Plato, order and goodness in the world come from divinely creative acts, which use as their guide, perfect, immutable form of nature - primary cause. Subsequent re-creations made by lesser beings constitute secondary causes, which are inferior to the primary causes and to the unattainable perfect forms. The end goal of the physical world then, is to mimic the perfect universal forms, even though they are impossible to achieve or even grasp by inhabitants of the physical world (Wattles 447). Plato describes the ultimate source of all creation is the Demiurge, the divine craftsman. He deduces this divine creator from the observation of all existing matter as being an effect of causes exterior to themselves. Working backwards form this presumption, Plato reasoned that eventually one would have to encounter a causal agent that stood at the ultimate beginning of the process, a divine source that brought organization to a universe of chaos.

The cosmos that Plato contemplates comes into being because of two forces: reason and necessity. Reason was divine, and descended from the Demiurge. In the absence of reason the universe was chaotic, but within this chaos was a kind of 'seed' of ordering actions which he deems as 'necessity.' Thus, a universe when in a state of chaos would, by means of necessity, settle out into a sort of order, similar to the way that chaotic individual stones or gravel poured into a container will settle out by into an eventual order when filling the container. This necessity was distinct and unguided by the divine reason of the demiurge, but existed as a property of the physical universe. (Provine 255). Matter stands as the end product when an act of reason cooperates with necessity to productive ends, establishing an understanding of the material world as an effect whose divine purposefulness is intrinsic to its materiality. Despite this, Plato urges a constant pursuit of the divine, primary attributes in matter and not to project too much importance on the secondary nature of matter itself. The perfect forms are not to be found in material objects, even if they were ultimately the product of those forms. We can never actually encounter these perfect patterns, but we can look for the evidence of their existence and nature in matter (Wattles, 448).

Aristotle rejected the perfect forms and other ideas of Plato, but agreed on material causes. Aristotle's causes however, move away

from the Demiurge, to posit a creative purposeful drive *within* nature itself. For Aristotle, mechanical causation is heavily reliant on a teleology inherent to things; all actions are in some way purposeful, but this purpose is derived from internal rather than external divine sources (Wattles 449). He outlines four causes related to this process: material, formal, efficient, and final causes. The formal cause that that by which we can identify the object in its maturity. For example, we identify the relationship between an acorn and an oak by virtue of its formal cause: the physical characteristics of a mature oak tree. Material causation addresses the type of matter necessary for the event - a stone is not the proper material cause for an oak, for example. The efficient cause identifies the source of the material causation. In this case, the efficient causation of the acorn which will become a new oak, is the parent oak tree which grew it. The acorn grows and reaches towards its telos, or final cause - that of the actual mature oak that its inherent material nature intended it to be (Wattles 449). Using Plato's terminology then, we can say that for Aristotle, necessity and reason operate in much the same way as they do for Plato, but the provenance of reason shifts from being exterior and unavailable to the physical world, to being inherent with matter itself. Aristotle, then sees nature *as* a sort of Demiurge which, like a craftsman, works by reason to guide the forces of necessity toward an ultimate end purpose.

Greece came under Roman rule in 146 BCE. Romans were fascinated with Greek culture, and by the time of the first century Greek thought had permeated the majority of the Roman empire. Emerging from this context was early Christianity which, although it maintained a Jewish cosmology at its core, was steeped in and directed towards Roman life. Due to this proximity, Greek teleological thought had marked influence on the theological philosophy of the early Christian church, which syncretized apostolic belief, Judaic traditions, and Greek philosophy (Nisbet 49). Because the early Christians were Jews, they tended to hold on to certain aspects of Jewish thought and practice, including millenarianism (Harrison 1751). That is, the belief in a divinely enabled 'golden age' of the future that the return of the messiah would herald. In concert with this continuance of millenarianist belief, the early Christian adherents were ordered to read and spread the gospel. As the early Christian texts were predominantly recorded in Greek, studying and understanding the Christian gospel required a facility with Greek that was enabled through the reading of a variety texts in the language, including Aristotle. In studying Greek texts, the early Christians also assimilated aspects of Greek cosmology and teleology. Nisbet points to this fusing of Greek telos and Jewish millennialism as the embryonic version of Christian conceptions of purposeful progress, as evidenced in St Paul's

metaphor of the church as a single human that grows inevitably over time (Nisbet 48).

After the collapse of the Roman empire, Greek philosophy lay dormant in much of the Christian West, although latent Platonic concepts lay hidden in some scattered theologians like Augustine of Hippo. During this time, Islamic and Jewish scholars continued to study and disseminate Aristotle and later Plato's works by translating the ancient Greek texts into Persian and Hebrew. It was not until the mid 12th century that Aristotelian thought was 'rediscovered' by Western culture via the translations of Jewish and Islamic scholars like Moses ben Maimon (Maimonides), Ali Ibn Sīnā (Avicenna), and Aḥmad Ibn Rushd (Averroes). For Western Christians at the time, the reintroduction of expansive Aristotelian thought from presumed inferior 'heretical' sources was revolutionary. Religious historian Richard E. Rubenstein likens this effect to contemporary scholars uncovering ancient tablets with the secret of time travel. Not only was there a reception of shattering information regarding the nature of the physical world, but the origins of the material stemmed from sources thought not capable of developing such knowledge (Rubenstein 7).

For decades, the Christian church battled with the existential philosophical crisis that Greek scholarship posed to Christian cosmology, wrestling with the question of whether the texts were

compatible with Christian doctrine, or heretical and dangerous. Further schisms relating to Aristotelian viewpoints also developed and continued. Written in 1265, Thomas Aquinas' *Summa Theologica* attempted to reconcile the rational, natural teleology of Aristotle with the eschatological cosmology of the Christian church (Geenan and Hunt 48). In the 14th century, William of Ockham came to see Aristotelian influence as an imposition on the absolute, transcendent power of God. Instead, he gravitated toward a more nominalist view of a God whose power is absolute, and incapable of being restricted by any force outside of Himself. Such a view countermanded any idea of a natural telos being compatible with Christendom. It was further viewed that any effort at divining God's machinations through the examination of the sinful physical world projected God's power as limited, and bordered on heresy. This was interpreted by many as projecting nature as being incapable of damage by human intervention, and thus the complete province of humanity to do as he saw fit. Ironically, this paved the way for more secular views of the natural world (Bennett "Enchantment" 68).

This is not to say that the totality of Christian theological currents swayed absolutely from one strain of thought to another in exclusion, but the increased availability of ancient Greek and Roman texts to scholars in Europe allowed broader and more varied interpretations of

Christian cosmology, affording space for contemplation and conflict leading into the dawning of the Scientific Revolution (Rubenstein 6). The internal conflicts of the church's stance on nature positioned it as being created in its totality by God. Any action or observation done to it were imitative, and could not compare to Gods ultimate power. Thus, human scientists could presumably act upon nature without fear of their actions being interpreted as attempting to directly manipulate the divine will of the creator to their own ends. In response, the philosophical gap opened by the church was bridged with cosmologies heavily influenced by classical philosophical approaches, from Epicurean atomism to Neoplatonism.

Edmund Husserl points to an example of this philosophical supplementation in Galileo's apprehension of mathematics and his interactions with the church. Husserl claims that, influenced by the idea of the perfected forms of Plato, Galileo and others applied Platonic mechanisms to mathematics. Theoretical, or 'pure' mathematics began to be considered as a sort of sublime framework that, although inaccessible in its actual state by humanity, could be used to form a positivist description of the physical world (Husserl 23). By introducing the perfect forms of mathematics as causes for the natural word, Galileo and others cleaved some of the personal totalizing guidance of

the supreme being from the countless minutiae of universal events (Wattles 451).

This is not to say that Galileo was a crusader for Neoplatonism or against the church. Far from it - Galileo was undoubtedly Catholic in his beliefs, and did not see church doctrine as being in opposition to heliocentrism or natural philosophy in general. In fact, it was his insistence that the church officially recognize this lack of conflict, that ended in his exile (Provine 257). Indeed, 17th century scientific discoveries of the natural world were generally assumed to be evidence of the divine, and the understanding of the Godhead as purposeful creator was presumed to underscore their efforts at discovery. Considering this, the emergence of scientific practice did not produce a fundamental conflict between science and religion. It was, rather schisms *within* the church that led to inclusion of more secularized ideas in connection with science.

This is not to suggest that early scientists practiced wholesale exclusion of cosmologies that mirrored the internal strife of the church. While the birth of nominalism and the subsequent reactions to it, acted as a major turning point in the secularization of scientific practice, caution must be taken against placing the internal scientific currents resulting from the secular turn in a totalizing light. Myriad varieties of scientific and theological thought abounded and permutated from the

Scientific Revolution through the Renaissance, and it would be reductive to envision the schism between science and faith as an unbridgeable chasm that starts with William of Ockham and grows to complete separation into modernity. Cross-pollination of theological and philosophical applications of science abounded, and allowed earlier teleological notions to persist. As an indirect result, key aspects of the modern understanding of scientific and technological progress were heavily influenced by a re-introduction of Aristotelian conceptions of divinity within the natural world. In England, these were ushered in by the Puritan revolution of the 17th century.

The Puritans' break with the Church of England during the English Civil War was more than just the want to 'purify' the Church of England from Catholic thought and practices (Spraggon 98). The Puritans also represented a crucial point of reconnection and synthesis with previous modes of Christian theological practice. Specifically, reconnecting it with the fusion of Aristotelian natural teleology and Jewish millenarianism. This was further synthesized with a tangent Greek idea of constant betterment in the arts and sciences (Nisbet 127). This, then is the first emergence of the key components of the modern conception of progress. The iterative, incrementally-improved change in the human production of arts and sciences was looked upon as an indication of the stepwise motion toward a millenarian golden age. At the same

time, the developments themselves were thought to actively promote its hastening, and were held to be at once a *sign* of the imminence of the golden age of the spirit on earth and a *cause* of this imminence. The divergent property that the Puritan revolution introduced was to see the Aristotelian unfolding of natural divinity to be *advancing* toward an eventual betterment (Nisbet 127).

In this way, the role of Providence was transferred to 'natural laws,' through which God was seen as expressing divine will. This tended to codify the understanding of history as being a divinely guided process of betterment, directed toward a 'golden age' of the future (Nisbet 127). The projecting of divine will into natural processes gradually became more secularized, but was still a complicated and convoluted matter. Although views of nature were becoming less attached to direct divine intervention, there was a continued stream of influence between 17th century Puritan millenarianism and modern secular ideas of progress via Turgot, Condorcet, Comte and others in the 18th century (Nisbet 126). During the mid 1700s, Enlightenment scholars like Turgot were losing their desire to serve the Catholic church, but not necessarily their faith, and instead opted to channel "rationalist-naturalist content into a framework of Christian dogma (Nisbet 181)."

Others followed suit and, in a paradigm shift that aligned with the early Industrial Revolution, the view of providence-as-progress gradually

became progress-as-providence (Nisbet 182). The flavor of millenarian teleology was never far removed however, and the future golden age was transferred away from being the product of divine grace, and toward an eventual result of human effort. These visions of gradual improvement echoed the earlier staged framework of Hesiod and his visions of subsequent races of humanity, culminating in the iron men who, though flawed, could eventually better themselves through their own efforts. This ideological lineage is clearly reflected in Nicolas de Caritat, marquis de Condorcet's 1794 text *Sketch for a Historical Picture of the Progress of the Human Mind*. This work, although highly critical of Christianity as being antithetical to human sciences, still reflected the divinely-inspired millenarian mechanisms of the Puritans. Condorcet lays out human history as a series of incrementally improved stages that are empowered by a view of progress as an unrelenting agency unto itself. This force compelled the destiny of humanity ever forward, so long as no human resistance stood in its way. So great was the power of progress for Condorcet, that he extended its conquests to provide human-made solutions to even death itself, save for unfortunate accidents (Condorcet 290).

Enlightenment views of a purposeful progress became interwoven with the industrial revolution and eventually extended into the spheres of science, technology, economics, politics, social

institutions, and ethics (Salvadori 8). In this way, the Aristotelian natural telos could be allowed to apply to more than just the natural world, but to the actions of humanity and history. In other words, just as Nature was seen as obeying certain laws that could be manipulated by humanity towards betterment, human culture and behavior was seen in the same light. The assumption of eliminating primitive, prejudiced and irrational obstacles from the past included an "accompanying vision of radical political liberation (Staudenmaier 270)" and the belief in the making manifest of a systemic worldly perfection, which would be disseminated in a downward direction, from more developed elites to the masses (Salvadori 11).

The rise of positivistic applications of the scientific method to issues of social organization and benefit, saw personification in the likes of classical liberalists like John Stuart Mill or utopian socialists like Karl Marx. By applying the scientific method to social issues, the budding social sciences were viewed to be connected to progress as a sort of objective natural law that must have a clear path made for it in order to hasten its arrival (Salvadori 11). Their influence popularized and perpetuated the belief in the possibility to plan quasi-utopian futures scientifically (Salvadori 13). By their lights, the spheres of ethics, politics and economics should be controlled by rational science so as to lead to an inevitable telos of peace on Earth.

Their methods however were sharply divided. Massimo L. Salvadori cleaves positivist thought from this era into two broad camps: bourgeois liberals and utopian socialists. The bourgeois liberals, like Thomas Hobbes, Thomas Robert Malthus, and John Stuart Mill, promoted absolute individualism and unregulated free trade guided by benign self-interest. They saw the progressive telos as being one based on negative freedoms in which a laissez-faire anarcho-capitalist system stood in opposition to any governmental regulations that would hamper the ability of private citizens to abide the natural progressive forces set into motion by the Industrial Revolution.

Socialists took an entirely different tack. They instead viewed the natural world as a model for frameworks that involved a shared economy based on collectivism and positive freedoms. By their lights, economic and technological systems are meant to run to their inevitable ends. By the time this occurred, technological progress would have advanced to a state in which the majority of labor would be done by machines and collective, highly regulated systems that guarantee a high quality of life for all. The thinking of Robert Owen and Karl Marx stand as examples of this brand of positivism. Despite their differences, both bourgeois liberals and utopian socialists had a similar deterministic faith in science, technology and industry; and were

fervent advocates of progress during the late 19th through well into the 20th century (Salvadori 16).

By the turn of the 20th century, portions of the scientific community began to contemplate that the job of science was drawing to a close and that humanity's development of scientific knowledge was approaching a millenarian age of completion: the 'end of science' (Badash 48). In 1887, T.C. Mendenhall, the future president of the American Association for the Advancement of Science wrote the following:

> More than ever before in the history of science and invention, it is safe now to say what is possible and what is impossible. No one would claim for a moment, that during the next 500 years, the accumulated stock of knowledge of geography will increase as it has during the last 500. In the same way, it may be safely affirmed that in electricity, the past 100 years is not likely to be duplicated in the next. (Mendenhall 223)

Technological developments at the time seemed to bear this out. The invention of the electric light, and the phonograph in the end of the 19th century and the mechanized Fordian assembly lines in the early 20th, signified to many the reality of the purposeful progressive dream. The projection of deification onto the fruits of progress were numerous and especially poignant surrounding the personification of electricity. Many portrayals of electrical progress in the early 20th century pointed

to the 'goddess of electricity' who, simultaneous with possessing an immutable sacred force of nature, was also capable of being indentured to men of science, who were imbued with magical elements to control her. Prominent physicist Edmund Edward Fournier d'Albe described the force of electricity at the dawn of the 20th century as being a goddess "enthroned, as she has been from all time, awaiting the genius of the inventor to transmit her blessings to mankind (d'Albe 8)."

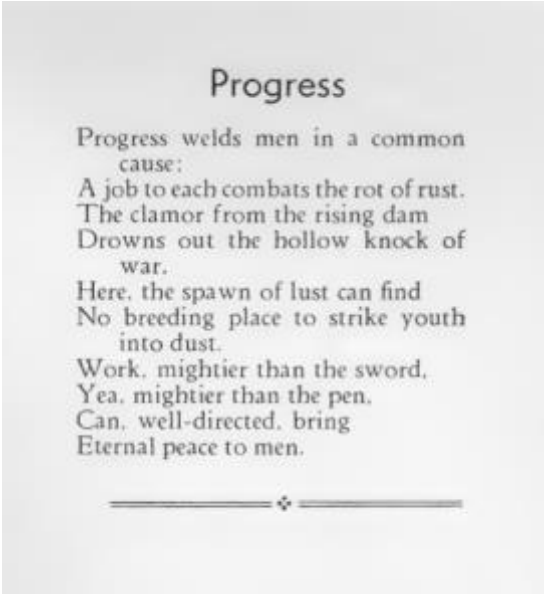
The idyllic view of progress was soon tempered, however. Technological changed spurred by the belief in progress showed its teeth by enabling the senseless mechanized savagery of WWI, and the hagiographic view of progress soon became attenuated in many public and artistic portrayals. Eugene O'Neill, in his 1927 play *Dynamo,* finds contempt for the vision of spiritualized purposeful technological progress that he viewed as a poor substitute for traditional faith. His play prompted one reviewer to comment on his critique as reflecting a position that "…the god of Genesis has given way to the Goddess of Electricity (Ryskind 84)."

These pessimistic views were overcome however. Industrial and political forces marshalled the promotion of progress as a positive response to the horrors of the war, and the economic necessities of recovery of the great depression that followed. The politics of the

progressive social programs of the New Deal went hand in hand with efforts toward shoring up belief in a decimated economy and industry. In world's fairs and public works programs, massive effort was undertaken in the US to provide, not only relief from the ravages of desperation from the great depression, but to instill a mindset of belief in a possible better future empowered by the effort of labor guided by private industry.

Is it not by accident that the monthly publication of the WPA was called "WORK: A Journal of Progress." Printed monthly from 1936-37, the magazine outlines in concrete terms how the New Deal was not only significant of a renewed commitment from the Federal Government to a suffering people, but a call for renewal of faith in the force of progress. Like Hesiod and Condorcet, the emphasis of the magazines centers around the ability and duty of the citizenry, through their own effort, to clear the path that was temporarily blocking the forward momentum of progress. The pages brim with photographic evidence of successful improvement through hard work which would lead to a golden age of peace and prosperity (figure 1.1). These coexisted with textual ideological calls for a renewed belief in progress, which were often quite straightforward in their positioning of a millenarian-esque view of future betterment through concerted effort (figure 1.2).

Figure 1.1: Photo of worker from *Work: A Journal of Progress* Vol. 1 No. 3. Nov., 1936.



Progress

Progress welds men in a common
cause:
A job to each combats the rot of rust.
The clamor from the rising dam
Drowns out the hollow knock of
war.
Here, the spawn of lust can find
No breeding place to strike youth
into dust.
Work, mightier than the sword,
Yea, mightier than the pen,
Can, well-directed, bring
Eternal peace to men.

Figure 1.2: Full-page poem from *Work: A Journal of Progress* Vol. 1 No. 4. Dec., 1936.

Great care was taken to align the survival afforded by progressive betterment with an industrial work ethic and the assertion that the recipients, although receiving monetary compensation, are equal partners with industry in contributing to a shared goal of a revitalized future in line with the needs of private commerce. Many testimonials reflect this meritocratic stance and espouse the program's valuation of hard work over 'hand-outs'. The work they praise is simultaneously active and passive: its action is evident in a literal sense - images of shirtless men swinging hammers, and others occupied with the physical business of human betterment. Its passivity is less blatant, and can be felt by the overall intent of the texts as whole: that the re-instigation of the belief in a purposeful, effective progress is reliant on the efforts of labor and a confidence in the system of industrial progress to make decisions on their behalf; the force of progress is expressed through industry and it is not place of the worker to question its decisions.

John Staudenmaier points to this kind of 'progress talk' that was also rife in the texts of world's fairs in the 1930s. He highlights the introductory paragraph the official 1933 World's Fair program touting a systematic hierarchical relationship between industry, science, and laypeople: "SCIENCE FINDS, INDUSTRY APPLIES, MAN CONFORMS (Staudenmaier, 294)." This position boldly implies that the fruits of

progress are nurtured and harvested by elite men of knowledge, developed by industry and presented to the population as positive change to which they must adapt, or risk holding humanity back from the rich future it is destined to receive. The acquiescence to power was more than figurative in the case of the many eugenics programs that also abounded in the local and world's fair exhibitions, especially in California. Campaigns like the YMCA's 'fitter families' program encouraged Californians to self-inspect for inferior traits and to avoid procreation if they showed signs of being 'unfit.'

