Defect at Manitoulin Permaculture

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Abstract

The purpose of this research was to describe technopolitics on a permaculture farm. The literature on technology and technopolitics is beginning to take shape around a series of unanswered questions regarding the role and potential of objects in social life. Using an actor-network theory framework and relying on Callon's (1984) sociology of translation and its principles, I identified the concept of defect and tracked how it was mobilized at Manitoulin Permaculture through participant observation across two summers. The concept of defect incorporated both sociopolitical as well as technological factors. The makers at Manitoulin Permaculture made sense of their choice to defect to a new life at Manitoulin Permaculture. In addition, their technologies, both new and old, became defective, animating their community in new and unforeseen ways.

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Arrival

It was under the starry skies of Manitoulin Island, meaning 'Spirit Island' in Odawa, that I began to wonder about my relationship to technology. While I walked down a lonely highway, I contemplated how the farmers whom I was staying with thought of things like light pollution. On the surface, the Northern Ontario Permaculture Research Institute (NOPRI) is a team of researchers bent on understanding nature and the world in a new way. They are also known locally as Manitoulin Permaculture, Heartwood Mushrooms and a few other businesses. Their small farm outside of Little Current serves as their base and visitors on this base are asked to contribute to daily tasks like cooking, weeding and building chicken coops. As seems to be the custom, long-stay visitors, called interns, live in geodesic domes situated between the main house and outbuildings, collectively called 'the homestead,' and the surrounding forest. This is where I stayed for the summers of 2017 and 2018. I initially went to Manitoulin to figure out how food forests created a sense of time. I was inspired by the suggestion that when one of the founders of permaculture walks out from his homestead the surrounding vegetation gives the feeling of there being 'more' time. On first journey to the island it took me several hours to meet the ship, the MS Chi-Cheemaun, that would ferry me to its edge. After being dropped off I was picked up by Eugene, who showed me the desolate farmland that lay between South Baymouth and Little Current, the town nearest the farm. He pointed out the desolation and infertility of the land that was punctuated by small towns. When I asked him why the land looked the way it did he explained that there wasn't much of a financial incentive to keep the land going elsewhere. The rejuvenation of the land would also require a lot more work than it seemed. When we arrived on the farm I was greeted by a picnic bench full of food, an outbuilding full of books and an open field of tall grass before their lake. An herb spiral stood in front of two vegetable gardens and two greenhouses. To their left was a pile of sticks several feet tall and twenty meters wide, supposedly for compost and support for a future project. To their right were tents and domes for people to sleep in. I made my introductions quickly before jumping into my first task. The main pump which supplies warm water to the outdoor shower was no longer working when I arrived. It would be long before we could shower again, but we tried to rework some of the junk pumps that we had laying around. I found out that I was working alongside trained engineers and a scientist. I felt like they were energized by the challenge of making the pump work in less than ideal conditions. After hours of effort and an accidental break, we accepted that none of the remaining pumps would solve the problem. We would have to buy a new pump, they suggested. Such a setback was not uncommon for them, especially in the course of managing human and non-human systems, and they accepted the possibility of a failed outcome as routine---just another contingency…

Introduction

This project studies farmers, better referred to as ‘makers’, and technologies using an embedded actor-network analysis of NOPRI, or Manitoulin Permaculture. Situated just outside of Little Current, Ontario, the community which makes up the participants for this project is a group of roughly 8 (although the ‘core group’ fluctuates), all self-perceiving as working towards ecological goals. My project starts from the premise that this organization is a form of (self-described) ecological activism that has as its mandate to increase food sovereignty and to contribute to the health of the Earth. I spent 3 months in the summer of 2017 and 3 weeks in the summer of 2018 living and working with this community. Since the work of people staying on the farm would not be considered farming, or restricted to farming necessarily, I decided to call them makers instead. I spent a lot of time helping these makers, many of them with engineering and science training, as they built, fixed, investigated and dreamt up different technologies for use on and off the island. Although the use of the term technology is complicated, and enacts a boundary I would like in part to interrogate through this project, I am using it here to indicate things encountered through the course of my fieldwork that are made of metal, plastic and wood. Although technology was an integral part of this project, the broader aim of the project focuses on the translation of “defect” at Manitoulin Permaculture in terms of how the concept of defect makes Manitoulin Permaculture translatable.