These efforts to restore public faith in progress were also dampened however, and by the middle of the 20th century it would seem that all hope for reason to usher in a utopian era of humanity was dashed. Any quaint thoughts of the ultimate ends of progress were seemingly washed away by the bestial brutality of WWII and the eugenicist genocide practiced by the Third Reich. These horrors were just the sort of thing that the indomitable stream of progress was supposed to carry us past (Salvadori 19). But again, like the reaction to the first World War, progress came back into favor following WWII. The mechanism for this revitalization was similar to its prior restoration. That is, a renewed public emphasis on the idea of progress was enacted not because the human situation had improved, but because the horrors of the 20th century mandated that modernity could not get along without

it. To abandon the belief in eventual human betterment was also to cast away any reason to rebuild and repair the damage humanity visited upon itself. Instead, faith in an inevitable human improvement reappeared, but cleaved from the aspects of social progress associated with the despair and suffering of WWII (Lasch 231).

Massimo Salvadori and Langdon Winner both point to a major difference in the version of progress promoted at this time. After WWII, anything remotely resembling the legacy of eugenicist thinking tended to be excluded from presumptions of the incremental improvement of human beings and social relations by the autonomous force of progress. In other words, the idea of social progress was marginalized and separated from the general conception of progressive force, leaving only technological and scientific conquest of nature to stand for the unstoppable mechanism of progress. This allowed for the rejuvenation of similar meritocratic and industrial-centered growth efforts similar to the ones enacted in the 1930s. By focusing them on a technological progress that was deemed to be socially neutral.

Daryl Chubin points to the specific moment of separation as being the year 1949, when Vannevar Bush, then head of the Carnegie Institute, was delegated to lead the Office of Scientific Research and Development. His appeal for the establishment of the NSF, entitled *Science: The Endless Frontier*, described science and technological

development in terms of a type of conquest, in line with myths of the American West (Winner 54). Technological innovations relating to the goals of social progress were all but removed. Instead, scientific progress is put forward as the only vehicle for general progress. These developments stressed defense and disease prevention as primary, with 'full employment' standing in for the totality of social progress. In this way, Bush puts forward a vision of science that contributes to knowledge, but solves no specific social problems (Chubin 178). Salvadori further posits that, with a guiding vision of social responsibility disassociated from science and the perception of technology as bearing no responsibility toward the betterment of humanity, the remnant consciousness of social progress was replaced in the US by nationalistic, anti-communist sentiment that further reinforced technological progress in line with in the interests of the desires of capital (Salvadori 20).

As much as the separation of technological progress from social progress tacitly attempts to quash the negative social effects relating to the teleology of progress by assigning a sociologically 'neutral' stance to progress as technological development, the vision of a purposeful, ever-bettering teleology still persists in many facets of popular culture and attitudes toward technology and science. The impact of the contemporary popular perception of evolutionary theories in relation to

progress serves as a particularly clear example of the complex and persistent permutation of this teleology.

By the time Charles Darwin published *On the Origin of Species by Means of Natural Selection* in 1859, the idea of evolution, or more specifically, that organisms change over time in response to their environment, was already in wide circulation in Europe. The popular work of French biologist Jean-Baptiste Lamarck proposed the 'mutability' of living things: that the effort of organisms in response to their surroundings could promote biological change that consistently increased in complexity over time. Lamarck expected his conceptions to be poorly received, and sought no public attention for his 1809 text *Philosophie Zoologique*. Following his death, the work gained wider attention and critique by the scientific community, including Darwin. What made Darwin's publication in 1859 so remarkable was not the introduction of evolution itself, but the proposal of its operation by natural selection.

Broadly, natural selection offered the mechanism of evolution as being a process that happened gradually over extremely long periods of time, in which the organisms most adapted to a specific environment would have the best chance to survive and pass on their genetic material to the next generation. Darwin described a process that was entirely materialistic and independent of any exterior force (as

opposed to artificial selection by divine or human sources). Critically, it was *completely divorced from any purposeful direction or improvement*. That is, organisms could and did change in relation to their environment over long periods of time, and this change has no relation to any presupposed betterment of the species linage or natural order. In other words, the most controversial characteristic of natural selection was that the process removed the aspect of telos from evolutionary change.

Others before Darwin had put forward similar ideas, to great condemnation and ridicule. The anonymous publication of Robert Chambers' *Vestiges of the Natural History of Creation* in 1844, created a huge controversy by suggesting that not only were species mutable, but the process that afforded this mutability seemed to suggest a system at play in which God did not have a direct hand in molding every aspect. Foreseeing this, Chambers elected to publish the work anonymously. This did not prevent public criticism of the *Vestiges* which, although hugely popular, were roundly disparaged both by scientists, who saw it lacking credible evidence, and by theologians for removing the guiding hand of God from the creation of nature (Secord 73).

Chambers' mutability countered the teleological, hierarchical view of the relationship between organisms that ran alongside the permutations of telos throughout Western history. Aristotelian scholars

referred to this species hierarchy as the *Scala Naturae*, which medieval Christian thinkers infused with biblical cosmology and designated The Great Chain of Being (Rothschild 95). This hierarchical understanding of the natural world describes the vast multitudes of entities in the universe as occupying a place in a grand scheme of value enacted by a divine creator. The location of each organism is fixed on a structure of meaning directly related to the proximity of God or Satan respectively. Humans occupy a privileged space below that of the angels, but above other organisms and all objects, each of which have their own individual place in the order of cosmological occupants descending to increasingly lower depths, eventually reaching the demons and Lucifer himself (Figure 1.4).

Figure 1.3: *The Great Chain of Being* by Fray Diego de Valades (1579).

Darwin was extremely wary of the reaction that the *vestiges* had received and was careful to present quantitative support for natural

selection before publication. Upon return from his voyages on the HMS Beagle, Darwin spent years becoming a leading expert on the biology of barnacles in order to compile a body of evidence for the mechanism of evolution that was too extensive to be easily dismissed. This mechanism was the main functional difference from Chambers' work, and made his arguments much more difficult for Victorian audiences to disregard. Even with this evidence, many simply could not accept humanity's loss of special purposeful status in the world, and its subsequent ramifications to ethics and cosmology. In short order, hundreds of competing theories sprang up in response to Darwin (Provine 259).

Theological scholar Mary Midgley identifies two major aspects of the reaction to and misunderstanding of natural selection that remain pervasive and problematic. The first is known as 'Social Darwinism.' Prominent Victorian-era polymath and free market advocate Herbert Spencer implicated Darwin in his coinage of the term ‘survival of the fittest’ which was used to justify social, economic, and moral theories equating 'fittest' with 'best' (Rothschild 98). This promoted the understanding evolution as a purposeful process in which cooperation tended to give way to self-interest. It also ascribed the appearance of scientific credibility to classical liberalist notions of economic meritocracy and laissez-faire social practices (Provine 253). The second

aspect that Midgley identifies is the conception of evolution as a force akin to progress that impels incremental betterment over time. Midgley refers to this as the 'escalator fallacy,' and likens this iterative betterment to the steps of an escalator or staircase. Versions of the great chain of being were sometimes imagined in such a fashion, with each step in the divine staircase holding a fixed organism. This collective arrangement reached ever higher toward perfection in a "steady linear upward movement" of evolution (figure 1.5). The escalator fallacy describes the erroneous association of the echoes of purposeful Christian teleology in the great chain of being, with Darwin's purposeless natural selection. Both of these misconceptions also paved way for a host of scientifically-justified racially-hierarchical thinking. Friedrich Blumenbach's theory of degeneracy; James Cowels Prichard's theory of progress from "black races of men" to the 'perfection' of white Europeans (Rothschild 98); and Francis Galton's conception of eugenics, all of which have been continuously used to justify white supremacy, colonialism, and exploitation (Midgely 9).

Figure 1.4: *Scale Intellectus*, by Ramon Llull (1305).

Ironically, by the century's end, the *Origin of Species* lead to a boon in the idea of evolution, but not the ideas of purposeless natural selection, prompting the reaction to be labeled the 'eclipse of Darwin.' Such was the post-Darwinian tumult that even though Mendel's genetic theories were re-discovered in 1900, it would not be until the mid-1930's that natural selection became completely accepted by the scientific community (Provine 259). Unfortunately, by the time science had

unified its support of Darwin, the public perception of his theories had established its misunderstanding and misuse in cultural, academic and political situations. Even literature meant to advance the popular understanding of Darwinian natural selection have, like Darwin's efforts, ended up presenting evolution as a purposeful iterative betterment.

One of the most pervasive examples of this is an image entitled "The March of Progress." It was first published in a popular 1965 Time-Life Books volume called *Early Man* and traced the evolutionary origins of human beings. Created by muralist Rudolf Zallinger, it was originally titled "The Road to Homo Sapiens" and was spread across a central foldout section of the book that spanned four pages (figure 1.6). The accompanying text by anthropologist F. Clark Howell described the image itself as 'progressing' across the *pages*, but was understood by millions of readers as suggesting a vision of evolution that conformed to an idea of incremental betterment, in line with notions of purposeful progress. This iconic image continues to reinforce in the public consciousness the popular misconception of meaningful iterative progress as a natural force, borne out by evolutionary science (Roberts and Thorpe 281).

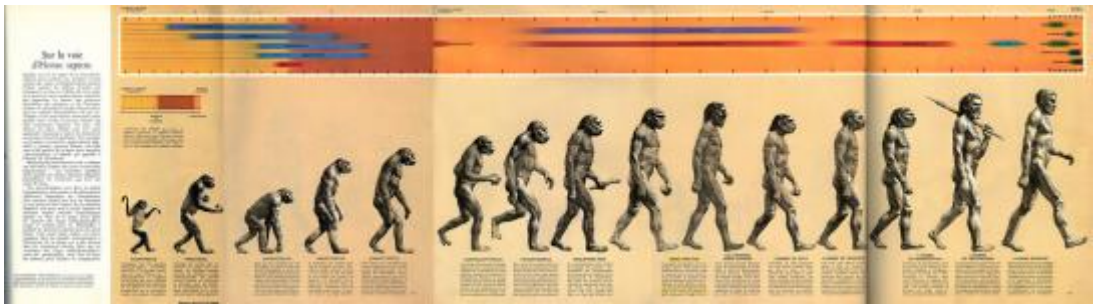


Figure 1.5: "The Road to Homo Sapiens," by Rudolf Zallinger (1965).

Considering this, it comes as no surprise that the understanding and full acceptance of evolution by means of *purposeless* natural selection has yet to gain a dominant foothold in American society. A poll of US citizens taken in 2017 by the Gallup company indicates that the vast majority of Americans (76%) believe that either humans were created by God outright, or that God had a purposeful hand in evolution ("Evolution"). The number of persons who believed that evolution was not guided by a deity was 19%. This is up from the 9% number shown by the same poll taken in 1982, but is still a distinct minority (Table 1.1). William Provine points out that Gallup did not ask those disbelieving in divine guidance if they thought that some other purposeful force besides God, guided evolution. He further suggests that it's likely a sizeable percentage of these respondents would reflect views that imagine evolution as a purposeful process, but not a divine one. Accounting for this would suggest that over 89% of the US population view the biological process of evolution as one that

conforms to conceptions of purposeful progress. It should be said that this is only a single poll and is clearly not absolutely conclusive as to the exact state of affairs in the American populous. It does however offer a small glimpse into the current of the flow of ideas within a highly influential nation. More pointedly, if it is the case that a majority of Americans ascribe a purposeful teleology to a natural process like biological evolution, it suggests that the archetypes of progress, even if tacit, are still deeply embedded in the contemporary psyche (Provine 254).

Table 1.1: Data from "Evolution, Creationism, Intelligent Design." Gallup Poll, May 2017

	Humans evolved, with God guiding %	Humans evolved, but God had no part %	God created humans in present form %	No opinion %
2017	38	19	38	5
2014	38	9	44	9

John Staudenmaier refers to this latent tendency for contemporary populations to incorporate teleological ideas of progress at an almost subconscious level as 'progress talk.' Like Midgely, he perceives this tendency to be one that has had detrimental effects and can continue to pose dire consequences, specifically, in its manifestation of the political passivity of the citizenry (Staudenmaier 270). Staudenmaier accounts for the colonial tendency of latent

teleological beliefs as recalling the Western idea of power over nature at the beginning the Enlightenment. This stance was mirrored by Adam Smith's conception of unfettered trade, and the beneficial 'invisible hand' of economic self-interest, which influenced the belief in meritocracy as a crucible for a common morality (Staudenmaier 276). Herbert Spencer's metaphor for 'survival of the fittest' becomes a methodology for the scientific validation of the moral superiority of those at the top of the free market. The same logic poses that those who do not succeed, do so due to fundamental character flaws. These flaws can be beneficially corrected by strict punishment from those whose power proves their superiority: "beneficent, though severe discipline...the poverty of the incapable the starvation of the idle...are the decrees of a large, far-seeing benevolence (Staudenmaier 277)."

Thus, in many respects science, technology and industry have been transformed to be seen not as humane guiding lights, but as mechanisms of conquest that compel those worthy of improvement toward greatness. Those left behind are done so by virtue of their own flaws- a justifiable, unavoidable price to pay for human betterment (Staudenmaier 284).

Salvadori argues that prior to the Second World War, the meritocratic manifestations of progress talk were offset by the influence of utopian socialistic perspectives. Since that time however, the

assumption of social betterment has been marginalized and bifurcated from the idea of progress. This left progress to be associated exclusively with technological, scientific and industrial betterment, which tended toward the promotion of more bourgeois liberal meritocratic values than socialistic ones.

The systems of production associated with technological development rely on a belief in technology as a force of constant betterment, an adherence to the necessity of an endless technological process for maintaining quality of life, and the expectation of workers and consumers not to challenge the ascendency of the system. Staudenmaier frames this passivity as being enabled by progress talk that evokes Midgely's escalator fallacy: technological development is viewed as a force unto itself that is continually and necessarily turning out ever-improving commodities. Viewed in this light, technological and industrial production comes to stand in for cultural change, accompanied by an assumption that culture will passively 'catch up to technology' and resist the notion of viewing technological development as anything but forward-moving (Staudenmaier 280). To question the inevitable advance of technology is synonymous with wishing to turn back the hands of time.

In sum, the conception of telos can be seen to have inhabited changing properties that became taken up into Western Christian

theological world views. These worldviews informed and became part of the Scientific Revolution, Renaissance, and the subsequent Industrial Revolution, moving from a divine source of ultimate agency to an even more anthropocentric one built around the presumed victories of modernity and industrial capitalism. Its path follows the lines of power and privilege embedded in colonialism and remain present, even if less evident in the contemporary moment, but can be sensed in the drive toward waste and obsolescence necessitated by technological production driven by the needs of capitalism.

This drive contributed to contemporary systems of economy and polity, which are reliant on constant consumption and production in line with purposeful progress, if by default more than an active ethical drive. Despite its entrenchment, there is no evidence to support the general notion of purposeful betterment as a factual reality. To the contrary, biological evidence via Darwinian evolution through natural selection seems to reveal no such telos of any sort. Despite this, human beings seem to have needed to hang on to the anthropocentric belief in purposeful eventual betterment, but have compartmentalized it solely into technological and scientific development. This myopic specialization perpetuates the function of progress divorced from any responsibility toward humanity aside from the needs of the market, while simultaneously abdicating any power that individuals may have

over the process. The next section will describe an active mechanism of global capitalism that is derived from and sustains the same ideological assumption of incremental purposeful progress: obsolescence.

Chapter 2: Obsolesence

Christina Cogdell outlines the cross-pollination of technological progress with a purposeful view of evolutionary thought in her text *Eugenic Design*. She traces the conception of streamlining espoused by eminent designer Norman Bel-Geddes, as a site where the teleological attitudes of industrial design and purposeful conceptions of evolution merge. For Geddes and others in the 1930s, the functional aesthetic of modernist design seemed to correspond with a mechanistic ordering of the physicality of life forms, as evidenced in the pattern of sunflowers, or the chambers of a nautilus. The best designed, manufactured objects could be seen to 'evolve' in their development as organisms did, to presumably create more perfect forms (Cogdell 66).

This type of connection between the echoes of purposeful, teleological evolution with technological determinism is evident in the

aesthetics of advertising campaigns for personal computer manufacturers. A 1983 ad for the now defunct Commodore computing company, features a linear assemblage of the Commodore 128 computer with an accumulation of peripherals increasing incrementally from the left of the image to the right (figure 2.1). The tagline of the advertisement reads "How to Evolve to a Higher Intelligence." The inference being that by purchasing more ancillary products, the consumer can activate an incremental improvement in technological power and, by association one's access to technological 'intelligence.'

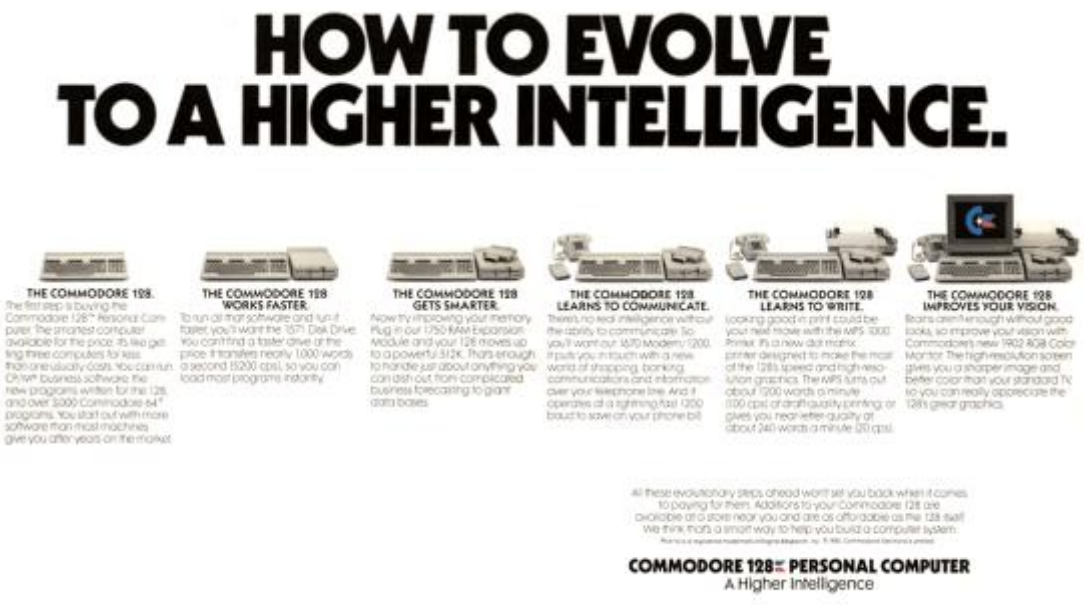


Figure 2.1: Commodore 128 advertisement circa 1983.

A more current advertisement by Apple Inc. for the 2012 iMac, also demonstrates the embrace of a pseudo-Darwinian stance in

positioning their products as exhibiting the hallmarks of betterment borne of technologically deterministic progress. The advertisement features an array of iMac models ranging from 1998 to 2012, viewed in profile (figure 2.2). The size of the computers can be seen to incrementally reduce in form factor from a large, bulbous CRT, to a thinner, more streamlined design that almost disappears into the page. The image alludes to the notion that Apple's products conform with the expectations of technological progress, and that by consuming their product, one can harness the power of this force.

Figure 2.2: 2012 Advertisement from Apple Inc., showing evolutionary implications

Both advertisements, although seventeen years apart, share the same mechanism of operation that positions progress as being in line with evolution as a natural force for betterment. Seeing commodities though an evolutionary lens far predated the personal computing industry, however. Christina Cogdell places the underlying conceit behind the 1930s practice of streamlining as drawing on similar evolutionary strains. These were linked with eugenic implications and

implicitly informed much of the design aesthetics of the early 20th century. She further points to these conceptions extending into the understanding of the economy in toto, and points to views of the processes of industrial production, consumption and waste as perfectible natural actions akin to eugenically alterable bodily functions (Cogdell 68).

The generation of decades-long cultural tendencies are, of course incredibly complex situations involving millions of actors and actions, and it should be pointed out that commercial evolutionary models did not go unnoticed or unchallenged. American Economist Thorstein Veblen questioned popular interpretations of evolutionary social betterment in his 1899 work *The Theory of the Leisure Class* (Dugger 424). Veblen was writing at a moment of economic transition in the West that sharply affected the valuation of consumption and waste. Previous to this time, the idea of conservation and thriftiness was the norm - to dispose of something before it had completely worn out was a sign of wastefulness, akin to the sin of sloth. This began to change when increased urbanization required higher numbers of the population to relocate closer to larger metropolitan centers. The tenements in which these workers lived, often left them without access or time to maintain and repair many common goods. Markets responded to this opportunity by producing cheap, disposable items

that performed the same function. Among the first of these were men's collars and cuffs. For many working men in large urban centers, reliable, affordable laundry services were unavailable, so they instead purchased disposable paper cuffs, collars and shirt-fronts that could keep up their professional appearances without the need to buy and/or launder multiple shirts. By the end of the 19th century, over 150 million of these collars were sold. This paved the way for a radical change in the expectation of the longevity of consumer goods, as items from watches to handkerchiefs became more expensive to mend than to discard (figure 2.3) (Slide 21).

Figure 2.3: Men's paper collars were a predecessor to mass-produced disposable goods.

Veblen was keenly aware of this trend of appearance over maintenance and its associated consumptive impulse in higher income brackets, which valorized what he termed ‘conspicuous consumption’

as a marker of success, and vilified thrift as a signifier of failure to thrive in the meritocratic economy (Veblen 63). For Veblen, the moneyed classes needed to consistently demonstrate their dominance by the display of leisure activities and commodities. The working classes, wishing to increase their status, tended towards 'pecuniary emulation' in which a constant striving to increase their social standing was also necessitated by visible manifestations of the trappings of upward mobility. This activity is ironically likened by Veblen to an illusory sort of joyless teleology, where the end cause is ultimately unreachable (Veblen 280).

Whether aligned or opposed to Veblen's work, economists and industrialists alike embraced the idea of the creation of waste as a positive byproduct of industrial production and one that was central to a functioning late capitalist economy. One such economist was Joseph Schumpeter who, although critical of Veblen in many respects, had alliances with Veblen's ideas relating to the process of wastefulness. Schumpeter inverted Veblen's rather disparaging perception of consumptive waste, and infused it with a view toward purposeful evolutionary economic change. Schumpeter claimed that in order to survive, Capitalism can never accept an economic state of stasis, and must instead strive toward endless growth, by constantly adapting to present circumstances. The engine of this evolutionary change is the

expectation of a constant influx of new, better consumer goods to make the old ones obsolete while providing new commodities to replace them. Schumpeter likened this mechanism to a sort of internal mutational process within industry, and dubbed it 'creative destruction' (Schumpeter 82).

Creative destruction was assimilated into the academic study of economics by the 1920s and influenced generations of entrepreneurs including Alfred P. Sloan. In competition with the unwavering allegiance to quality elicited by Henry Ford, Sloan was able to create desire for less durable GM products by appealing to the vanity and social anxiety of consumers. Sloan, who studied Schumpeter's ideas at MIT, was able to create demand for GM's lesser quality cars by modeling them after the body designs of luxury vehicles, while deriding the standard Ford Model T as being old, outdated and unsophisticated. Sloan's successful campaign relied on convincing consumers to see something lacking in their perfectly functional, but older and less stylish cars.

Over time, obsolescence expanded as a practice into three broad operational areas: technical or functional obsolescence, planned obsolescence, and stylistic or psychological obsolescence. Technical obsolescence is believed to occur when a technology is no longer adequate to do the job it was designed for, a new technology

appears that does the job better, or the job for which it was designed is no longer needed. For example, hand cranks for cars were considered functionally obsolete when the electric starter was invented. This would seem to be a natural by-product of continuing technological development resulting from the need to increase efficiency, but as with any technological commodity, the pace of technical improvement is driven by the needs of commerce. Economists, like Joseph Schumpeter, encouraged the creative destruction implied in this process and promoted the constant production of 'new and improved' commodities as a standard of economic thought (Schumpeter 82).

Planned obsolescence has more complex origins. The push towards more disposability in the early 20th century drastically changed after the 1929 stock market crash. During the Great Depression that followed, cash-strapped consumers were less likely to buy consumer goods until the older items were no longer functional. Responding to this, American real-estate broker Bernard London self-published a pamphlet called "Ending the Depression Through Planned Obsolescence (London)." In it, he called for manufacturers to deliberately design their products to wear out or break after a limited amount of time. This would maintain the cycle of obsolescence, and force the consumer to purchase new products, which would in turn stabilize the economy. The process was adopted and continued long

after the depression, as it allowed for many companies to increase their sales volumes while lowering their material costs.

Vance Packard's book *The Waste Makers* in 1960 re-introduced the term into the public consciousness, but with a critical focus (Packard 53). Though criticized for its lack of scholarly rigor, Packard was successful in bringing planned obsolescence as a pejorative term into the public consciousness. His portrayal of the practice characterized industrialists of the time as avariciously working against public interest, while increasing the wastefulness of American consumer culture. In response to the negative exposure, industry simply rebranded. Planned obsolescence became 'dynamic' or 'progressive' obsolescence, replacing the image of wastefulness with one of patriotic consumerist cooperation with progress (Slade 13). Regardless of terminology, planned obsolescence became a permanent fixture of the economy and continues to the present, as evidenced in recent debates over weather technology giant Apple was practicing planned obsolescence in their iPhone7 design. Critics like Jonathan Sterne claimed that the elimination of the headphone jack in the phone was driven not by technological innovation, but the desire to sell more products by forcing customers to purchase additional proprietary accessories (Sterne).

In contrast with the functional focus of technical and planned obsolescence, psychological obsolescence encourages the disposal of objects even when they are still perfectly operational. This is done by associating a newer product with fashionability and the older one with being 'out of touch' or 'behind the times.' This type of obsolescence can be seen in the fashion industry where an expectation of constantly changing style is distinctly visible. Psychological obsolescence is also prominent in technological markets, especially mobile technology, which often acts as a marker of taste and social status, with tech companies routinely building it into their business models, contributing to an enormous portion of the global economy as well as the overall production of electronic waste.

Pollution-related issues have run alongside technologically-fueled commodity capitalism since the industrial revolution, but the creation of digital technological waste is a purely 20th century phenomena enabled by the transistor. The process of functional obsolescence influenced the development of the transistor in 1945, which was created by a team of scientists at Bell laboratories, headed by William Shockley. Their goal was to create a technology that would succeed the vacuum tubes currently used to amplify electrical signals. Replacing the bulky and expensive tubes, transistors allowed efficient

amplification in a form factor that was a fraction of the size of the tubes and needed far less power to operate.

The transistor was revolutionary to the production of electronics, especially audio devices. By 1954, the first mass-produced pocket transistor radio was introduced, having a marked impact on music consumption and popular culture in the US. Due to its small size, the transistor radio could be taken anywhere, allowing music and radio programming to be untethered from the wall sockets upon which tube amplifiers were dependent. This allowed a radial increase in mobility for youth culture that previously was required to share listening and viewing time with the rest of their families on larger hi-fi home record players and televisions. Now untethered, teenage culture could be more outwardly expressive, and the transistor radio became emblematic of this cultural shift. The prominence and popularity of the transistor radio drove pop-culture movements and the sound of pop music itself, with producers like Phil Spector touting a return to monophonic sound and mixing music that would sound best on the cheap, diminutive speakers to which his music audience had access.

But transistors did more than amplify sound. By changing the bias of transistor components, they also had a property that allowed them to open or close a circuit in the presence or absence of voltage; they acted as electronic versions of mechanical electric switches. The

application of this to binary digital logic circuits meant that the new compact technology could be used for immense computational purposes. Replacing vacuum tubes in computer systems meant that computers reduced drastically in size and at the same time increased dramatically in performance. As soon as transistors were introduced, efforts were made to reduce their size and increase their capability. The incremental change of this process was famously highlighted by Gordon E. Moore in his 1965 paper "Cramming More Components onto Integrated Circuits." The text describes the functional increase and spatial decrease of transistors as an algorithmic quotient in which the complexity of the components produced doubles every year while overall cost per component decreases exponentially (Moore 114). Although Moore only projected this operation ten years into the future, the paper was revised and subsequently taken up by later engineers, and still influences design and performance expectations to the present day. Moore also directly connected the transistor with the size and performance capabilities of computers. In 1965, even transistor-based computers took up enormous amounts of space. Moore correctly expected the price and availability of computing technology to change such that computers would become the personal necessities they are today.

What was not connected at the time was the prospect and *expectation* of obsolescence that Moore's prediction brought along with it. Contemporary tendencies are to expect increased performance and decreased size with every year's new computer model, in alignment with Moore's predictions. The technological expectations associated with Moore's Law directly correlated with similar notions of technological progress activated by industry. In this way, the presumption of technological betterment, became a key component of technological commerce, driving obsolescence and consumption. Like purposeful progress, however, there is no evidence to support the physical possibility of endless size and performance reductions. To the contrary, many current estimations place the timeframe for reaching peak performance from transistor technology to be as close as the next 6 years. In other words, the physical possibility of increasing the speed of transistors, and by extension computer processors may be nearing its end (Courtland).[1]

[1] The present crisis associated with anthropogenic climate change, has elevated the significance of waste and pollution to heretofore unprecedented levels. Despite increased public awareness of the these issues, the production of technological waste shows no sign of abating, and the amount of e-waste produced each year is immense. As of February 2015, only 27% of cell phones were recycled (Moss and Scheer). Sales estimates for the iPhone 7 predict up to 70 million units for fiscal year 2017 (Moga), with the majority of the buyers in possession of a previous model in working order. A considerable amount of waste to produce in the name of psychological obsolescence.

This does not stop the *expectation* of Moore's law to persist, and to do so in direct association with commodified technology. To continue the cycle of waste and production of technological commodities, commercial interests have increasingly turned to emphasizing psychological obsolescence over functional obsolescence. The proposition of a lack of new stunning functional innovation points to the increasing placement of technology as objects of conspicuous consumption. Apple Computers in particular provides a clear example of this in its projection of style as paramount in technological consumption. The emphasis on sleek modernist styling and highly visible mobile products positions its brand as an extension of the self and its connection to technologically enabled status (Arrudo-Filho et al 475). This emphasis on style and, by extension psychological obsolescence has been a key component of their public perception:

> Apple have made style central to the relationships people have with their computers. The colour ..., slim body, and lightness … are examples of computers marketed as something more than what we traditionally think of as computers. Indeed, this has been Apple's stock in trade since the Apple II. For Apple, computers are not just computational devices they are objects to be with. We are encouraged to see them as sensuous objects… (McCarthy et al 88)

By projecting their products as sensuous objects, the functional aspects of Apple's technological commodities become leveled with or at times

superseded by their operation as objects of conspicuous consumption. Apple's 12-page advertisement spread in the November 2015 issue of Condé Nast's *Vogue* magazine seems to highlight this effort by Apple toward connecting technology, fashion, status, and exclusion (King). The advertisement positions the Apple iWatch product in the same light as luxury high-end watches - sparely occupying a wash of negative white space with minuscule font underneath describing its bonafides (figure 2.4).

Figure 2.4: Apple iWatch advertisement

Indeed, the model featured is just that. With a case made of 18 karat gold, it retailed for $10,000 US. Apple's public appeal to be associated with elite tastemakers would have fit quite comfortably with the progressive evolutionary ideology underpinning design in the early 20th century. Egmont Arens, in an advertising campaign for Condé Nast

in the 1920s called "Why Sell to the Wealthy?" stated that "style percolates downward" through the "hands and brains of the wealthy." The idea that "masses follow classes" or that the status is conferred by celebrity and wealth, has been a mainstay of advertising through the 21st century, but stems in part from sociological associations of meritocratic success with evolutionary fitness (Cogdell 78). Apples famous 'Think different' advertisements which associated famous and important celebrities and politicians with their product paved the way for the more bald-faced appeal to status that the Vogue spread projects.

These stand in stark contrast to earlier advertising campaigns that imparted more egalitarian sensibilities onto Apple's products. One advertisement in particular, aired during the 1984 Superbowl, depicts a dystopian world of powerless subjects under the spell of a projected 'Big Brother' figure. Into this scene runs a female Olympian carrying a forging hammer and defiantly hurls it at the screen, smashing it to pieces and freeing the hostage subjects (figure 2.5). The constructivist imagery of this commercial in contrast to the placement of the iWatch advertisement make plain a shift in the perception of the consumer from populist to elitist.

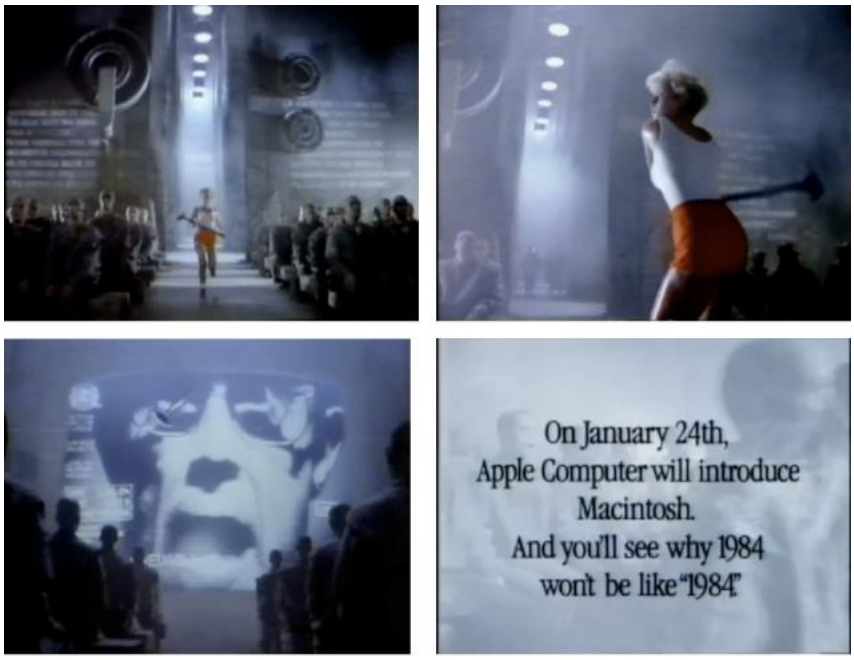


Figure 2.5: Screenshot from Apple Macintosh "1984" advertisement.

Thus, presumably 'functional' technological objects have their functionality subsumed beneath expressions of wealth and social status that conform with Veblen's framing of conspicuous consumption. They replace the excess symbols of leisure activity previously accomplished with servants, to artificial digital means. This is of course an illusion, as the actual labor involved in the production of these objects is considerable, and the effect on the workers involved is startling. As with the normalization of electronic waste production, the trail of the exploitation of labor by digital technological commerce also points us to California in the mid-twentieth century.

Before WWII, US manufacturing for the electronics industry was concentrated in the Midwest and Northeast, making mainly vacuum tubes and other components for consumer radios. At this time, the consumer market made up approximately 75% of electronic manufacturing. After the Korean war however, the military expanded rapidly to take up 60% of production. Driving this transition was the replacement of the vacuum tube with the newly developed transistor technologies. In addition, the close alliance of the electronic industry with aerospace put the military in a dominant position for constant development of consumer and military electronics. At the forefront was transistor designer William Shockley himself who, landing in the Silicon Valley in 1955, founded the Shockley Transistor Corporation. The Palo Alto company would spawn a number of high profile semiconductor firms, such as Fairchild, National Semiconductor and later, Intel. Many of the founders of these firms left Shockley Semiconductor directly to form their own companies in the Silicon Valley. Between 1950 and 1974, this boom in the transistor industry required the enlistment of thousands of workers of various skill levels, and large number of immigrant laborers were hired.

Specific immigrant communities tended to be singled out for particular low-skilled tasks based on myths related to their ethnicity. Asian women in particular were believed to have small 'nimble' fingers,

and managers sought factory production workers who were 'small, foreign and female.' In addition to the belief that Asian women were particularly suited to small repetitive tasks, they were also considered to be willing to work for less pay and be not as likely to organize or stand up against dangerous workplace conditions (Pellow and Park 88). This singling out of workers by racial background is not surprising upon consideration of the racial presuppositions of the transistor industry's founder. Shockley began researching theories of connection between race and intelligence from at least the mid 1960s, and began openly promoting eugenicist views in the 1970s. In a televised exchange from 1974, he debated with Afrocentrist scholar Frances Welsing in which he stated that his research:

> "leads ... inescapably to the opinion that the major cause of the American Negro's intellectual and social deficits is hereditary and racially genetic in origin and thus, not remediable to a major degree by practical improvements in the environment." ("Racial Superiority")

Although not necessarily as blatant as Shockley's racialist views, echoes of eugenicist tendencies reverberated in Silicon Valley tech culture through the decades. In 1995, Richard Barbrook and Andy Cameron authored a scathing view into the ethics underpinning the rise of the Internet. They outline the 'Californian ideology' as the strange

marriage of 1960s counter culture, free market meritocracy, and technological determinism. They portray the tech-insider community of Silicon Valley as merging the anti-corporate attitudes of the New Left with neoliberal values, imparting this combined ethos into the narrative of the early internet. This ideology acted as a sort of perfect storm that tended to blind the mostly white male programmer set from recognizing their connection to patriarchal colonialist power dynamics, by pointing to technological development and proficiency as a marker for the superior nature of those who control and develop it (Barbrook and Cameron). While not overtly beholden to essentialist views of intellect and ability, the Californian ideology nonetheless contributed to the perpetuation of a social environment within the Silicon Valley that allowed essentialist views to fester. Periodically, this tendency becomes more visible.

In a 2017 article in the *Communication of the Association for Computing Machinery*, former ACM president Vincent Cerf made claims to the effect that the history of technological innovation in Silicon Valley was due to a genetic predisposition toward problem solving and invention that drives an overall desire to achieve in computer science (Cerf 7). Another highly visible example of the latent undercurrents of genetic determinism in the tech industry can be viewed in the recent controversy regarding the anti-feminist

essentialism within the Google campus. Responding to efforts to promote gender diversity in the workplace, programmer James Damore authored a personal critique of the efforts toward inclusion. Like Vincent Cerf, he also attempted to point to spurious scientific evidence to corroborate a viewpoint of a genetic predilection toward technological innovation (Molteni and Rogers). Damore's contention was that women are not excluded from the workplace by systemic bias, but that they are simply genetically predisposed against technological and scientific types of work. Damore was eventually terminated for his circulation of views counter to the official Google corporate policy, but the ethical environment conducive to essentialist action still persists (Bort).

In light of this foundational and continuing attitude and practice in the Silicon Valley, it should come as no surprise that unlike the higher-paying programming and engineering positions, women - particularly immigrant women of color – have historically dominated the ranks for the most dangerous and toxic of menial manufacturing jobs (Pellow and Park 88). David Naguib Pellow and Lisa Sun-Hee Park point to the distribution of gender and work type in the Silicon Valley from 1980 through 1990. They show a distribution of lower paying manufacturing jobs that disproportionately put Asian and Latina women in manual labor manufacturing jobs relative to white males (Table 2.1).

Table 2.1: Race, ethnicity and gender of Santa Clarita Valley (Pellow and Park 69)

TABLE 4.4

*High-Technology Employment by Race, Ethnicity, and Gender in Santa Clara County, 1990**

	Male	Female	White	Latino	Asian
Officials/Mgrs	78%	22%	80%	4%	12%
Professionals	72%	28%	70%	4%	21%
Technicians	76%	24%	53%	10%	31%
Office Workers	21%	79%	65%	13%	15%
Blue-Collar	61%	39%	43%	20%	31%
Laborers	51%	49%	18%	38%	42%

*Siegel 1994.