As well as making Manitoulin Permaculture translatable, defects also appeared throughout my thesis and thesis process. Often many things did not work and continue to not work despite the best efforts and intentions of myself and everyone else. Hopefully, my defects were half as effective as defect could be as an object of inquiry in the social sciences.

The first chapter of the thesis explains the methodology I used as well as the role defect played as an epistemological object and follows an introduction to the context of Manitoulin Island and Manitoulin Permaculture. Afterwards, I will use theoretical literature to help make sense of the ethnographic material that became central to this project. The literature I draw on starts with the definition of the word "technology" and borrows from some themes related to techno-politics, understood as the ordering of power and authority by the very design of technologies. Specifically, in my fieldwork on Manitoulin Island among a community of makers working with Manitoulin Permaculture, I studied normalized behavior and patterns of social activity as they might be imprinted upon human relationships by technologies, as well as the makers' ideas about the outcomes of the imprinting of normalized behavior on human relationships (Winner, 1978, 331). I will also borrow from actor-network theory which was used as both a theoretical frame and a methodological resource. I was excited by Michel Callon's (1984) sociology of translation for my methodology as well as Brian Massumi's and George Bataille's critiques of utility to complicate technology as a tool for sociological analysis. I will present the translation of "defect" by the makers at Manitoulin Permaculture as it animated the community using field notes and transcripts of semi-structured interviews. The main argument of this project is that, while fundamental principles of permaculture have to do with the equilibrium of nature, I witnessed the central role of problems and disequilibrium in animating makers—problems that were technological or entrepreneurial, as well as aesthetic and environmental. The engineer, or maker, is conceived of as a pivotal figure in the study of technology because the engineer makes social as well as technical decisions. Although I spent time with 'makers' I was also interested in them as engineers. The engineer is similar to what Callon called the 'engineer-sociologist' who makes predictions and analyses not only of physical systems but of society as

well. However, the notion of surplus-value and value as the "qualitative character of its own occurrence" in Massumi, as well as the notion of "expenditure" in Bataille's *Visions of Excess (1985)*, complicate the claims to utility contained in approaches to actor-networks and techno-politics as seen in Langdon Winner's writings on technology.

Defect emerged as a concept that helped me make sense of the makers of Manitoulin Permaculture. While I was unable to 'locate' defect, its existence was enough to animate the community at Manitoulin Permaculture into acts of creation and expressions of life. Defect created an opportunity to show off expertise, to care for the animate and inanimate and for continual contribution that solidified relationships, keeping Manitoulin Permaculture together. Defect mobilized sharing behavior, it made people work together and co-operate. By contributing in individually unique ways to solving the problem, something new is created by the makers but not of their individual design, because they all share in the production of things, mostly in a 'haphazard' way, they all contribute to something that they do not necessarily know the outcome of. If it were not for defect, Manitoulin Permaculture would not exist in the same form that it does. Defect animates problem-solving behaviors, competition and caring practices and it inspires transformation. It is because of the ongoing and endless creation of 'defect' as a result of makers' activity whose consequences, technological or otherwise, are unforeseeable and produce unpredictable outcomes. Not only was defect prevalent at Manitoulin Permaculture, but it also appeared within geological, biological and spiritual anomalies on Manitoulin Island.

Manitoulin Island

Very little has been written about the history of Manitoulin Island. The sources I draw on are texts known to local residents and those at Manitoulin Permaculture. Thanks to the pioneering work of Shelley Pearen, I was able to learn Manitoulin history, geography and

mystery in depth. Her two works *Exploring Manitoulin* and *Four Voices: The Great Manitoulin Island Treaty of 1862*, make up most of what is presented here. Pearen also borrows heavily from scientists who have previously written about the island, such as geologists and biologists.