Although lower paying than engineering positions, technological manufacturing jobs are often the most toxic and dangerous. The reason for the toxicity is that silicon increases its conductivity exponentially when exposed to certain chemicals. Because of this, the growth of the semiconductor industry was linked to a contemporaneous boom in the petrochemical industry after World War II. Both of these industries were aligned with the US military, which had already set up infrastructure and expectations for indiscriminate chemical dumping in the Silicon Valley (Pellow and Park 76). This took a terrible toll on the health of the workers, and by 1995 the semiconductor industry had double the illness injury rate than other electronics manufacturing (Pellow and Park 108). The environment and the larger communities of laborers also suffered. One notable instance in 1981

saw the water supply of the South San Jose neighborhood of Los Paseos contaminated with trichloroethylene. Used to remove grease from ICs and microchips, it is also extremely toxic. Investigators found that approximately 14,000 gallons of the chemical had been deposited into the groundwater by Fairchild Semiconductor's faulty containment system (Pellow and Park 73).

As Moore's law and the needs of progress-fueled technological production continued, the levels of toxicity increased in tandem with the reduction of transistor size. This is due to the fact that the manufacturing of increasingly tiny and complex components requires an equally increased level of cleanliness. As smaller circuits are more easily contaminated, they need to be cleaned with more amounts of toxic chemicals like trichloroethylene. Consequentially, the more 'state of the art' a given piece of technology, the more potentially deadly its cost to workers and the environment. Communities and workers in the Silicon Valley organized to call for change, and in the 1970s, increased local regulations and labor laws began to make toxic semiconductor production less profitable for major manufacturers (Pellow and Park 105). By this time, however, the semiconductor industry had grown to become a global commodity. Giant transnationals absorbed smaller companies and shipped production overseas, where costs were cheaper and regulations were lax. Fairchild moved its chip bonding

works to Indonesia and the Philippines and practiced 'unified management' which ensured the same conditions and secrecy existed at all sites worldwide (Pellow and Park 175).

While high technology and globalization is often touted as breaking down barriers for global capitalism, it does do while erecting barriers to information regarding human health, environmental, and chemical usage. Often what one nation knows about production is not shared with another under the guise of 'trade secrets'. Due to these limitations, workers in many heavy manufacturing countries are barred from knowing the toxicity of the materials they are using. Although local governments do contribute, a great deal of the techniques used toward silencing worker and environmental voices have their origins in the Silicon Valley (Pellow and Park 170). Even though the negative effects of technological production have gained more public attention in the personal digital device sector with the reporting of the mass suicides at the Shenzhen Foxconn component factory, physical and environmental damage is still a consistent presence in almost all facets of electronic production.

The rise of obsolescence then, can be viewed as a logical extension of the faith in technical progress, aligned with industry and a passive workforce to provide a better future through consumption. In the field of digital technology, the decreasing propensity for big

breakthroughs, and the socially visible aspects of mobile devices encouraged the focus of obsolescence to include both functional and psychological types, with an increased appeal to class consciousness. While the tech industry accumulates wealth and influence, it derives it much of its productive power from poor communities at the expense of their health and environment. What started in California became too unpalatable for the reputations and bottom lines of the manufacturers, and was moved overseas, where the consequences of the cycle of obsolescence could be more easily ignored.

In order to facilitate a resistance to the destructive and unsustainable tendencies of obsolescence, it was necessary to outline the historical and sociological ideologies that underpin it. These ideologies have a shared origin in the legacy of teleological progress, which places the actions and interests of human beings as paramount in nature. By diminishing the faith in, or reliance on anthropocentrism, it may be likewise possible to reduce the assumptive effectiveness of systems that rely upon the process of obsolescence. The theoretical discourse of new materialism offers some insight into enacting strategies that may be employed to counter human tendencies toward anthropocentrism, and by extension, the effects of obsolescence. The following two chapters offer an explication of this discourse, beginning

with its critical stance on anthropocentric humanism and the Christian theological teleology that informed its development.

Chapter 3: New Materialism in Theory

In *The Posthuman*, Rosi Braidotti argues that the Christian teleological doctrine was also responsible for fundamental ethical problems in philosophical humanism. The sense of incremental purposeful change that empowered the efforts of the early Scientific Revolution also migrated the source of this change from the divine to the human. This had a relational effect of imbuing the core of the Western philosophical thought that followed with an anthropocentric bent with 'man as the measure of all things.' The aftermath of the reaction against these traditions during the 1960s and 70s led to a subsequent rise in what Jürgen Habermas referred to as the 'post-secular condition.' That is, that contrary to what Enlightenment conceptions predicted, the effects of progress did not lead to an erasure of faith by reason. Habermas points to the global persistence of varieties of fundamentalism, including a fundamentalism of humanism

itself (Habermas, 24). Braidotti does not bemoan this circumstance, but positions it as an opportunity for a renewed perspective, and posits the rise of faith within modernity as one of many pathways to political subjectivity (Braidotti 31).

She points to the same critical moment as Massimo Salvadori to pinpoint the rise of contemporary humanist thought, namely the crisis of faith in progress that the atrocities of WWII let loose on the world. The role of the USSR in the defeat of Nazi Germany caused Marxist humanism to be associated with anti-fascist ideas and gain a foothold in Continental philosophical theory (Braidotti 18). The subsequent tragic realpolitik of state communism led to the rise of anti-humanist and anti-liberal energies in the US with the militant New Left of the 1960s and 70s (Braidotti 19). However, these frameworks themselves, being based on humanist values, often ended up enacting some of the same problems that they were fighting against (Braidotti 29). This is in part due to the central anthropocentric tenet of humanism, which relies on a dualistic separation between non-human objects and human subjects. This is, for Braidotti and other posthumanist philosophers, a fatal flaw that limits the effectiveness of anti-humanist thought.

To counter this, the adoption and permutation of the monistic materialism of Spinoza becomes germane to posthumanist discourse. The line of thinking is a permutation of the Spinozan revitalization in the

1970s by postcolonial theoreticians, who used monism as a means to counteract the issues inherent in dialectical materialism. Spinoza rejected traditional understandings of God as transcendent, separate from the physical world. Instead, he posited the existence of a single substance, which he defined as a unified materiality of nature and God, with all divine actions and creations originating from *within* physicality itself (Negri 26). This 'radical immanence' rejects all forms of transcendence, and comprises the basic structure for a posthumanist theory of subjectivity that does not rely on anthropocentric humanism. Instead, it emphasizes the "unity of all matter" as a self-organizing scientifically resonant "'smart' structure of living matter (Braidotti 57)."

Spinoza's drew his immanent cosmology from the Greek stoics, and his methodology from René Descartes. Although he rejected the dualistic approach of Descartes and much of the scientific thought of the time, he used their methods to create a framework that pushed against what he perceived as the limitations of spiritual thought. In a similar manner, Braidotti calls for an enactment of posthumanist subjectivity as a means to counter the inadequate framework of humanism, and by extension the tacit legacy of purposeful teleological 'progress talk'. This subjectivity is "materialist and vitalist, embodied and embedded, firmly located somewhere, according to the feminist 'politics of location' (Braidotti 51)." Its specific location is within the

relationship of the inhabitants of the physical world, but allows for a wider inclusion of the post-secular turn, while not embracing obscurantist views. By her lights, the enactment of subjectivity situates the subject, and the agency for creating the subject, as a vital, intrinsic property of a shared materiality. The subject becomes immanent rather than transcendent, while allowing for non-secular tendencies and applications (Braidotti 52).

This animated version of the material world stands in contrast to the more traditional dualistic notions of matter as inanimate instruments, set apart from both humans and from anthropocentric purposeful teleologies. Jane Bennett contends that because the humanist tradition has been almost entirely focused on the human domain, the material world is seen as dead and outside of the human self, with objects deemed to be used as humanity sees fit. This anthropocentrism is posited as a key limiting feature of humanism and its repudiation is a major tenet in posthumanist thought (Bennett "Enchanted" xvi). A monistic, unified world view is instead put forward to countermand an exclusive fixation on human states of affairs, allowing more complex, intermingled discourses to unfold.

For posthumanist thought, recognizing the interconnected nature of subjects, human and otherwise, to the material world is crucial. In order to trace the connections between anthropocentrism, capitalism

and exploitation, we need to be able to surpass the limitation of objects as being separate from and inferior to humanity. Facilitating this paradigm change requires the idea of solid, dualistic borders to be broken down. In this adjustment, Gille Deleuze's conception of deterritorialization and defamiliarization is key. Deleuze suggests the reapportionment of the subject through what they deem the 'chaosmic' breaking down of barriers between dualistic categories. The chaosmic perception encourages the sense of being in a multiverse of interconnected becomings (Braidotti 93). To break down the territory of object is also to break down the territory of the body. This deterritorialization of bodily experience disrupts habits or 'strata' of thought and action that organize the self-image of the body in relation to and within the physical world (Bennett "Enchanted" 25). I will next examine three major aspects of this deterritorialization posited by Karen Barad that are germane to new materialist applications: matter as action; the problematizing of material boundaries; and matter as agential being.

Superficially, much of the physical world appears to be solid and stationary, the ground from which the figure of the human subject emerges. This may be the molar manner in which humans phenomenologically experience the material world, but in respect to the molecular dynamics of the properties of the physical universe,

matter is not the material from which actions are produced. Rather it is the case that material objects, ontologically *are action.* This image seems at odds with the way we experience the seeming concreteness of the physical world. Jane Bennett explains that this experience of physical solidity is rather more of an illusory effect of the relative speeds at which the human body experiences other objects with which it comes into contact. Objects whose rate of change is much slower than that of the human corpus appear to us as fixed. Those whose rate of change is faster, appear as in motion. One can envision this, by considering a rusting iron gate in relation to a burning match. The atoms of iron in the gate combine with atoms of oxygen in the atmosphere to become the molecule iron oxide. The molecules of wood in the match are also combining with oxygen atoms to produce light and heat. Both the gate and the match are undergoing a similar process of oxidation, but at much different rates. This difference in the speed of change relative to the human body is what causes us to perceive the former as being stationary and the latter as in motion, or as Bennett addresses it: "objects appear as such because their becoming proceeds at a speed or a level below the threshold of human discernment (Bennett "Vibrant" 57)."

This concept is central for Karan Barad's explication of lively matter, which constantly co-constructs the material world through

action. Approaching the question from the perspective of quantum physics, she uses Niels Bohr's principle of complementarity to lay out a case for physicality as a differential property of an ever-churning universe which is never at rest. Bohr's principle postulates that the 'pieces' of matter at the subatomic level can simultaneously act as particles and waves depending on the nature of the physical environment in which the experiment was enacted. Barad extends this to mean that the ontological physicality of the atomic world is not an inherent property of the atoms, but are themselves constituted of contextual actions. In other words, matter does not cause phenomena, matter *is* phenomena. She further directs us to reconsider the borders perceived to be separating objects, and instead allow a view of the material world not as "...independent objects with inherent boundaries and properties, but rather phenomena" (Barad 139). These relative differences in states of phenomena are a constant occurrence, consistently activating dissimilarities through action that, to the sphere of phenomena that we roughly refer to as 'humans,' appear as the physical world. When viewed in this light, the solid boundaries between individual objects begin to become difficult to discern.

Once we see matter as action, the idea of interior and exterior, or of borders and boundaries becomes moot (Barad 181). This is not merely metaphorical, but quite literally a condition of materiality via

Barad. In her view, what humans perceive to be the edges of objects are in actuality, more porous than might be expected. Upon careful examination, the clearly defined edges that humans perceive to form the outlines of physical things become diffuse. Specifically, they begin to exhibit the same diffraction patterns that particles can produce when behaving as waves. In other words, the 'hard edges' of material objects upon closer inspection, enact wave-like behavior. The boundaries of objects betray their ontological nature as phenomenal, not stationary: their hard boundaries blur to an energetic, permeable flux (Barad 156). For Barad, the active diffraction patterns are not only characteristic of the edge areas of matter, they are at the ontological core of physicality itself. In other words, matter is differential patterns of mattering; iteratively produced phenomena that enacts detectable difference (Barad 140). Mattering, in other words is composed of actions that are 'differentially enacted' on a stage of emergent possibilities, or discourse (Barad 183). Barad identifies these actions as 'material-discursive practices,' that enact "specific material (re)configurings of the world, through which the determination of boundaries, properties, and meanings are differentially enacted (Barad 148)." They are things as actions that iteratively produce differences that cause subjects and object to emerge (Barad 143).

If differences are enacted iteratively by everything, then all matter enacts action an influence in relation to everything else. In other words, objects have agency. This is especially important to Barad's agential realist depiction of the material world, in that by recognizing the effect that objects have within the physical active continuum, it shows matter to be an "active participant in worldly becoming (Barad 136)." Changing the understanding of the agential association between objects, also changes the perspective of ownership and utility in terms of the relationship between humans and the material world. Collective agency as seen in this manner transforms objects into doings, calling into question their status as inert possessions and bringing to the fore an acceptance that agency not just human. This is not to say that humans do not have a significant part to play in the physical world, but the role they do play should allow for a conception of the human body as but one site in a constant co-construction of a materiality with fuzzy borders. This casts a markedly different shadow than 'man as the measure of all things' that is bound up in the humanist tradition (Barad 172).

Although definitive border separations are not inherent and fixed, they are not illusory either. The point here is not to eliminate difference, but to take account of the actions made by humans and nonhumans that enact these boundaries (Barad 136). Moreover, if physical edges

are no longer to be seen as permanent and non-porous, our grappling with boundaries can act as a point of entry into questions of meaning that are also produced by the differential responsiveness of material-discursive border practices (Barad 149). The question of meaning becomes especially salient when more extended boundaries are taken into account. When interactions with the material world are opened to overlap between humans and things, then material tools become more than mere instruments, but "boundary-drawing practices - specific material (re)configurings of the world…[that] create boundaries between humans and nonhumans, culture and nature, science and [the] social (Barad 140).

In light of the active, troubled borders and interactions within the world of objects, the active, troubled borders and interactions of the larger sociopolitical sphere appear as a logical cognitive extension. The porous borders between my hands and my computer, for example, are not limited to two bifurcated objects. Their interaction extends immensely further in scope and complexity to include an immeasurable universe encompassing of all the actions that, through their physical traces, led to the present state of the materials that constitute the possibility for their connection. A small sampling of these actions includes: the production of the raw materials from which the computer is manufactured (the mining, processing delivery, etc. of components

and parts); the wider system of capitalist forces that compel the production of commodities and the actions performed on them; the workers whose labor produced and assembled the objects, etc. (Barad 143). To take to heart material-discursive border practices is to consistently open oneself up to the totality of the sociopolitical and more, when confronting the material world. In other words, political power is not a force acting on the material world from without but is, like matter itself, an immanent property of the "dynamic and shifting entanglement of relations" of material agency (Barad 225).

As a part of a radically immanent universe, matter also has agency in constructing the political subject. Karen Barad points to Leela Fernandes' study of the power dynamics between the workers, managers, and machines contained in a Calcutta jute mill. She finds a delicate interplay of power relations between all actors in the situation, including the machines. She describes the relationship of humans and objects as enacting differences in the physical nature of the configuration of the jute factory floor, in which the agency of the humans and non-humans collectively has an impact on the physical and the political. The actions of a neglected machine's malfunctioning, for example, opens the possibilities for consequential reactions that included the workers being given a day off, a worker being injured, other workers being compelled to work faster, etc. She further points

out the material traces of systemic production practices also have the potential to co-produce social actions. Specifically, she highlights the arrangement of the machines in the jute mill as being enacted to maximize space and productivity, but also allowed for the workers to be in close enough proximity to organize (Barad 239). The jute factory exemplifies the potential of human and non-human entitles to contribute to the materialization of power through their co-construction of bodies, identities, and subjectivities discursively produced in the physical manifestation of the shop floor. Like the iterative enactment of matter via the differential commingling of varying states of phenomena, political and economic power can be seen as being similarly produced by a differential comingling of bodies and objects on a larger scale. Like objects, power is also a 'mattering': a doing that is physical as well as social, a "dynamic and shifting entanglement of relations, rather than a property of things (Barad 225)."

Within this explication of power, we can see similarities to Marx's construction of the reified body. That is, that the value embedded in commodities is present within the objects themselves as a sort of crystallized form of labor power (Wendling 118). This identification of a commonality between human and non-human objects via agency, allows for the consideration of commercially-produced objects as sites where human subjectivity embeds itself within the non-human physical

world. The scope of a new materialist conception of reification goes far beyond Marx's discourse of capital. Where Marx is chiefly focused on economic concerns, new materialism urges us to push past the compartmentalization of specific areas of interest. Instead, the frame is widened to bring into view the recognition of a vast system of entangled interrelationships between subjects and objects, producing power relations as they produce physicality. Seen in this way, the actions and materialities of bodies, labor and objects can be considered as part of the technology of capitalism in further relation to the totality of interrelated social and political frameworks (Barad 237).

As a system within the larger entangled chaosmos, capitalism also generates difference. Similarly, capitalism also has agency. However, in contrast to the agential differential practices of matter in the physical world, the meta-system of capitalism is guided by a primary purpose, namely the reification of the physical world for the generation of profit. Demonstrating that material agency can be malevolent as well as benign, Rosi Braidotti puts capitalism within the posthuman framework as a machine that "actively produces differences for the sake of commodification (Braidotti 58)." She further describes the most central aspect of contemporary capitalist structure as being techno-scientific in nature. The discoveries generated by scientific discourse fuel new technologies, commodities, and methods

of profit generation. The momentum of this history of progress-driven desire to discover, innovate and profit, portray contemporary capitalism as a system of difference that "both invests and profits from the scientific and economic control and the commodification of all that lives (Braidotti 58)."

The acknowledgement of capitalism and other systems as being interrelated and entangled within a larger discourse of material-agential difference, also offers the possibility that capitalism, like any other system is part of an endless array of possible (re)configurings of agential mattering. Thus, the posthumanistic turn allows for a shift in theoretical potential that makes possible reactions to and corrections of injustice that gets missed when solely focused on human agents (Barad 239). In other words, matter as active agent not only allows the physical world to emerge through action and difference, but by nature of its entanglement with the larger totality of meta-systems, also indelibly attaches itself to ethics.

Inversely proportional to complicating the expectation of physical boundaries between objects and actions; is the recognition of the inseparability of physicality, active change, and ethics. One cannot address the material world without simultaneously addressing the principles of practice that are immanent within it. Barad refers to this extended consideration as ‘ethico-onto-epistemology (Barad 70).' She

further cites Emmanuel Levinas in locating within the recognition of difference, an acknowledgement of shared responsibility. In doing so the tendency for anthropocentric individualism is attenuated by the acceptance of a materiality in which '"proximity, difference which is no-indifference, is responsibility (Barad 391)" To recognize the Other, regardless of physical form, is to recognize an entangled ethics that extends beyond the human realm. This differentiation is not about identifying an interiority and exteriority to ourselves, but about the recognition of the agency assumed in the production of separateness. Caught up in that agency are our own actions and ethics: "Being in one's skin means that one cannot escape responsibility (Barad 392)."

In sum, humanist philosophical traditions can be viewed as the distant echoes of ancient ideas of divine and secular purposeful direction of a view to the physical word that privileges humans. Because these traditions rely on a transcendent agency of some type (divine, natural, etc.) they set up barriers of interiority and exteriority: (humans from nature, God from humanity, objects from subjects, ethics from objects, etc.) These boundaries have historically informed tendencies toward exclusion and the abuse of power, as seen in the history of colonialism and genocide in the West.

Karen Barad's reading of particle physics would demonstrate that even our assumptions of seemingly simple, natural boundaries are

largely misunderstood. In her understanding of the physical world, the borders between objects break down into active diffraction patterns, rendering separateness between objects moot. This indicates that the nature of matter is based on phenomena, not stationary components and that the appearance of solid and other material in the world is the result of differences in the states of action in a given area.

Accounting for this, prompts some reconsideration regarding the nature of agency and subjectivity in the physical world. Because the physical realm is actively generated by everything within it, matter itself has agential power on a par with the ability of any other physical state of being to determine the cut between subject and object. In exerting agential power, objects contribute to the creation of difference, which is porous and unstable. These porous boundaries extend to molar as well as molecular systems. As a part of this extended, immanent system, human ethics are also co-emergent with objects.

In order to account for a changed physical paradigm, different posthuman philosophical perspectives are called for to push against the legacy of humanism. These includes new and widened definitions of the subject that take into account the simultaneity between action, difference, materialization and relative position. This allows the idea of subjectivity to have a resistance to essentialistic individualism and

enable "new micropolitical and microsocial practices" (Bennett "Vibrant" 114).

To redefine the location of the human self in co-relation to active non-human agents, is to redefine what it means to be human. This can cause a certain sense of anxiety in human subjects, who can perceive the recognition of humans as but one emergence within a multitude of emergences, as a call for the marginalization or negation of humanity. This is not necessarily the case, however. New materialist thought does not call for the dissolution of humanity, only for a reevaluated understanding of the nature of humanity (Braidotti 101). That is, a humanity that understands the human self as being an immanent part of the 'natural' world, which is interior to a human body inextricably entangled with non-human objects. With this sort of understanding, humans can proceed and interact with other non-human emergent assemblages in a manner that respects this shared ontology and interest, like "unruly relatives" with whom we share familial bonds (Bennet "Vibrant" 116). Viewed in this way, a new materialist account of the universe is strikingly monistic, but this does not correlate to the elimination of the subject, human or otherwise. There needs to be *some* kind of subjectivity, including the human variety, and the redefinition of the self in a world of dynamic boundaries can be sustained though the rejection of subjective extremes, from individualistic exploitative

anthropocentricity on one end, to obscurantist holistic spiritualism on the other (Braidotti 103). Within these limitations, the bounds of personhood are left open to the prospect of including "more earthlings in the swarm of actants" that can be engaged with respectfully and strategically (Bennett “Vibrant” 111).

A new materialist attention further has the potential to activate an augmented perception of the self within larger economic and political contexts. To perceive objects as co-actors in a discourse where human goals are attenuated, and our perceptions of nonhuman actors are heightened allows us to "consult nonhumans more closely", and be more attuned to what they may be telling us about larger entangled human-driven and organic systems: to consider smaller emerging agential assemblages within larger emerging agential assemblages within a system that is itself agential. To see, for example, the assemblage of actions that lead to obesity as a co-emergent property of biological need, advertising, fast food companies, the beef industry, increased CO2 production, and global warming. To include large scale organic and artificial actions as other forms of active assemblages, acknowledges these agents' ability to act as a collective voice, reflecting the actions and consequences of the sociopolitical and economic systems on which we and many other organisms currently rely (Bennett “Vibrant” 108).

Chapter 4: Enchantment and Technology

A critique often leveled at new materialist theory is that it lacks an obvious mechanism to connect it with direct action within the human sphere. Taken at face value, many new materialist / posthumanist conceptions seem to lack a degree of traction necessary to put them into play in our collective lived experiences. In other words, now that we take into account the entangled nature of matter, subjectivity and ethics, what is to be done with it? How exactly do we proceed in a way that takes these concepts into concrete lived actions? It is to these questions that Jane Bennett's conception of enchantment can be put to use to provide an additional layer of perception, and bridge the theoretical understanding of the vibrant, agential material world into everyday interactions. Specifically, our interactions with digital and other technologies.

Jane Bennett describes a prevalent view of modernity as consistent with progressive views of temporal change. These views exhibit mechanisms in line with incremental progress, albeit in different directions. One view, sets modernity as emerging from a 'dark,' superstitious premodernity into a rational, improved present: it portrays progress as proceeding from a previous negative state to a current, positive one. The converse view, that the modern world has somehow lost touch with a preternatural 'golden age' of oneness with the natural world, also exhibits the hallmarks of incremental progress, albeit in the opposite direction (Bennett "Enchantment" 3). Both views posit the contemporary moment as one that is lacking in spiritual connection to the world. In positive estimations, a sense of superiority exists in the present for vanquishing inferior premodern superstitions and ignorance. This is tempered, however, with a sense of nostalgia for the loss of magic and spiritual connection with the physical world: the emotional price for the loss of the premodern everyday supernatural. Anti-modern holdouts exist, but these positions are often viewed as obscurantist mystics and tend to be marginalized (Bennett "Enchantment" 57).

Bennett dubs this modern discouragement against affective attachment to the physical world 'disenchantment.' She claims that although the Christian syncretic transcendent views that guided Western thought were hierarchical and teleological, they did provide a

system of ethics and meaning to life, portraying a concrete model of the natural world and humanity's place within it. The gradual replacement of religion with the belief in science and technological progress, promoted a viewpoint of the world that left a vacuum for meaning and affectation. In this way, Bennett depicts modern science and Western religions as collaboratively contributing to 'disenchanting' modernity (Bennett "Enchantment" 62). She further positions this sense of disenchantment as a major obstacle in perceiving and engaging with the material world in a way that is more in line with new materialist agential principles.

In contrast to disenchantment, Bennet presents the possibility of a renewed sense of enchantment in line with modernity, that may be more easily reintroduce into our lived experiences. She refers to this practice as a sort of quotidian sense of sublimity, enabled by a renewed, new materialist understanding of the material world. This sense of enchantment is a functional point of entry for reintroducing the familiar with a sense of wonder. To be enchanted is "to be struck and shaken by the extraordinary that lives amid the familiar and everyday. (Bennett "Enchantment" 4)." The enchanted materialism she describes is one that can also work against the lingering legacy of change and meaning associated with a purposeful, designed, teleological universe (Bennett "Enchantment" 10).

Bennett claims many forms of enchantment, but outlines three basic types that are variously related to teleological views of nature. The first is a divine Aristotelian Christian cosmology, in which all things in nature have a teleological purpose embedded within them by a transcendent creator. This form of enchantment sees the natural world and matter as being evidentiary of the work of the Godhead, and by extension is imbued with divinity in its own right.

The second reflects what Bennett refers to as the Kantian view. In this perspective, the induction of telos is more aligned with Platonic immutable and unreachable forms. Kant referred to this as the noumena, the divine 'thing as such' or actual nature of the universe, which humanity could only experience phenomenologically, through their limited senses. Here, the limitations of human phenomenological interpretations of whatever noumenal teleology may be present in a given natural form, prevent the viewer from making any absolute judgement regarding the final causes of the process at hand. However strongly a telos may appear to be present, it is always tempered by the understanding of the inaccessibility of an unknowable noumenal reality.

Bennett puts forward a third type of enchantment based on Gille Deleuze's conceptions of deterritorialization and becoming. In *Logic and* Sense, Deleuze extends the consideration of change to one that

includes both the forward and backward motion of time. He uses the example of the operation of Alice's change in size within the world of looking glass after eating a small cake. Deleuze describes her alteration as one in which, during the process of change, Alice is continually larger than she once was, but smaller than she will be. Deleuze deploys this tactic to deliberately "elude the present" and introduce a sense of ambiguity of time during the process of change (Deleuze 1). Once the action has ceased, it is no longer a becoming, but becomes a stationary matter of fact. The sense of becoming, then, refers to a defamiliarization of the sense of time associated with active change, and produces a sense of self as an 'infinite identity' in relation to the objects and actions considered (Deleuze 1). Deleuze embraced an application of schizophrenic logic, enabling the act of becoming to encompass radical extensions of the self as enjoined with objects and actions far removed from the human subject.

Bennett points to the uncanny nature of this upending of time and change, as fertile ground for a sense of fascination to flourish. The disruption resulting from the Deleuzian 'becoming the Other' can open up a point of entry for wonderment and enchantment. In its radical timelessness, Deleuzian becoming eliminates the expectation of telos altogether, as it compels the redefinition of normative experience. It is this uncanny anti-teleological redefinition that Bennett seizes upon as a

seedbed for techniques of modern enchantment (Bennett "Enchantment" 48).

She accomplishes this by linking the disruptive mechanism of becoming with Deleuze and Guattari's conception of the *vital impulse*. Deleuze and Guattari position vital impulse as an agential force immanent to matter that produces emergent patterns in relation to the rest of the material world. They likened this to biological evolution by natural selection, due to its relational nature with its environment. (Deleuze and Guattari 407). Recalling the Victorian conception of vitalism as a force unique to living things, Deleuze and Guattari extend the vital life force to be compatible with the conception of matter as action (Bennett "Vibrant" x). In new materialist terminology, one could view this material vitalism as a way of considering Karen Barad's action-based material world of difference, to be itself an emergent life force. For Bennett, the use of vitalism as metaphor rejects the inherent dualism of the Victorian notion, but embraces its potential for allowing an understand of matter as animate and in some way, alive (Bennett "Vibrant" xvii).

In this way, vital materialism enfolds a deliberate portion of anthropomorphism into its cosmology. It does this to work against the entrained notion of dualism and utilitarianism with which humans tend to view the material world. This is done with a sense of caution against

viewing the nonhuman as being in some way divine, or in a superstitious, romanticized manner. Instead, it is meant to enable, in a practical way, the taking-in of the material world as being not so different from the self, and by doing so, temper the tendency for interpreting the human 'living' subject as being distinct from an inert, 'dead' material world (Bennet "Vibrant" 120). Bennett points to this tendency for anthropocentrism as reinforcing purposeful progressive narratives of conquest and consumption, by cutting off the willingness to accept how much 'thingness' is embedded in 'human-ness' (Bennet "Vibrant" ix).

Although opposition to anthropocentrism is a major component to vital materialism, Bennett points out the futility in the attempt to completely eliminate the tendency for humans to privilege the human self above the non-human Other. To some extent, this is a perfectly understandable tendency borne of the physical consequences of the human body. The vital actions of life-sustaining functions like health and survival, will tend to take priority over the needs of a greater human to non-human alliance. The sense of self-preservation is too great and will not allow one to "'horizontalize' the world completely (Bennet "Vibrant" 104)." Ironically, to do so could be viewed to be an anthropocentric act itself. If we accept the tendency for self-preservation as a necessary instance of self-centeredness in all living beings, in order to promote an

attenuation of this in humans, it necessitates an expectation of humans to act in a way that differentiates them from the rest of biological world. Indeed, Bennett does not call for the elimination of difference between agents, but a recognition and respect for these differences while extending an effort toward a view of the interdependencies of agential matter. The making-porous of borders allows the material world to leech into the conception of the human body, and the human body to open out onto the rest of matter.

Vital materialism then, does not disregard self preservatory tendencies, but seeks to augment them with a sense of shared affinity with the material world in "a polity with more channels of communication between members (Bennet "Vibrant" 104)." In this regard, human self-interest is not negated, but enhanced by expanding the definition of self. If the human self becomes a heterogeneous assemblage, then human self-interest becomes a collective rather than individual concern. In this view, the human body becomes confederate with non-humans, and human self-interest becomes bound up with the interests of the rest of the material world in congress. The voice and power of nonhuman actors becomes amplified and all, including humans, are better for it (Bennet "Vibrant" 22).

In response to an expanded, monistic definition of self and self-interest, a deterritorialized, expanded definition of the non-self is also imperative. To be aligned with these principles requires the rejection of the legacy of dualistic separateness between the human subject and a so-called 'natural world'. A consideration of the self as an immanent assemblage of the non-human requires a redefinition of what was previously understood as environment or 'nature' to include the 'unnatural.' Specifically, technological objects.

Rosi Braidotti reflects this position in pointing out that a vitalist view of the material world in which self-organizing, living matter is fundamentally entangled with non-living matter, also compels the understanding of technological and informational systems as a relational part of that assemblage (Braidotti 64). In this sense, technological objects and systems become part of what gets considered as environment; technology becomes the new nature. In doing so, Braidotti recalls the material vitalism of Deleuze and Guattari, and frames the technological as a productive non-teleological material process: "The technological apparatus is our new 'milieu' and this intimacy is far more complex and generative than the prosthetic, mechanical extension that modernity had made of it (Braidotti 83)."

The conception of technology as nature becomes especially evident when the definition of technology is not limited to electrical or

electronic devices. For example, in terms of material composition, a mobile phone can appear far more removed from the natural world than a simple hammer. It is not so challenging to project an image of the 'natural' state of the hammer's wooden handle to a tree, or the iron head to the ore. The phone, being far more complex, poses more of a barrier to be seen as being of a kind with a living ecosystem. Despite this, the phone, like the hammer is also an emergent product of the same active immanence of which all human and non-human objects are a part.

In this context, the technological object rejects the notion of being the sole creation of an individual human commanding their environment in order to hew a tool with which to more efficiently dominate nature. Instead, it emerges as a byproduct of the immanent differential reactions of the tool user within the larger material world. In other words, like matter, the technological object is also emergent, differential action.

Medieval historian Lynn White, Jr. describes the centuries-long process by which the mechanical crank emerged into common use. He traces the earliest record of this technology to a water bellows of Chinese origin from approximately 31 BCE. Despite isolated instances of similar applications of the idea of the crank, the concept did not reach widespread use in Asia until the12th century, and was not incorporated

into 'industrial' use in Europe until the 14th century, when the idea was applied to circular grindstones. After this period, the concept of the crank quickly spread with the new design. White suggests that the extreme delay of almost 1300 years before this simple device found widespread use, was due to the difficulty for humans to assimilate the mechanics and motion of the crank in relation to their normative bodily movements. He points to numerous technical illustrations of crank-based engineering projects and tools from this period that mechanically misunderstand its operational workings. In other words, not only the uptake, but the functional understanding of its actions was directly inhibited by the material functioning of the crank relative to human action.

White illustrates this object-to-human interaction by following the development of a common household tool. For centuries prior to the 1400s, Eurasian inhabitants used grain-grinding devices called querns. These were typically made of a flat stone base and heavy circular stone on top ,with a wooden dowel inserted horizontally. Grain was placed in the central space of the stone, which was operated with a back and forth alternating motion, grinding the grist into meal (figure 4.1). At this time, it was assumed that the weight of the stone was essential to the operation of the machine, and larger, heavier stones were generally chosen.

Figure 4.1: Quern with horizontal handle and larger stone. Linda Spashett, 2009.

Over time, it became understood that the grinding of the grain relied as much on the shearing action between the stones, as on the weight of the upper grinding stone. Quern builders gradually incorporated this fact and moved toward flatter, lighter millstones to save effort and material. As a result, the vertical surface area of the millstone decreased, making it increasingly difficult to insert a dowel horizontally without weakening or breaking the stone. Because of this, dowels gradually became angled more vertically, until it assumed the shape and function of a simple crank (figure 4.2).

Figure 4.2: Quern with vertical handle. Chaojoker 2010.

White portrays this process of change in the design of the device as being a co-operation over time between the human body and the material nature of the nonhuman world. He claims the placement of the vertical handle reflects a natural inclination of the materiality of the human body towards reciprocating motion rather than circular. It was not until the millstone became too thin to support the back-and-forth mechanism that the circular motion emerged. This change resulted as much from the materiality of the millstone as from the physical inclination of the human quern builders. It was not the brainchild of a sudden 'innovative' moment of human domination of nature, but of a gradual evolution (in the non-teleological Darwinian sense) of the device through the entangled action of human and non-human

materiality. Whyte describes this as a sort of gradual compromise between the motive inclination of the human body and the normative agential motion of nonhuman objects:

> "Continuous rotary motion is typical of inorganic matter, whereas reciprocating motion is the sole form of movement found in living things. The crank connects these two kind of motion; therefore, we who are organic find the crank motion does not come easy to us. "...we find the rotary motion an impediment to the greatest sensitivity. … To use a crank, our tendons and muscles must relate themselves to the motion of galaxies and electrons. From this inhuman adventure, our race long recoiled." (White 115)

Although clearly dualistic to an almost adversarial degree, White nevertheless outlines the story of technology as a space that alludes to a sense of animation and agency on the part of the material world. Despite the apparent incompatibilities inferred between human and nonhuman, White portrays technology as uniquely positioned to act as an intermediary between the human-nonhuman boundary. The agency of the object in question plays a large part in the process of change regarding design. The gradual deeper understanding of the material nature of the stone developed through practices in relation to the physical properties of the grain and the needs of the human subject. In other words, the technology of the quern developed not through a deliberate sense for immediate change, but gradually,

through action that was cooperatively enacted by the human and nonhuman agents.

Like Karen Barad's action-based ontology of the physical world, technology is perhaps also best understood as consisting not of things, but of actions and relations of actions to actants. This understanding of technology as a *doing* that emerges from complex extended action, takes into account the intricate relationship between objects and subjects, allowing for a fuller account of technology that resists the inference of telos. Viewed in this light, technological action and change is in direct relation to the manner in which objects and organisms affect change in each other over time. In this way, technological development can be viewed as being akin to non-purposeful non-teleological evolutionary change. To be clear, this evolutionary likeness is fundamentally at odds with the sort of purposeful, incremental bettering associated with the legacy of technology within the scheme of progress. Rather, technological change can be regarded as a single aspect of the actions that result from the interactions between living and non-living beings. The technological process then, becomes a sort of symptom of life: not something exterior to humanity or objecthood, but an immanent layer of action within other immanent actions.

The use of tools by non-humans provides another possible reflection of this effect. In a study published in 2000, ornithologist Gavin Hunt describes his observation and recording of a species of crow native to the New Caledonia island off the east coast of Australia. His research revealed that the crows routinely fashion their own implements to reach food sources from their surroundings. The birds take up dead leaves and strip them down, so all that remains is a single spine ranging from 10-20 cm in length. These the crows insert into the bore holes of decaying candlenut trees, which long-horn beetle larvae occupy. A larva interprets to the leaf spine as prey, and grips it with its mandibles, allowing it to be drawn out and subsequently eaten by the crow (Hunt 109). The crows re-use the same twig, or fashion new ones as they continue their feeding behavior. This type of tool use is not unique to corvids and has been seen in other Aves as well as Primates.

Unless the crows are considered to possess some sort of transcendent knowledge, it seems reasonable to view the production of their twig technology as an emergent property of the agential interactions involving the living and non-living objects of the New Caledonia region. The tool use of the New Caledonian crow then, developed as a result of the lived action of the crows over time with the material objects within their milieu.

The action of the birds' activation of their tools occur in concert with the agential, active states of the other living and non-living matter in which they exist. The grub evolved a certain agency that allowed it to interact with potential prey; the candlenut tree agentially interacts with sunlight through its spiny leaves; and the Crows cooperatively interact with these agential changes. Similar to the way in which objects can be said to exist only via relational action that causes difference, the technological aspect of objects demonstrate an emergent property of their actions relative to other objects and actions. Within this context, the objects used by the crows can be seen to become tools, not by a fundamental aspect of their physical nature, but in the moment of their agency, in concert with the actions of the insects. Both in terms of the change from leaf to twig, and from twig to grub-acquiring instrument, the object as technological object only emerges through the entangled interrelated field of actions and actors. Apart from the active engagement as food-procurer, the actors involved are free of this particular technological action. Before the action of making the tool, the object is only a leaf; after it has been used and discarded, it is only a leaf spine. If Barad defines matter as an active *mattering,* then technology can be viewed to emerge when distinctive matterings technologize. In other words, technology as

subject appears when "material arrangements enact an agential cut between subject and object, makes them emerge (143)."

The emergence of the technological subject is also reflected in the physical change that the technological act imparts on the material world. The process of technologicalization alters those included in its operation. The physical change implied in the technological act leaves behind a ripple through its actions that enacts a corporeal exchange between the agents involved. Jonathan Sterne, in describing Bourdieu's conception of the habitus, poses technology as being at once socially and physically constructed as the "crystallizations of socially organized action (Sterne 367)." As such, it can be understood as reflecting the physical states of being at play during technological action. When not technologically active, the material components of tools bear the imprints of change imparted upon them by the actions of active beings. This aspect becomes especially meaningful when considering manufactured technological commodities.

Objects created for consumption also bear the effects of the physical interrelationship of events, objects and bodies, that can be read as a demonstrable trace of the consequences of late capitalist production. The commodities in question leave imprints, not only of the intentions of the movers of market forces that instantiated their production, but of the physical conditions of the producers and the

impact of production on the lives of human subjects. Likewise, the conditions of their manufacture, and the agents involved leave their marks on the objects as well. In this way, the commodity itself becomes a sort of palimpsest of bodies, actions and objects within the discourse of capitalist production.