Manitoulin Island could be described as a giant limestone formation with unusual geographical characteristics. "Manitoulin Island is the world's largest island situated in a freshwater lake. It is 29 km… long, varies in width from 4 to 48 km… and has more than 80 inland lakes. Its north shore forms one side of the North Channel, and its east coast, together with the Bruce Peninsula, forms Georgian Bay" (Pearen, 2001, xiii). Dr. John Morton, co-author of *The Flora of Manitoulin* believed that the geological change between the North Shore of Lake Huron and Manitoulin Island produced differences in landscape and vegetation. "[T]he North Shore is formed of the granite and quartzite ridges of the Canadian Shield, while the island is formed of limestone, with rock plains (and) long perpendicular cliffs…" it has a geology which Merton seems to suggest is one of the causes for the ecological diversity on the island (Ibid, xiv).

A variety of ecological niches also arose due to the activity of glaciers on the island's limestone and dolomite bedrock. In 1865 Professor Robert Bell (1841-1917) conducted the first study of the flora of Manitoulin Island and since then experts have recorded more than nine hundred species (about one fifth of Canada's total variety of plants) one of which is the Manitoulin Gold Daisy (Ibid, xv). Once again relating the local ecological diversity with species diversity, Pearen points out that "[t]he Manitoulin Nature Club's booklet *Birds of Manitoulin, A Seasonal Occurrence* credits the diversity of habitats on Manitoulin both with producing 155 breeding bird species and with attracting a large variety of migrants" (Ibid, xv). It was a potential for diversity and abundance, of people or otherwise, that attracted me to permaculture and Manitoulin Island. The isolation of the island may provide an opportunity for life to proliferate

and diversify producing novelty, resemblance and 'defect' in its wake. Since the island is isolated, it is free from certain influences, like those that are unable or unwilling to travel across water, and a different arrangement is possible. While the geography of the island is unique, so too are its people and their histories.

One of the defining factors in the history of Manitoulin is its relationship to European expansion and Canadian treaties. When I visited, I attended an intimate ceremony of asking the land for permission to be built on. We offered, with the guidance of a local elder, the four sacred herbs to the mountain which was about to undergo development. Although the makers and the local elders appear to get along, in the past this arrangement would have been unlikely. Later, we will see the entrepreneurial history of Little Current, the largest settlement on the island, whose history is still relevant today.

Pearen begins her history of Manitoulin Island by dividing Ontario pre-history into four sections, starting with the Paleo-Indian period and ending at the Terminal Woodland period and European contact. Afterwards she explains how we approached the present day:

> By about AD 1400 the Terminal Woodland people had evolved to the Eastern Woodlands people, who spoke languages from two unrelated linguistic families, Iroquoian and Algonquian. These were the natives the first European explorers encountered in Ontario. The Iroquois, who inhabited the temperate and fertile lands of present-day southern Ontario and northeastern United States, relied mainly on agriculture; the Algonquin, inhabiting rugged northern areas, survived by fishing and hunting. The Algonquin included Ojibwe, Montagnais, Naskapi, Micmac, Malecite, and Beothuk. The Ojibwe are the ancestors of the majority of Manitoulin's native population. The Ojibwe included four groups: the Ojibwe of Lake Superior, the Mississauga of the Mississauga River and Manitoulin, the Odawa of Georgian Bay, and the Potawatamie of the west side of Lake Huron (Pearen, 2001, 3).