Marx described this physical suspension of action, power and matter as an effect of 'frozen labor' that is suspended within the technological object (Wendling 118). In this sense, the object ceases to be a distinct and static body unto itself and instead becomes a repository for the ghosts of reified labor to leave their traces on the objects they create at the very point of their reification. Marx scholar Amy Wendling describes this fluid interrelation between objects agencies and discourses thus:

> The material continuity between human and machine is the precondition for a kinship between the two. If humans and machines are set against one another as contrasting terms, this kinship is less visible. In the manner of all capital, both humans and the machines with which they work can be reduced analytically to a frozen form of past labor: that is, dead or objectified labor, as Marx calls it. Laboring humans are the product of the (often-limited) surplus energy of worker parents. Machines are the product of the surplus labor of generations of workers and technicians channeled into scientific innovations. (Wendling 122)

A vital materialist assessment urges us to recognize mass produced technological objects as not only the products of human

interactions, but *as objects that are ontologically partially human.* In other words, they are not only the traces of the human agents that come in contact with them, they are, if only in their reflection of a negation of presence, human in their own right. It should be noted that the application of strategic anthropomorphism should be used judiciously. The intent is not to 'allow' objects to enter the human realm, but to utilize the human tendency toward self-interest to open up a sense of enchanted commonality and respect toward the material world and the fate of non-human objects. The human experience of wonderment associated with often seemingly mundane objects may help to promote moments of joy that recognize a sense of ethics intrinsic to materiality. In embracing such a personal and ethical conception of matter, the conception of obsolescence becomes difficult to maintain. In the following chapter, I will outline specific instances and applications of the use of an enchanted, new materialist perspective to promote interactions with digital audio technology that push against anthropocentric obsolescence.

Chapter 5: New Materialism in Practice

The position of the digital artist or musician within the context of the consumption of technological commodities offers up some important challenges. To utilize technical devices for creative, expressive ends is also to contribute to the cycle of production and obsolescence involved with global capitalism. A serious consideration of the position of the digital artist within this framework necessitates an ethical examination of the merit of the work produced in relation to the overall waste and exploitation that the connection to technological commodification entails. At first glance, there seems to be little ethical space for the creative technological act. When confronted by the scope of the power structures involved, the most obvious reactions are to cede to the futility of the expressive effort and simply cease producing work, or to be overwhelmed by the enormity of the task, and cast aside responsibility as being beyond reach. How does an

electronic musician or digital artist come to terms with the results of her actions as an expressive being in relation to the actions of the beings who sacrificed to create the tools of her trade? How does one begin to come to terms with the process of technological obsolescence that compels further production?

The embrace of an enchanted view of technological production can act as a means to address the larger contextual issues surrounding the technology involved in the creative act. An anthropomorphic view of the technologies that enable modes of expression can facilitate a more personal connection with the devices used, and can push against the overwhelming aspects of facing up to the totality of late capitalist modes of production. Furthermore, this enchanted, humanized view of technological devices can also be instrumental in providing a view of technology that resists the tendency toward latent teleologies of progress. The following is an account of how an enchanted perspective can be applied to expressive uses of audio technology.

Enchanted materialism cherishes moments of delight resulting from the unexpected results of the agency of objects. In this view, the patterns produced by a malfunctioning piece of audio technology can be received in the same light as a composition of a human agent. The output of the object in this situation is not taken as a malfunction at all,

and the object moves from being broken to being treasured. This perspective also prompts uses of sound technologies in ways for which they were not designed, in order to search out enchanting results from the machines.

Jane Bennett highlights the etymology of the word enchant as being derived from the French word meaning 'to sing.' She further relates this frame of mind to one that promotes enchantment, the affordance, through anthropomorphic channeling, of expressive agency to objects. Bennett frames this in a metaphorical light, but in the sphere of audio production, it takes a more literal tack. Placed in feedback, electronic audio devices have the capacity for creating and altering sound in infinite, unpredictable ways. The methodology to heighten the sonic agency embedded within audio objects is also alluded to by Bennett via Deleuze and Guattari's description of the refrain as a complex entangled action that "turns back on itself, opens onto itself, revealing until then unheard-of potentialities, entering into other connections, setting [things]...adrift in the direction of other assemblages (Bennett "Enchantment" 6)." To enfold and turn back audio signal upon itself is to create a self-expanding and often unpredictable state of active signal path characteristic of audio feedback.

Audio feedback has a history that is intrinsically linked with amplified sound itself. Almost all audio amplifiers use some form of feedback in their operation. That is, in order to properly amplify an electronic audio signal, part of the signal needs to be reintroduced within the amplification mechanism to improve stability and bandwidth. Amplifiers typically do this without adding any more gain to the system than if the feedback was not present. This net lack of overall addition of amplification informs its name: negative feedback. A different type of feedback, known as positive feedback, or the Larsen effect, occurs when an amplified audio signal that has passed through the final amplification stage gets re-introduced to the signal chain, resulting in recursive amplification of the signal, until differences in the frequency response of the system become expressed as audible tones. If a given amplifier tends to respond more to frequencies around 6000 Hz, for example, the effect of putting it into a positive feedback loop will likely be the production of a 6000 Hz tone. This is the type of feedback normally associated with the ringing tones produced while 'mic checking' a PA system.

Positive feedback tends to be highly unstable, and has historically sought to be eliminated by designers of audio equipment, performers, and recording engineers. The use of positive audio feedback as a means of generating musical source material dates back at least to the

mid 1950s with the work of Nicolas Schöffer and later Roland Kayn (Patterson 48). In popular music, the use of the electric guitar as a generator of feedback-based audio has been popularized by artists like Jimi Hendrix since the late 1960s, and is a continued presence in guitar-based popular music styles. In more academic electroacoustic forms, the use of positive audio feedback was taken up in earnest in the 1960s by composers like Alvin Lucier, Gordon Mumma, and David Tudor, to name a few (Sanfilippo & Valle 12).

More recently the practice of using the mixer as a generator of audio material has been put into the public consciousness by noise musician Toshimaru Nakamura. After playing electric guitar in an improvised rock group, Nakamura became frustrated with the volume and contextual limitations of playing within the traditional rock instrumentation. After performing solo guitar, he moved to using the mixing board as a musical performance instrument in 1995. His process, which he calls 'no-input' mixing, consists of creating positive feedback loops within the signal chain of the mixing deck. That is, he was not vibrating the air and re-introducing the signal via a microphone or magnetic pickup, but directly connected audio cables form the output jacks of the mixer into various input possibilities, which he could further vary by altering volume and EQ parameters in real time.

Needless to say, this is not the manner in which the audio mixer is typically designed to be used, and heightens the chaotic nature of the type of positive feedback produced by open-air propagation. This quixotic property of the sound produced, meant that he could no longer claim to be in complete control of the operation. In order to instigate no-input performance, Nakamura had to give up a large measure of agency to the machines and the internal feedback system, adjusting his own actions in response to them. This change of power dynamic was a welcome one for him:

> I think I find an equal relationship with [the] no-input mixing board, which I didn't see with the guitar. When I played the guitar, "I" had to play the guitar. But with the mixing board, the machine would play me, and the music would play the other two [band members], and I would do something or maybe nothing. … for me, [the] no-input mixing board gives me this equal relationship between the music, including the space, the instrument, and me. (Nakamura)

This type of deliberate identification and cultivation of the agency inherent in nonhuman objects is directly in line with new materialist modes of thought relating to the defamiliarization effects of an enchanted view of audio technology. This type of exploratory approach to audio technology as an agential partner in collective activity is in line with what Deleuze and Guattari suggest as a type of analog to scientific experimentation that leads not to a total

disorganization, but to results that are "joyful, hybridized and content rich" (Bennett "Enchantment" 25). These human / non-human collaborative exercise explores through action, the possibilities of the chaotic recursive soundsphere. The expectations of the results of individual changes enacted by the human participant, produce consequences that are often unpredictable, blurring the boundary between actor and actant. This unpredictability produces a sense of surprise and enchantment at the encounter with a non-human agential Other made plainly audible by the feedback manipulation process (Bennett "Vibrant" 27).

Bennet further points to a sort of extended phenomenological understanding afforded by the process of enchantment. She points to Diana Coole's reading of Merleau-Ponty's phenomenology of perception as one that counteracted the anthropocentric tendencies of phenomenological understanding and opened it up to "agentic contributions made by an intersubjective field" of a "spectrum of agentic capacities" that were sometimes housed in humans but also could be seen in extended systemic actions and objects (Bennet "Vibrant" 29). Dylan Trigg also pushes against the phenomenological as being exclusively a human domain, and categorizes this expanded consideration as 'unhuman phenomenology' or 'xenophenomenology" (Trigg 6). Although his application is directed toward the abject Other

involved in horror fiction, the identification of the abject as having an experience and agency that is relatable to and collectively part of one's own, is crucial to an enchanted view of musical electronic audio feedback.

In my own practice, I deliberately use the technique of 'no-input' mixing, but the objects involved are strictly limited to the use of 'obsolete' or broken electronic devices. The use of these objects is not intended as an effort toward any kind of generalized ecological movement or 'upcycling' concern, but to push against the systemic tendency toward obsolescence informed by models of purposeful progress and misinformed evolutionary constructs. As definitions of progress are relational, so are definitions of obsolescence.

My practice deliberately address three broad areas of obsolescence: the cooperative agency of technological audio devices within the milieu of the aforementioned audio feedback, a potential for meaning that takes into account the socioeconomic functions for which the objects were designed, and a personal anthropomorphic sense of connection and responsibility that can result in viewing the objects as bearing the traces of the bodies that contributed to their manufacture.

Without restating the previous explication on feedback in relation to enchantment, the phenomenological view of audio devices in

feedback positions them as being fellow musicians, capable of unexpected change and growth. Viewed in this way, the value system and functionality that would inform their consideration as being obsolete, becomes unmoored from the objects. Regardless of their intended purpose or operation, the internal space of the feedback loop accomplishes a very real activation of the boundary troubling practices of Karen Barad and Jane Bennett. When many devices are put into feedback within the same mixing console, it often becomes impossible to discern which object is affecting another, and how a specific human-directed change will affect the outcome. Within the feedback pool, the devices act as one, regardless of the intent behind their construction. In this way, their co-operative action belies any presumption of their designed use value. The dissolution of active agential boundaries also alters their capacity to generate meaning. Once in the feedback loop, they no longer are limited to a specifically intended function, and the related parameters of obsolescence fall away.

The second area of operation against obsolescence relates to the extended understanding of connection to the structural apparatuses that affect what commodities become produced, and subsequently absorbed by global capitalism. In other words, to consider audio devices as being the products of and actants within large-scale

systems that include capitalism, national boundaries, political movements, etc. In this sense, objects are intrinsically interlinked within a vast array of mutually co-creative actions and objects. Bennett provides a brief illustration of this systemic setting in her description of a new materialist understanding of an electrical power grid:

> To the vital materialist, the electrical grid is better understood as a volatile mix of coal, sweat, electromagnetic fields, computer programs, electron streams, profit motives, heat, lifestyles, nuclei, fuel, plastic, fantasies of mastery, static, legislation. water, economic theory, wire, and wood-to name just some of the actants (Bennett "Vibrant" 25).

In a setting such as this, the agency of audio technology within an extended understanding of systemic processes does not discontinue after they have been deemed in the large as non-functional or obsolete. This applies not only to their operation, but to their meaning as well. As products of a specific moment in time within the mechanism of global capital, they reflect in their physicality, the actions and intents of the humans and machines that affected their creation. These aspects include aesthetic design, material choices, operation, and advertising. They mirror the view of an intended customer base, a culture for whom the intended audio produced would be relevant, and a hierarchy of values of the product designers as well.

To ground this extended connection of objects to systems, I will focus on a specific piece of equipment and explore its connection to the systems in question. The audio device used for this examination will be the Zoom 505 guitar multieffects processor (figure 5.1). Produced in 1995 for a mass-consumer market, I bought my particular unit at a garage sale in Santa Cruz, California in 2010. At this time, I was beginning to explore the wider possibilities of low-quality, broken and obsolete audio products in feedback, and the Zoom 505 met at least one of those criteria. When placed within the feedback milieu, I found it able to create an exceptional variety of sounds from delicate, almost tonal repetitions to deep, low frequency growls. The sounds that the 505 emitted in this context were wholly of a different world than those normatively associated with it, and although it is now a staple of my live performance arrangement, I would have never considered purchasing the device for its intended purpose. This was largely due to the design qualities and reputation of the company that manufactured it, which was widely associated with inexpensive hand-held recorders and low-end guitar processors. An examination of the Zoom corporation's advertising tactics will provide more context for this understanding and of the role that audio devices play in the wider world of technological audio commodities.

Figure 5.1: The Zoom 505 Compact Guitar multi effects processor, ca. 1995.

Although increasingly associated with mobile and wearable devices, the juxtaposition of status, celebrity and technology is not limited to personal computing devices, as audio technologies also rely on appeals to celebrity to market their products. The guitar processing industry, although much smaller than that of tech giants like Apple, is still a formidable economic entity with over $300,000,000 per year in profits (Block 22). Akin to other digital technology producers, signal processing companies like Zoom rely on vanity and connection to celebrity to create psychological obsolescence and drive sales.

Formed in Japan in 1983, the Zoom Corporation specialized in digital signal processing integrated circuit chips and then began to

produce their own effects processing units. Their debut product, the Zoom 2002 premiered in 1992, and boasted of advanced signal processing capability in a small package. Like many other signal processing companies, Zoom used celebrity endorsement from popular rock guitarists, whom the company believed their audiences wished to emulate. By placing these musicians in advertisements with their products, the audio timbre associated with the musician was presumably connected to the product. Although these ads juxtaposed the musicians and the equipment, they often made no claims as to whether the musicians actually used the units in any way (figure 5.2). This marketing technique remained in use to sell later versions of similar multieffects units, issuing specific 'signature' units modeled after prominent guitarists. Released in 2005, and designed to be associated with popular guitarist John5, the Zoom G1J offered the same technology as the regular production model G1 multieffects processor, except for the fact that the default settings were programmed by the musician that is its namesake (figure 5.3).

Figure 5.2: Zoom advertisements circa 1992

Figure 5.3: Advertisement for the G1J John5 Signature guitar pedal.

Much of the Zoom corporation's output is solidly aimed at a young amateur market, creating items that were portable and inexpensive but provided the illusion of larger amplifiers. These products included the 7010, which had a small pop-up speaker built into the unit,

allowing it to be used unobtrusively in bedrooms and other close quarters. Other advertising elements more blatantly focused on young players purchasing an instrument for the first time. The tagline for the Zoom 505IICG touts the device as being "your first purchase after your guitar" (Zoom "your first"). The focus on image and celebrity over audio fidelity is consistent with a youth market, as inexperienced players tend toward prioritizing affordability and may lack the knowledge or interest in reading the technical details.

This becomes evident when examining the specifications of the Zoom 505 in comparison with its subsequent replacement. Both of these units employ a sample rate of 31.25 kHz per second. This is rather narrow considering the standard 41,400 Hz required to fully represent the total range of human hearing, and is certainly not indicative of a product designed with high audio fidelity as its primary purpose. This relatively low sample rate persisted in subsequent models, with the analog to digital conversion bit depth and oversampling rate in the 505II unit actually *decreasing* from the previous model (figure 2.4). Comparing the specifications of the 505 and 505II units with the Zoom Corporation's advertising practices would seem to indicate a prioritization of obsolescence over any idea of incremental improvement.

A/D conversion:	18-bit 128-times oversampling converter
D/A conversion:	18-bit 128-times oversampling converter
Sampling frequency:	31.25 kHz

Specifications

Built-in effects	max. 9 simultaneous / 33 total
Effect modules	max. 7 simultaneous (5 modules + 1 block)
Banks and patches	6 banks x 6 patches = 36 patches (rewritable, with memory store capability)
A/D converter	16 bit, 64 times oversampling
D/A converter	16 bit, 8 times oversampling
Sampling frequency	31.25 kHz

Figure 5.4: Specification for the Zoom 505 (above), and the 505II (below), highlighting conversion and sample rate differences

A case study by Astrid Lassen sheds some light on the internal conflicts within guitar effect companies that contribute to design decisions resulting in products like the Zoom 505. Lassen examined the decision-making processes of a digital audio effects company for a period of two years, beginning in 2005. The company, Danish-owned SME, was examined in terms of the practices of the engineers in contrast to the management. She contended that the engineers were primarily interested in more disruptive and financially risky sound-producing commodities, that put currently manufactured products at risk of technological obsolescence. The management, however were more interested in "incrementally exploiting and optimizing existing products or processes (Lassen, et al 182)," which would produce more profit. In other words, the engineers were more interested in enacting creative destruction or technological obsolescence in line with

teleological progress, and the management was more interested in what the author deems 'controlled adaptation' or creating ever-newer markets for existing products through psychological obsolescence.

In this case, as in the Zoom corporation, the promotion of one type of obsolescence made it possible for another type to coexist. In either case, the necessity for constant influx of capital required the promotion of a constant consumption of commodities, regardless of necessity or, in the case of psychological obsolescence, quality. In either example, the specter of obsolescence posed a constant presence, and one whose primacy would seem to supersede the functionality of the product produced. Justus George Frederick, an advertising mogul from the 1920s, depicted this dominance of obsolescence as a sort of god that required constant sacrifice to allow the existence of capital:

> "Wear alone …[is] too slow for the needs of American Industry. And so the high priest of business elected a new god to take its place along with–or even before–the other household gods. Obsolescence was made supreme." (Slade 60)

The sacrifice required by obsolescence involves not only material commodities, but includes human and nonhuman bodies within the continual rite.

This leads to the third aspect of obsolescence in aural practice to be addressed. It concerns the physical manifestations of larger systemic operations that become embedded within the materiality of the audio devices themselves. These include the record left behind by those whose labor and bodies came to produce and assemble the components and cases of the devices. To read audio commodities in this manner is to see them as palimpsests, as collective imprints of the material and human actions that went into their creation. In this way, the obsolete becomes the archival, a record of material and human interaction that emerges as a consequent byproduct of technological manufacture.

Identifying the specific properties and entangled histories involved in the manufacture of technological devices can be a monumentally difficult, if not impossible task to reckon with fully, however. Early on, the Zoom Corporation adopted the Silicon Valley method of outsourcing the production and assembly of component parts to exterior companies, whose exchange rates and lax labor laws made manufacturing less costly (Iijima). Although this process, known today as "electronics manufacturing services," is the dominant method of electronics production, precious little information about the companies serviced, or the environmental and labor conditions involved in the manufacturing process is publicly available. This is likely

the product of the desire to keep competitive information and public relations concerns within the domain of trade secrets in line with Silicon Valley practices. In addition, the EMS process often spans numerous subcontractors and factories, making the creation of a complete account its effects an incredibly complex and financially unprofitable exercise to fully and accurately engage with. Aggregate data valuation services do exist, but they tend to be focused on single component manufacturers rather than larger retail producers. Because of this, it became evident that in order to make a positive connection between my Zoom 505 unit and its potential effect on the wider physical world, it was necessary to partially dismantle the device, and personally investigate the provenance of its individual components.

Opening the 505 guitar multieffects unit shows a number of components that warrant investigation. Many, however lacked sufficient markings to enable the proper identification of the manufacturer, or sufficient available information about the manufacturer to determine the circumstance of their making. Out of the hundreds of components in the 505 unit, only two IC chips had both identifiable markings and available records sufficient to get a picture of the wider scope of their effects. The first is a semiconductor memory chip that the device uses to store custom presets made by the user. The IC in question is the Winbond W24L257AJ-15 chip (figure 6), made by

the Winbond Electronics Corporation in its Memory Product Foundry located in Taichung Taiwan.

Figure 5.5: Winbond memory chip.

The foundry is situated within a huge manufacturing zone known as the Hsinchu Science Park, where Winbond and many other companies continue production to the present day. Similar to electronics production in the Silicon Valley, the Science Park exhibits a pattern of pollution and lax safety standards. A 2005 study found that soil samples taken in the area contained extremely high levels of volatile organic compounds used in electronics component manufacturing (Wang et al 1236). Also akin to the Silicon Valley, the most dangerous work done in the Science Park is engaged by majority female, majority immigrant workers (Chang and Tu 260). These workers were further disempowered

by the proximity of the IT industry to the Taiwanese government, and a prevailing cultural view of the betterment of living conditions being intrinsically linked to the growth of the IT industry, even as workers and surrounding communities are routinely exposed to hazardous chemicals (Chang and Tu 258). Hsinchu Science Park employees showed decreased levels of pulmonary functions and increased lung abnormalities (Yoshida 8), especially in the photolithographic areas that use the toxic cleaning chemicals. These effects extend to local residential areas as well, as many of those living nearby the Hsinchu Science Park show high levels of toxicity in their blood and urine from decades of ground water contamination (Chang et al 21). The push towards secrecy in terms of environmental problems is very common among electronic component manufacturers, but even with this protection, Winbond still earned an independent rating in the 28th percentile for environmental issues in relation to other firms, industry-wide ("CSR Hub").