Pearen seems to suggest that the exchange of survival skills and furs for the Europeans' cloth, tools and weapons upon their arrival at the end of the sixteenth century, dramatically altered the lives and traditions of the Natives (Ibid, 4). One of the earliest and most notable

arrivals was that of French explorer Samuel de Champlain. He encountered Algonquins and their Iroquois Huron allies when he arrived in 1603 (Ibid). In 1609, he helped the Algonquian Montagnais defeat the Five Nations Iroquois Mohawk, forming the basis of a French-Algonquin-Huron Alliance (Ibid). Pearen continues with Champlain's goals:

> In addition to explorers and fur traders, France sent Roman Catholic missionaries. Champlain's aim was to establish a colony and to Christianize the natives, as well as to develop a system of trading posts. To implement his ideas, Champlain sent for Recollets and Jesuit missionaries. These priests travelled by canoe up the Ottawa River to the land of the Huron, whose population is estimated to have been twenty thousand in the year 1600. They lived among these natives, established missions, and learned their language in order to convert them to Christianity (Ibid).

It may be that along with trade and the gospel, the Europeans brought European diseases as well, severely reducing the population of the Huron nation (Ibid, 5). Up until their arrival, the Huron had been sheltered from these diseases (Ibid).

In *Four Voices: The Great Manitoulin Island Treaty of 1862* Pearen provides a detailed account of Manitoulin history by explaining it through four key historical perspectives. She suggests that Manitoulin's age-old residents, the *Anishinaabe*, changed throughout Canada's evolution from independent organized nations to trading partners and then to isolated peoples (Pearen, 2001, vii). Before the treaty of 1862:

> [t]he *ogimaag* (chiefs) who signed the agreement in 1836 believed the government was acknowledging and affirming their title to Manitoulin and the adjacent islands; they were agreeing to share it, forever. The government was merely acquiring land on which to collect them, and accepted the agreement as one of several dozen agreements, treaties, or surrenders signed between the Crown and the Native peoples since Britain's assumption of control of North America (Ibid).

In the foreword to *Four Voices*, esteemed Manitoulin resident, Ojibwe *Anishinaabe* from M'Chigeeng First Nation, Alan Ojiig Corbiere wrote "[t]he story of the Great

Manitoulin Island treaty is a microcosm of the story of Canada. The treaty process was, in Canada's eyes, honed here. Earlier 'mistakes' or 'anomalies,' were treated by the government as lessons learned as the treaty process moved westward with colonization" (Ibid, xii). Through the personal stories of four key figures, Pearen unravels the history of Manitoulin Island during and after one of its most contentious periods. Throughout Manitoulin's tumultuous past, from pre-1862 to present, the island has been visited by people with entirely different intentions than the colonizers. I am one of those visitors with different intentions (doing research) than the islanders (many of whom are not doing formal research).

Finally, a history of Manitoulin Island and an introduction into my experience of it would not be complete without an explanation of the name "Manitoulin." "The word Manitoulin means 'Spirit Island' based on translations of Ojibwe, Odawa, and Potawatamie languages. Manitoulin is believed to be the home of the Great Spirit, or Kitche Manitou" (Pearen, 2001, 31). Manitoulin has a close connection to the Creation myth. It is incorporated into Creation in the following legend:

> When Kitche Manitou created the world, he set aside the best of each piece of Creation: the bluest, most sparkling water; the whitest, most fleecy clouds; the brightest stars; the most fertile fields; the greenest forests. When he was finished the earth, he created from these special pieces an island and set it in an inland sea, Lake Huron, where it drifted to the North Shore's rugged coast. He was pleased with this setting of extreme contrast, the North Shore's rough coast against the delicate island. He secured the island in place and proclaimed it 'Manitou-miniss' or Island of Manitou (Pearen, 2001, 32).

Having been to the island, I can see why the belief in Manitou remains. While in Little Current, for example, I heard many people proclaim that the island has "magic" and that they had

experienced magic on the island. I was also drawn to Manitou as I grew to understand it, but, like defect, I couldn't see it, taste it, touch it or smell it. Initially, however, I was chasing something different than a pursuit of magic when I went to Manitoulin Permaculture.

Little Current: A Brief History of the Market Town

I spent quite a bit of time in Little Current during my stays on Manitoulin since it was the nearest town to our farm that could supply us with necessary resources like potable water. It is a delightful town on Manitoulin Island with a rich history. Pearen explains how Little Current got its name:

> The ambitious tourist can walk for several kilometres to the west, below the churches on Robinson Street, to Spider Bay Marina and the ruins of the former mills west of Spider Bay. This site was named Wewebjiwang or 'where the waters flow back and forth' by the natives; 'Le Petit Courant' by voyageurs who passed by on their fur-trading routes; 'Dingwall' by the post office (though the name was not sanctioned); 'Shaftesbury' by surveyor T.J. Patten, who laid out the townsite. But since the 1860s the town at the North Channel's narrowest point, where the current slows or reverses, has been known as 'Little Current' by its residents (Pearen, 2001, 43).

Little Current was settled about 140 years ago by native entrepreneurs taking advantage of its harbor, they were joined by non-natives 15 years later (Ibid). "Little Current was a supplier of fuel for steamships, a shipper and miller of lumber, a coal transshipment center, a water-based tourist destination, and, always, a market town" (Ibid)**.** Its location on a steamer route made it an important market town, but lumber's booms and busts helped define it (Ibid, 47). "According to F.W. Major, author of *Manitoulin, the Isle of the Ottawas,* Little Current's sawmill history began around 1874 when John Amos built a small mill, which was joined a few years later by John Dawson's... By 1890 these large mills made Little Current an important Lake Huron center,

processing twenty million feet of pine per year...The ruins of these former mills can be viewed on the western waterfront." (Ibid).

The market continued to have an influence on Little Current. When it was incorporated as a town in 1890, the first council was elected with general merchant Thomas Chapman Sims elected mayor (Ibid, 51). The first council was also market oriented, it was composed of a hotel owner, another general merchant, a livery stable keeper, a tailor and a confectioner. When I visited, I met the owner of the same hotel, as well as the owners of a local general store and the director of the newspaper.

While on the Island I had the opportunity to attend two of the largest festivals on the island. The Wikwemikong powwow and the Haweater festival occurred at the same time in June 2018 when I went to the powwow in the afternoon and the Haweater festival in the morning. In 2017, these festivals were held separately allowing me to fully attend both. The powwows have a longer history than the Haweater festival, they have likely been going on since the beginning of time and have been recorded on Manitoulin island since 1830 (Ibid, 26). Pearen writes:

> Manitoulin Island is a natural host for powwows. The traditional Algonquian name for Manitoulin, Manitou-miniss, or Spirit Island, still accurately describes this unique isle. The 1990s saw a resurgence of Spirit or Manitou here. The most visible sign of this spiritual revival is the powwow, although native arts, crafts, and theatre have also enjoyed a renaissance. About half of Manitoulin's population of 10,000 are native Canadians. Most reside on the island's six First Nations. All of these communities hold summer powwows that visitors are welcome to attend (Ibid, 25).

For the Haweater festival, I helped some of the makers set up their market stalls and watched them compete in the annual cardboard boat race. Regarding the origin of the term "Haweater" Pearen writes "[i]t is believed that early pioneers were once saved from starvation by eating the berries off the hawthorn tree. Today the term Haweater signifies someone born on Manitoulin" (Ibid, 55). Thus, the "Haweater" festival. However, one of the makers suggested to

me that this legend is not true, or unlikely. Here it seems to me, history becomes a tool for integration with a new worldview: makers assert that the accepted history is wrong and that they know the right history. Makers told me that it would have been nearly impossible for people to survive off of the berries on the island because the berries are eaten too quickly by the birds when they first appear and thus no substantial amount can be harvested. Regardless of the accuracy of the term Haweater, the island's competing breweries make their own delicious beers from this hawthorn, "haw," berry. It is becoming a major tourist attraction.