The legacy of the Winbond chip points to the immensity of the scope of information relating to the traces left behind by this particular component. The operation of the memory chip ironically is devoid of a sense of memory in regards to its own production. The little facts we do know point to a continuation of some of the same polluting effects present in the earliest days of the 'Silicon Revolution.' An industry that

was touted as being 'clean' in relation to the smokestacks of other modes of manufacturing, instead directed its waste into the ground, where its effects were less detectable until much later. With the very general information available regarding the connection between the bodies of the manufacturing workers, the factory, and the materials involved, it is difficult to obtain an image that we can impart Bennett's sense of anthropomorphism into and connect the objective effects with our own experiences, even though we are aware of some aspects of the circumstances. The next component investigated, however, has a much stronger association with this personal connection.

In addition to the preset RAM chip in the Zoom 505, the other most identifiable component is the PCM 3003 analog to digital converter manufactured by the Burr-Brown Corporation (figure 7). This chip handles the conversion of the electrical impulses that enter the unit into digital information and vice versa. This component was produced in Burr-Brown's manufacturing facilities in south Tucson, Arizona. This area has been a concentrated electronics manufacturing center for over 70 years, housing Hughes Air Force Missile Plant No. 44 and other military facilities. The area has contemporaneously been home to a residential population of predominantly Latino/a and Native American communities.

Figure 5.6: Burr-Brown analog to digital converter chip.

Since the founding of the Hughes plant in the 1940s, the toxic industrial waste from the plants was dumped into unlined industrial pits, which over time leached into the groundwater table, poisoning the city's aquifers with trichloroethylene (TCE) used to clean silicone chips. The contamination affected the local population of over 600,000 residents and contaminated the water in the workplaces of Hughes Aircraft and the Tucson International Airport Authority ("TCE Contamination" 6). In 1985, the toxic plume of trichloroethylene from Burr-Brown's factories had been verified as extending far beyond what was previously publically known. The toxicity spread across an area over five miles long and two miles wide, prompting the EPA to close

contaminated wells and declare much of the area a superfund site. At the center of the cloud formation, TCE levels were measured at 20 times the EPA maximum (Ostertag 49).

In the eye of the toxic contamination lived Rose Marie Augustine and her family. After being informed of the EPA's findings, she connected the heightened carcinogen levels with elevated rates of cancer and rare disease within her community. Her own family was impacted, with cancer affecting her husband, and her son contracting a rare muscular condition. Both of her family members' conditions she attributed to years of exposure to toxic drinking and bathing water.

After reaching out with community members to local officials for answers they were rebuffed, being called 'hysterical Hispanic housewives' by one official and another telling them that "the people on the south side were obese, lazy, and had poor eating habits, that it was our lifestyle and not the TC [toxic chemicals] in the water that caused our health problems (Cox & Pezzullo 277)." The group came to conclude that local officials knew about the contamination, but did not inform the population about the toxicity problem, for fear the negative publicity would dissuade future businesses from locating in South Tucson.

In response, Augustine organized the Tucsonans for a Clean Environment (TCE) to force local government and manufacturers to

make changes to protect the local citizens. By 1991, the group was able to get Burr-Brown to agree to divert its chemical dumping away from the water supply, and Hughes to install a 33-million-dollar air stripper. Burr-Brown was sold to Texas Instruments in 2000, but the legacy of semiconductor manufacture endures. After more than 30 years, the group that Augustine founded remains as persistent as the ground water contamination that still plagues the South Tucson community: just this year they prepare for new conflicts over recently discovered 1,4 dioxane contaminants in the water table.

This leaves us with a striking case in which the materiality of a specific component of audio technology had devastating effects on the material and bodies of a wide region. The same TCEs that bound with and changed the Burr-Brown D/A converter to enable its function, also became bound to the bodies of the human beings in the town of South Tucson. To take these material connections seriously it becomes impossible to separate the physicality of the sonic technological object from its history which, when used by sound producers, includes their own bodies as part of this history. The 'radical permeability' of the technological object as palimpsest, binds the audio practitioner up with the ethical and epistemological properties of its ontology. The act of engaging with these objects is to bring the discomfiting collected history and effects of its physical components into the mix, in a sort of

unequal but collective effort. An action of performance involving the 505 processor then, must also include the actions of the factory workers in South Tucson, and the effects acted upon them by the manufacture of its components, binding their humanity up with the material agency of the PCM 3003.

The perspective of collaborative action brings along with it the associated effects of embedded power relations as well. Can one label a performance seen in this light as collaborative, when the embedded humanity implied by the object cannot signal its consent? Merely considering the prospect can again open up the same discomforting problematic resulting in abandoning technological practices on one end, and capitulation to apathy on the other. Pointing to the potential benefit from encountering this sort of discomfort, Jane Bennett asserts the positive creative possibilities of the dissolution of bodily boundaries are worth the risk. While maintaining a view towards recognizing the larger systems of power relations at play, she pushes against terms that presume the separateness of entities, and by extension the possibility of redirecting the streams of influence. Instead, she prefers the term 'crossings' to indicate an active meeting of entities with a more fluid consideration of boundaries. She projects that crossings have a lively potential to bring new things into being by creating negotiable spaces that allow for new types of actions (Bennett "Enchantment" 31).

Bennett further confers the same sort of actions resulting from the intermixing of human cultures to human-nonhuman crossings. Citing Homi Bhabha's ideas of cultural ambiguity she portrays crossings as:

> ...a process of identifying with and through another object, on object of otherness, at which point the agency of identification - the subject - is itself always ambivalent, because of the intervention of that otherness. ...it bears the traces of those feelings and practice which inform it (Bennett "Enchantment" 31)

In anthropomorphically considering the technological object as a subjective other, it may be possible to counter the overwhelming tendency involved in enfolding the historical subjectivity of the objective world into our own. In allowing the consideration of the electronic components within my own audio devices, I must reckon with the ugly timelines of human-imposed contamination and exploitation that are present within these objects. At the same time, however, I also am obliged to take into account the traces of persons like Rose Marie Augustine, whose actions of resistance are also a component in the act of crossing. The anthropomorphic projection of the 'fingerprints' of a perceived human agent within the understanding of crossings can serve to render the task of confronting larger sociopolitical systems more personal and achievable.

To perceive manufactured objects as having aspects of individual humanity intermingled with their physicality, renders an ethical value onto them that transcends any notion of use value and obsolescence. In technological audio objects, the imprint of anthropomorphic crossing can have more palpable effects. Portland Oregon-based composer and author Andrew Durkin's concept of the 'audible trace' vouches for this perceptible residue. He also considers technological audio objects as physical manifestations of human attitudes and actions, with which we are intimately entangled. This audible trace is one imprinted by human beings onto technological objects, such that their entangled interactions make physical changes that can be aurally sensed.

Specifically, Durkin focuses on the material remains involved in the human production of audio technology. He claims that despite the impression of uniformity associated with mass production, audio devices evidence often minute functional characteristics unique to each individual unit. These characteristics exhibit a singular sonic character, similar to the properties of certain cameras to the photographs they produce. Durkin refers to this as 'phonographic timbre' (Durkin 92). He asserts that technological laborers rarely get included in the account of the creative musical process, yet the record of their efforts get left behind in physical media objects and affect this

phonographic timbre. Recording credits often list producers, but few note who invented, designed and assembled the music players, media and speakers commonly used on a daily basis (Durkin 76).

In his 'decompositional' view of electronic audio devices, Durkin considers audio technology not as a static thing, but as an active space in which human interaction takes place, however asynchronously, by many actors and bodies over time. These bodies include human and non-human alike (Durkin 79). The audible traces that the actions of bodies leave on technological audio objects can act as aural signatures that evidence the collective crossings of users, audiences, technicians and laborers (Durkin 90). These traces can be heard in the hum of the motors of a cassette player, the low-end rumble of an LP, or the compression artifacts of an mp3.

Audio technology has historically regarded these aural traces as negative aspects of recorded media, and the industry has put much effort towards eliminating them. From microgroove records, to redbook digital audio, recorded sound technology has sought to make invisible the audible evidence of the mechanisms that enable it. In doing so, they elide the audible traces of the hands that created the devices themselves (Durkin 103). Viewed in such a light, the recorded sounds of artists like Duke Ellington were not result of a singular genius, but the combined actions of numerous musicians, technicians, material, and

labor over time (Durkin 98). Durkin further points out the material agency inherent in audio recording devices, and the individual functional demands that they can place on human collaborators. In this view, the technical 'limitations' of a given piece of music technology are seen as a call to attend to, and work with the unique characteristics of the device in question. Many artists have been able to work successfully with devices in this manner. Some by luck, like Enrico Caruso, whose voice was well suited to 78 rpm records, or by intuition and circumstance like Grandmaster Flash who purportedly developed scratching while pausing a record to avoid a scolding from his mother (Durkin 94).

Taken together, the three counter-obsolescent perspectives, overlap and interact with each other. The broader circumstances related to the production of commodified technological objects, leave their imprints on the commodities produced. These objects carry with them imprints of the bodies that affected them and the bodies they affected. These imprints can be detected through sound as audible traces which, in the realm of audio feedback become manifest, active, and capable creating new sounds. The quality of the sounds produced have nothing to do with any presumed functional standard or intent of their production. A brand new $1400 Fulltone tape echo can have as

much meaningful effect as a discarded Digitech multieffects pedal. In this context, obsolescence is effectively erased.

The focus on audition and co-creation of new sound is reliant on a sense of openness in relation to the value of audio technical objects. This openness and strategic anthropomorphism allows for a sense of playfulness, as a device is put into feedback and heard to 'speak'. Often these voices can produce effects that would never have been attempted with a more traditional utilitarian viewpoint. The results can be exhilarating and surprising. The activity is one that is enabled by and productive of a sense of enchantment toward the devices that belies any sense of obsolescence. Thus, an acceptance of an anthropomorphic playground of audio feedback can provide space for innumerable moments of enchantment intrinsically intertwined with ethics. Through sound, feedback can cause musicians and audiences to:

> linger in those moments during which they find themselves fascinated by objects, taking them as clues to the material vitality that they share with them. This sense of a strange and incomplete commonality with the outside may induce vital materialists to treat nonhumans – animals, plants, earth, even artifacts and commodities- more carefully… (Bennett "Vibrant" 19).

I propose that this type of stock-taking is especially necessary for musical and artistic practitioners. By recognizing the human trace within

the technologically obsolete, we can come to terms not only with a sense of value in what would otherwise be considered garbage, but in recognizing the garbage as being in some way partly human. With this carefully limited sense of self-interest, we can hope to develop a capacity for empathy that encompasses physical objects as our own, and in that way impact on our shared sense of ethics and actions. In such a frame of mind, it becomes difficult if not impossible to consider any being, human or non-human, as obsolete. To do so would render one's self without value as well.

Chapter 6: Case Studies of Expressive Technological Materiality

Cultivating new ways of thinking about materiality and obsolescence may help in reducing the tendency towards constant and unnecessary production, and promote a more measured, conscientious approach to creative audio design and practice. New materialist perspectives can help facilitate this change in the manner in which we understand technological audio objects and physical material itself.

In conversation with Astra Taylor, critical theorist Slavoj Žižek suggests a break from the 'illusory ideology' of the bifurcation of the material world into natural and artificial territories (Taylor 156). In a stance similar to that of Rosi Braidotti, he claims we should dispose of the preconception of a lionized 'natural' world and a vilified 'artificial' one. If anything, he states, we should become *more artificial* not more

natural, in that we should accept and feel at home with our trash. The role of aesthetic visualization is key to this:

> The greatest challenge is to discover trash as an aesthetic object ... when you see an object that originally was a functional object, part of our system of needs, as no longer of any use and changed into trash. At that point, you should accept it … The true spiritual change is to develop, if you want, a kind of emotional attachment to, or find meaning in, useless objects. (Taylor 163)

For electronic musicians, this points to a way of re-considering technological sound objects through practice, changing their operation and meaning. Perhaps the most durable figure in this sort of electronic audio repurposing is American musician Qubais Reed Ghazala, widely known as the originator of a practice called circuit-bending.

Circuit-bending is a method used to turn any electronic object into an electronic musical instrument. This is accomplished by deliberately shorting parts of an electronic circuit and listening to the results. When an interesting effect is found, the short is noted and then later permanently rewired.

Ghazala stumbled upon the technique as a teenager, when a small open-backed amplifier shorted out onto a metal drawer and began producing unusual sounds. He became fixated on producing

the shorts himself and the amplifier was soon remounted into a larger enclosure and expanded with components pulled from any source he could find. This original circuit-bent object eventually became an elaborately constructed sound-maker in a custom-made cedar box (figure 6.1).

Figure 6.1: Original Circuit-bent amplifier. (Photo courtesy Reed Ghazal)

Ghazala describes his passion for the craft as one with an economic component directly related to his social and financial status at the time. Being underage and lacking access to the kind of funds to purchase a synthesizer, he had to rely on the self-creation of sophisticated sound technology via discarded or extremely inexpensive

materials. He also positions the development of the process as one that is based on a reciprocal ecology between human beings and objects.

Describing this tendency, he states that it is within human nature to "musicalize" objects. He likens this to coconuts washing ashore on a hypothetical deserted island. When found by human beings, these objects will be made into all manner of musical instruments depending on the identification of the physical sonic potentials of the interaction between the object and the human; a coconut can be fashioned into a percussion instrument, a wind instrument, etc. depending on how one imagines an interaction with it (Ghazala 100).

He extends this analogy to electronic waste products:

> Our society's electronic discards, like coconuts fallen to the sea, collect at the high-tide lines of garage sales and flea markets, second-hand shops and garbage bins. … These circuits are coconuts of our island. Adapt the coconut, adapt the circuit. (Ghazala 100)

This understanding of the electronic object as inhabiting a space that is caught up within the same systemic process as all living things, not only imparts a kinship with the obsolete, but also sets up a sort of anthropomorphic consideration of them. This is in line with a perspective on objecthood put forward by new materialist philosopher Jane Bennett.

She offers a way of thinking about non-human objects that considers them part of the cycle of life and, in a broad sense, as being 'alive' (Bennett 17). She accomplishes this by a strategic partial embrace of anthropomorphism to project a sense of 'living thingness' into inanimate objects. This is done in order to counter the tendency for humans to think of themselves as being separate from the ecological, political and economic systems in which they live (Bennett xvi). This projection of human qualities into things is not meant in a strictly literal sense, and its purpose is not to promote obscurantism or to replace scientific inquiry. It is done, in part, as an effort to expand the understanding of humanity to a more systemic perspective that positions objects in a way that puts them on a more equal footing with humans. By doing so, we can begin to include material objects, including waste objects, within our own personal sense of self-interest: our fate becomes bound up with theirs (Bennett 12).

Ghazala's comments on his work seem directly in line with this inclusive understanding of electronic objects, identifying the physical limitations of certain circuit-bent devices as being "living instruments" (Ghazala 101). By this term, Ghazala is describing the tendency of the operations of some circuit-bent instruments to change over time and even to cease functioning. This is due in part to the bending process, which re-wires circuits in ways they were not designed to function, often

putting extreme strain on the components. He describes this tendency in a way that includes human beings in its definition:

> You and I are living instruments. We accept that our voice will change, become deeper over time, quieter in the end, and will some day fail. ... Some bent instruments do age and sound different as time passes, as they consume their accelerated timeline. The instrument grows a little older, moves a little closer to early demise, every time you turn it on. Don't play it to save it? Play it to let it sing? (Ghazala 101)

Ghazala's anthropomorphic projection here seems to impart a sense of empathy and concern for the objects' wellbeing, juxtaposed with his desire to experience the sounds they produce. This sense of projection and empathy is also reflected in his conception of interaction between circuit-bent instruments and humans via direct connection with the physical circuits themselves.

Because the human body has resistance properties, it can itself act as a component in a circuit. By deliberately building in metal 'contact points' in a device, sound can be altered by merely coming in contact with them. This touch-based interaction can be further expanded by contact with other humans, creating a sound situation that can be performed by touching other people as well as the technological object.

Ghazala describes this extended instrument as a 'BioElectronicAudiosapien', or 'BEAsape' (Ghazala 101). He portrays the experience of participating in these type of human/object interactions as one that is mutually transformative: "I was changed and the circuit was changed, and I had trouble deciding where each of us began and ended. I simply concluded we were something new, and we were one (Ghazala 101)." This body contact experience, for Ghazala, is ultimately one that troubles easy boundaries between objects, bodies and technological waste. His understanding is one that compels us toward a conception, through sound, of a more entangled place in the continuum of objects and being.

This consideration of a diffuse boundary between individual objects and beings lies squarely within the wheelhouse of posthumanist theorists like Donna Haraway and Karen Barad. By their lights, material objects are not fixed, stationary, separate entities, but a continually shifting result of constant action. Barad describes matter as "...a dynamic and shifting entanglement of relations, rather than a property of things (Barad 224)." A posthumanist viewpoint can lend an understanding of material that completely belies any sense of obsolescence in favor of a more equitable, respectful placement of objects within the continuum of beings.

American musician and sound artist Suzanne Thorpe has a history of work that engages with physicality in this manner, troubling borders between what it means to be an 'object', 'animal' and 'human.' For Thorpe, sound is not only a desired end result, but a part of a larger process involving intersecting systems that include the sound produced, the place it is enacted, living beings, means of production, and the materials involved in its creation.

Her sound installation *Listening is as Listening Does* mimics the systems that certain animals use to interact with the material nature of their habitats. The piece uses echolocation, a process native to animals like bats, that projects sound into a given area and then derives information from the reflected echoes to construct an understanding of the physical nature of the immediate environment. Instead of navigation, however information from the reflected sound is used to drive changes in the audio sent back through the speakers in response to the material environment. In this way, the piece also works to promote an understanding of the material world that obscures boundaries between what we consider human, animal and object.

Although Thorpe works in close alignment with non-human objects and beings, it does not follow that she considers the agency of all parties involved to be completely leveled. She is careful to point out

that she does not regard what she does as collaboration, but a co-mingling of systems:

> The term collaboration can be troubling because that implies that there is a will or willingness of these supposedly inanimate objects to be collaborating. … I use co-operation. I often will put the hyphen in to re-emphasize my operation and the operation of other entities - its system with my system (Thorpe).

Other artists are not so hesitant to presume agency, or even some form of subjectivity in the inanimate. Sonic artist and technology designer Joe Patitucci creates music and music systems that that are controlled by sensory data from plants. By attaching sensors to living foliage, Patitucci converts variations in voltage levels from the leaves into digital signals that then directly control aspects of an immersive synthesized soundscape. This is done in part, to make music while simultaneously investigating what he sees as "the secret life of plants" (Data Garden, "MIDI Sprout").

In stark contrast with Susanne Thorpe's measured account of the boundaries between entities, Patitucci readily projects a sense of agency into the non-human. For him, the connected, musical plants have an agential response that can be directly detected via changes in the soundscape when humans interact with them. At times, the manner in which he frames his own work evokes a technologically

enabled sensitivity that can be interpreted as bordering on the obscurantist:

> ...I'm inspired to do this work because I believe that humans have sensory abilities beyond our current understanding and that through using technology to expand perception we may activate innate capacities previously abandoned in our particular trajectory of technological evolution. (Patitucci, "Joe Patitucci")

He further points to industrialization as a factor that has made these latent inter-species communication skills obsolete "…due to their perceived irrelevance to our industrialized world" (Patitucci, "Joe Patitucci").

True to his convictions, Patitucci launched a website devoted to non-stop live streaming of plant-generated music called *plants.fm*, and *Data Garden*, a record label and web-based portal for electronic music that reaches out to others who are interested in exploring plant-human communication through sound. In 2014, *Data Garden* launched a campaign to produce the "Midi Sprout", a consumer version of the technology used by Patitucci in his own work (Data Garden, "About").

Although the Midi Sprout is designed to further creative ends, its nature as a manufactured object posed somewhat of a discord with Patitucci's strongly oppositional feelings to what he calls the 'junk culture' of mass-produced consumerism (Patitucci, "Panel"). To confront

this, the Midi Sprout was limited to periodic productions of 300 units and was mounted in recyclable cardboard instead of a plastic enclosure (Data garden, "Technology"). For Patitucci, the limited production numbers served to make sure that surplus, unwanted items were not manufactured, and the cardboard enclosure mitigated concerns for the environmental impact of plastic waste.

Concern for ecological waste is shared by many in the electronic music community, as well as other design aspects whose repercussions are not so obvious. Ethnomusicologist John Fenn points to effects in the manufacturing process beyond the ecological. He posits that the cultural attitudes of electronic audio objects become concretized in the physical forms of the sound making objects themselves. In interacting with mass-produced electronic audio technology, musicians often explore and alter a playing field that is not of their own devising. As such, they are in effect working with and improvising not only with the objects, but also with the cultural and functional assumptions of the use values embedded in them by their designers (Fenn 71). Like the material in which they are ensconced, these vestigial intentions can play a key role in the development of aesthetic.

This is certainly the case with Springfield, Illinois based noise musician Curtis Rochambeau. Performing under the moniker [view], Rochambeau creates dense, often punishing sheets of noise. In his

performances, he uses a variety of electronic equipment to make sound, although many of them were never designed for that purpose at all. Specifically, Rochambeau uses midcentury electronic medical equipment such as nerve and muscle stimulators to create sound.

After receiving an old piece of text equipment form his uncle, Rochambeau immediately began experimenting with the generated voltages to alter the sound and function of his synthesizers. Rochambeau was taken by the heft and history of the unit and was soon scouring online auctions to buy other obsolete equipment to alter his sounds: "The shipping cost more than the auction," … "Even if it didn't work, I wanted to see what I could get out of it" (Tammik).

Eventually, instead of using the machinery to control the modulation and frequency of his synthesizer, he plugged the output of the medical units directly into the audio inputs of his mixer. The medical equipment was designed to send electrical impulses over 100 times stronger than standard audio signals. The complete mismatch of expectations and cultures of practice embedded in each technological object produced sounds totally different from those of his audio generators. In addition to the extreme voltage difference, the advanced age of the components in the machines caused them to behave erratically, changing their activity over time and in response to their surroundings.

Like many of the artists discussed, Rochambeau imparts a kind of anthropomorphism to the machinic agency of the failing, misused equipment, seeing them as friendly co-workers:

> [They] have a mind of their own...I can leave it on...go putter about and come back and it's something different. I find that endearing. It is kind of like a trusted bandmate. They are going to do their thing, while I'm doing something else, and it will continue to work itself out. (Kaiser 122)

For Curtis Rochambeau, the traces of cultural and functional perceptions imprinted in his technological objects become a raw material with which to mold his aural aesthetic. It is very likely that had the extreme high voltage not already been part of the physical makeup of the medical equipment, he would never have added a crucial part of his aesthetic to his practice. In close proximity to Andrew Durkin's conception of the audible trace, Rochambeau's practice relies on the embedded histories of the technological objects with which he works. Their original function, intent and contexts become expressed in their actions, now diverted to other ends. Like the voltages in Curtis Rochambeau's obsolete equipment, these physical traces left behind in media can impose their own agency on creative practice, having potentially drastic effects on sound and meaning. In William Basinski's

case, this agency played a crucial role in a years-long process of preservation, memory, decay, and self-discovery.

In the early 1980s, William Basinski moved from his native Texas to New York City, where he began a practice of experimenting with a variety of methods of recording onto handmade analog audiotape loops. With limited funds, Basinski purchased inexpensive tape recorders and began making tape loops from a variety of sources, bouncing the recordings among various recorders to create endless layers of dense sound.

Basinski's understanding of his practice was one of pure experimentation and personal exploration rather than of the creation of a singular aesthetic. It seemed to him to be a practice wholly outside of any appreciable tradition and lent him to feel isolated and unsure of the merit of his work to outsiders. In this context, he persisted with his practice as a sort of therapeutic meditation. He describes the loops involved as being both literal in their physical form, and symbolic of the emotional catharsis he sought to achieve from the process.

The process he describes is one that plays with a personal understanding as well as a sense of agency imparted to the materials and technologies that he utilizes. He describes the unexpected qualities of working with physical loops of tape:

> ...there's something about the sound of analog tape … they have wow and flutter. Sometimes, … if it gets a little bit loose, … there will be a little bit of a fade out or a drop out … it might even pick up the reverse bit that's on the other side of the tape, which I always love.... Throw in a little bit of a surprise. (Basinski)

He highlights the lack of his absolute control in the process as being 'exciting' and that a major point of the work is a sort of collaboration with the machines themselves, pointing out a milestone his technique when he "…learned how to stay out of the way and see what happens (Basinski)."

By the late 1980s he directed his efforts elsewhere, and put the loops away, storing them in take-out boxes, ice cream containers, whatever they would fit into. It is in this manner, the loops remained for years until he decided to archive them into a digital medium. During the archival process, Basinski noticed that because of the advanced age of the audiotape, the iron oxide particles embedded on it were starting to drop off as it was being played. Each time the loop went around, the tape lost a bit more of its magnetic material and some of its sound as well, fading away until he was left with a clear plastic tape that transmitted only silence (Gough 94).

Through the process of physical decay, Basinski gained a new understanding of the physicality of the media itself, as well as its potential effect on his sound practice. The media had exhibited

another form of agency he hadn't count on. This change reflected not only his personal state at the moment of the loops' creation, but of the passing of time and its effect on the audible trace of his own interactions with the material.

During the process of digitizing his work, another unexpected layer of meaning was imposed upon Basinski's loops. In 2001, Basinski was living in New York City, archiving his decaying loops. On September 11th of that year, he witnessed the destruction of the Twin Towers from the roof of his studio building. As the day wore on, he watched as the ruins smoldered under billowing clouds of smoke and ash. Seeing a connection, he set up a video recorder and captured the last hours of daylight as the sun went down over the decaying buildings. Later, Basinski superimposed this footage of decay onto the recordings of the deterioration of his loops as they too were reduced to piles of dust (Gough 94). The resultant work was released on DVD in 2002 as *Disintegration Loops.* In experiencing an overwhelming moment of helplessness at the hands of the physical world around him, Basinski found a conduit to extend his hidden personal gesture to sublime proportions, connecting them to the decay of expectations, physical and symbolic, as they merged together through mutual destruction.

Today, Basinski still works with physical material as a primary medium. He regards these objects as though they had a sort of

inherent spirit contained in them. When asked if there was a spiritual connection with the technology he uses, he responded:

> Of course there is! That's why I … let the spirits come into the work. … There's always a spirit within the stuff! There's a spirit within the machine. Last night, my brand new big old Mac studio computer … just decided to reboot. There's always spirit in the machines somewhere, even in the crazy digital machines. It might be a nefarious one, I don't know. (Basinski)

When asked if he perceived a sort of good spirit in analog, and a malevolent one in digital, he replied: "That's right. Because it's all sampled, it's all bullshit. When the asteroid comes and the whole system goes down, it's all gone, baby! (Basinski)."

Basinski's rejection of the digital medium and his sense of a spiritual animating presence implanted within technology, again points to the perception of a kind of embedded 'ghost in the machine' - of the actions and experiences that are locked inside of disused material practices and obsolescent objects. The palpable intimation that in a sense, these objects regardless of what is recorded on the media, act as a sort of unintentional archive of the historical and cultural moments involved in their production.

In a 2016 article in *ACM Interactions*, sound artist Jentery Sayers outlined his method to address the embedded histories in audio

technology in a more direct manner. He calls his process "design without a future," and describes the procedure as one that doesn't use design as a way to create new instruments or functionality, but as an engagement with the past in a "…correspondence with past events, with an understanding of what we cannot recover (Sayers, 74-75)." This correspondence recognizes obsolete material objects as a conduit to and a filter of history, and that objects and humanity are intrinsically linked. As such, he posits that the nature of audio design should also allow for this connection between objects and people in a way that is self-reflexive, rather than exclusively focusing on producing new objects or products.

Informed by this idea, Sayers exhibited an installation in which he recreated an early experimental prototype of magnetic recording technology from 1898. His piece, entitled *Jacob: Recordings on a Wire*, was guided by descriptions and rudimentary diagrams of Dutch engineer Valdemar Poulsen's first experiments with magnetic recording. Using a magnetic transduction trolley traveling on a piano wire, participants could speak into the device and have the magnetic imprint visualized by iron filings sprinkled on the wire, as it was in the 1898 experiment (Sayers, 76). The installation did not project a new functional potential of audio recording, but instead revealed forgotten

sonic relations with objects, whose meaning and agency was obscured by time and obsolescence.

Similarly, the work of American performance and recording artists Scott Smallwood and Stephan Moore also involve the revelation of a forgotten or secret sonic life of objects. Performing under the name Evidence, their piece *Losperus* relies on the idea of an active layering of sounds on top of one another in realtime. The material nature of the objects they use works to produce sound that is integral to the performance of the piece. But unlike Jentery Sayers' work, *Losperus* directs its focus not at historical audio technology, but on revealing the hidden sonic potential of common mass-produced household goods.

Smallwood and Moore describe the piece as a "performance of unstable sound sculptures, fashioned improvisationally from discarded household items. (Moore and Smallwood, "e v i d e n c e")." Unstable is a very gentle way of describing the action that takes place during the performance. Two plastic oscillating fans are placed on a table, their front guards are removed, and they are turned on. The spinning plastic blades then become the proving ground for a host of items the duo brings into their proximity. They coax the objects into touch the spinning blades with various levels of force, producing sound that is directly related to the interaction of the manufactured materials along with the decisions made by the human performers. The results are often wildly

unpredictable, with objects often being cast into the air and into the audience.

In tandem with the acoustic sound of the kinetic material confrontation, the duo use specialized microphones that allow a highly magnified, more intimate sonic interaction with the objects. With the microphones, a delicate layer of sonic world is exposed, allowing a glimpse into the interplay between objects on an intimate level, while being constantly on the verge of a cacophonously forceful decay into explosive chaos. This tension typifies the experience: between objects and other objects; between microscopic sound and destructive force; between the performers and both of these systems; and finally, between the audience and all of the foregoing.

Scott Smallwood describes the added microphonic layer as a vital element to the piece:

> ...the mic ... adds an additional layer ... it's putting a microscope on it … I think that layer is actually essential because without that layer, it relies solely on what I'm seeing from my vantage point… (Moore and Smallwood, "Personal interview")

Stephan Moore also describes the microphone as investigatory tool into the miniature sonic world of the objects in the performance:

> ...we're able to get a microphone into the 'scene of the crime' and really crank stuff up. …getting in really close ... so that when you sort of 'zoom out' from it, you see the table and you see what we are trying to… (Moore and Smallwood, "Personal interview").

The use of microphone placement as a tool for uncovering hidden physical soundscapes is directly drawn from the practice of audio field recording. Indeed, Smallwood and Moore point to a shared experience in acoustic ecology as a major influence in the development of the piece. An important imperative in field recording is to listen to the totality of the environment at all times, compelling a troubling of the consideration of what constitutes a 'natural' soundscape (Moore and Smallwood, "Losperus" 2). For Smallwood and Moore, the understanding of ecology includes the man-made environments we inhabit together with manufactured objects. In doing this, possibilities are made available to perceive industrial objects and their sounds in the same kind of wonder that one might contemplate natural scenes: the humming of a particular HVAC system becomes as serene as the sound of a placid beach.

This expanded ecology also invites a certain sense of individual history attached to many of the objects that are involved in the piece as Moore relates:

> I feel that these objects, they've already usually had nice long lives. You can tell, especially with the fans, there is a nice layer of dirt and dust on it. … So these objects get to have a second life. To me that just makes the thing more meaningful … (Moore and Smallwood, "Personal interview").

The extension of a personal history to the objects used in *Losperus* also tends toward the consideration of these materials as agential beings in a collaborative performance, at times even imparting an anthropomorphic sense of animal action to them. Stephan Moore recalls a time when, in creative exploration, he placed an oscillating fan on its back and turned it on. He describes his perception of the object as feeling as if it was less mechanical and more organic, almost alive:

> ...it didn't seem as mechanical to me. It seemed almost like a newborn baby laying on a table who doesn't really know how to use tis arms and its legs yet. Everything is just kind of moving and twisting in the way things are because they're not totally in control. I got this feeling that I was more in the presence of some small animal or some small human even. (Moore and Smallwood, "Personal interview")

This anthropomorphic projection leads to a sense of shared agency between the performers and the objects, and cultivates a sense of uncertainty relating to the perceived 'will' of the objects used in the piece as Moore relates:

> ...it's also this sense of like 'I'm going to like try something, and nobody knows, including me, what's going to happen'. ...there's...these real questions being asked of

> these materials in terms of how they will perform - what the behaviors will be, what the sound results are going to be and that we're all going to kind of figure that out together and it's actually happening in realtime ... (Moore and Smallwood, "Personal interview")

Although they highlight this shared agency as crucial to the piece, they also are quick to point out that the primary motivation for their actions are for musical ends. Scott Smallwood comments to this effect:

> I think its music. On some level we're musicians and yes, those things are all part of it, and there are subtle layers, there are hidden layers, we're definitely acoustic ecologists at heart in many ways but on some fundamental level we're musicians, and what we're doing is making chamber music. (Moore and Smallwood, "Personal interview")

In conclusion, the artists featured here often vastly differ in their methods, trajectories and creative output. The contrast between William Basinski's personal sonic explorations and Suzanne Thorpe's precisely interwoven sonic narratives are quite stark indeed. What they have in common, however, is a prevailing sense of the object as a shared partner in the creative act. From Evidence's perception of fans as living things, to Reed Ghazala's human-machine morphic BEAscape, these artists rely on their material counterparts for vital support in the

crafting of sound, often counteracting the drive for obsolescence that has for so long been a part of global culture. It is my hope that this sense of creative resistance to obsolescence through sound will continue to flourish and can in some small way become a part of the fabric of creative consciousness.

Conclusion

As we have seen, the continuing legacy of the teleology of purposeful progress did not end with the dashed hopes for humanity in the mid twentieth century. Instead, the notion became unmoored from the expectation of overall human benefit, and was exclusively associated with techno-scientific betterment. The association of progress solely with the mechanism of technical development enabled by private industry, effectively acted to distance the process from public accountability (Chubin 179). This fostered the marginalization of the social sciences as well, alluding to a perceived lack in quantitative rigor and, by extension ultimate value (Lasch 233). The net result was to reduce the expectation of industrial production to benefit the entirety of humanity, while providing cover for continued exploitation. As such, the residual idea of progress that remains is less of a distinct ethos than a cultural ritual, or habit - especially as it expresses itself in technological

development. In the tech world, the tacit enactment of progress is deeply embedded in the culture, so as to view the expectation of radical technological change as being conservative (Mitcham 232). In pointing out the separation between social and technical betterment, Massimo Salvadori indicates the need to once again take up the goal of reconnecting the social expectation of progress with scientific and technological development (Salvadori 133). In this he asserts a sense of urgency, as he positions the issues facing humanity in the 21st century to be issues of raw survival.

At the same time, he tempers his faith in the prospect of a reunified belief in progress to save humanity from itself. Instead he cautions that "humanity is on the point of losing the helm..." of progress (Salvadori 22). More specifically, it is not necessarily the mechanism of progress, but the *faith in its necessity* that invites the question of control. I contend that such a faith is in the end misplaced, as the ultimate teleological goals of progressive ideals are illusory, and radically ahistorical (Staudenmaier 283). Carl Mitcham provides a novel mathematical model demonstrating that any idea of betterment is entirely dependent on what aspects are allowed to count - what individual 'slices' of history are appealed to. The evidence supporting any type of overall improvement then, is not a factual given, but is largely socially and historically determined. As such, progress is not

necessarily *found* in the history of science and technology, but projected *onto* it (Mitcham 251).

Despite the implied futility of rejuvenating the ideals of progress, it would be unwise to ignore or capitulate to those mechanisms that rely on a tacit assumption of inevitable betterment. To do so, elides questions of power and endorses what John Staudenmaier described as a "...passive conformity [that] merely hands the task of shaping technological consensus over to [more powerful] others (Staudenmaier 286)." Staudenmaier further argues that it is our duty to confront the injustices bound up within technological production and the assumption of progress (231). David Noble extends this thought and contents that if the technological subject has the right to accept development and deployment of technology, they also have the right to refuse it and prevent its development (Noble 90). Instead, the presumption of exterior, transcendent progressive mechanisms must be constantly challenged by the society for whom it is presumed to serve. Sites of power must be identified - who makes policy decisions and for whom? Who wins and who loses? "Which citizens have access to the design process? Whose values are embodied and whose ignored in systems that become economically and politically successful? (Staudenmaier 286)"

Staudenmaier's final question is one that crucially links lived experience with technological materiality. It furthers a view toward the consideration of technological objects as palimpsests that reflect the physical techno-social conditions of their manufacture and use. In doing so, it may assist the usage of materiality as a means of questioning the deterministic qualities of technology, and the lines of power that follow them. To this end, an enchanted view of technology inhibits a sense of technological determinism and forwards a more reasoned terminology: technological change. Emmanuel Mesthene described the aspect of change as one that more aptly captured the emergence of a new technology into a given society. For him, new technologies do not result in any sort of linear progression. Instead, they open up subsets of new possibilities, as they lessen the likelihood of others (Mesthene 116). Viewed from another perspective, Mesthene's mechanism can be interpreted as positioning technological change as being a single agent in a larger scheme of agential actions. In other words, while the introduction of a given technology may offer and take away possibilities, the potentiality of its emergence is reliant on the material-cultural context in which the technology develops. This view is in line with posthumanist understandings of technology as being, for humans, a part of our 'natural' environment, shared with human and non-human objects.

This is not to say, however, that the posthuman turn should stand as a sort of telos in itself. On the contrary, it offers no utopian solutions, nor is it meant to. Rosi Braidotti points up the potential for posthumanist ecologies to even present themselves with the same cruel effects that the legacy of anthropocentric humanism has caused (Braidotti 97). Accelerationist philosopher Nick Land's 2012 text "The Dark Enlightenment," provides an example of this sort of posthuman nadir. Land expounds on the ideas of neo-reactionary computer scientist Curtis Yarvin, who poses capitalism as the only force worth aligning with, as it eclipses the power of everything else - including independent agency. In his projection, capitalism rightly breaks down democracy and reinstalls a feudal technologically-enabled plutocracy, whose lines are drawn in terms of genetically determined agential factors. For Land, those more evolutionarily 'adapted' will eventually become enjoined with technology, to create a future in which human identity becomes "unintelligible as it is subsumed into the technosphere (Land)." Acting as a sort of ethically inverted version of Donna Haraway's conceit of the capitalocene, Land's brand of posthumanism provided some of the theoretical underpinnings for contemporary neo-reactionary and neo-fascist movements, commonly referred to as the 'alt-right.' Although Land rejects their tactics as being unsophisticated, his posthuman hyper-capitalist accelerationist views nevertheless

provide philosophical cover for racist revitalizations and tech-secessionist movements.

In the face of this, the possibility of personal and enchanted interactions with technology has the potential to provide a contrary method of linking joy to objects, objects to ethics, and ethics to lived experiences. In *The Enchantment of the Universe*, Jane Bennet outlines the normative humanistic expectations of ethics as operating as a kind of static code that stands outside of human action. Ethics tend to tell us what to do but, do not necessarily inspire these actions. As sterile, transcendent aspirational forms, they are set apart from the immanent intra-active sense of common identification that encourages the type of nurturing generosity that the *action* of ethics requires. In other words, ethics oblige action, and as such, need to "draw sensuous performances toward avowed purpose (Bennett 29)."

It is my contention that an enchanted re-engagement with technological objects previously considered inoperative or obsolete can operate as one form of sensuous performance. To find joy and create music with these discarded articles is to simultaneously identify ourselves within them while elevating a sense of respect for them. In this way, we approach these objects with a sense of humility. In the midst of a sea of obsolescence, we to turn to our trash to help us find a collective voice.

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