Today, Little Current has technically been amalgamated into Northeastern Manitoulin and the Islands (Ibid), and it is this township which is responsible for leasing land to the makers of Manitoulin Permaculture for $1. After proposing their plan to the city council, the council sold the property for $1 because there had to be a non-zero price for the land to be sold properly. Toby explained that, since the decision makers were easier to access, their project was able to get off the ground much faster. If he were still in California, it might have taken years of climbing just to get someone's ear. This year the Northern Ontario Permaculture Research Institute (NOPRI), the official legal entity that houses Manitoulin Permaculture, was awarded a contract to build a greenhouse. Their greenhouse will use renewable energy, recycled materials and mobile communication technology to demonstrate the viability of producing year-round food in Northern climates. The greenhouse will be a 1,000-foot model of the existing prototype designed and built by Toby, Rodney, Eugene, Troy and Clare, who I will introduce shortly. When I arrived, they had just dug out 'the pit' for the foundation of that greenhouse. The pit was a wide, long but not deep hole in the ground in front of the road that ran adjacent to the property. When I first saw the pit, I felt a sense of dread as Eugene laughed at the amount of work to be done there. It was empty for now, but it wasn't going to be long before I would toil away in the pit to

bring the greenhouse to life. Once built, the greenhouse will accelerate Manitoulin Permaculture's permaculture projects, since it allows them to grow more plants faster as well as make some money for their projects.

Manitoulin Permaculture

According to Bill Mollison, the 'grandfather' of permaculture, "permaculture design is a system of assembling conceptual, material and strategic components in a pattern which functions to benefit life in all its forms. It seeks to provide a sustainable and secure place for living things on this earth" (1998, 35). Permaculture is a portmanteau of 'permanent' and 'agriculture.' It is an alternative style of farming and living that is distinct from monocrop farming as well as other less well known styles of farming. Although permaculture farms and groups are extremely diverse, all of the accounts of permaculture participants suggest that they share several interests, one of which is living in harmony with nature. In *Perma/Culture* Molly Wallace and David Carruthers situate permaculture in the heart of the Anthropocene. They argue that permaculture gives people the opportunity to experience the "joy of doing something" as they work towards a better world, tying permaculture to the motto of the World Social Forum "Another World is Possible" (Wallace and Carruthers, 2018, 3). The makers at Manitoulin Permaculture made it clear to me that their explicit goal is to contribute to a better world by sequestering carbon so that humans might continue to live on Earth.

Permaculture is an international movement that began during the back-to-the-land 1970s (Wallace and Carruthers, 2018, 4). It was introduced in Bill Mollison and David Holmgren's 1978 text, *Permaculture One: A Perennial Agriculture for Human Settlements* , where they endorsed an "agriculture in tune with nature, using practices that follow what the land could itself support (rather than imposing human desires upon it), resulting in an agricultural aesthetic

that eschews the geometrical rows and squares of industrial monoculture in favor of diverse spirals and companion planting" (Ibid). Permaculturists live as if the apocalypse, usually an anthropogenic one, has already arrived (Ibid, 5). This belief is often related to millenarian movements, but permaculturists "tend to have an optimistic view which recognizes a path of escape through personal will" (Lemons, 2012, 97). The idea of a 'self-saved' world is ideologically key. Critical of existing schemes to mitigate these environmental crises, Wallace and Carruthers argue that we should joyfully repair the planet and thereby produce an abundance for all beings. Michael Lemons reads this as an expression of deep millenarian roots within permaculture, where, through labor and the return to a natural past, permaculturists can prepare for an uncertain future (Ibid, 99). Lemons believes that permaculturists see the environment as the godhead and so nature will make the changes required while permaculturists toil in a state of glory (Ibid).

Permaculture shares goals with many kinds of alternative living arrangements. In *Lifestyles of the down and prosperous: Nature/culture, counterculture, and the culture of sustainability* Lemons tries to show that the permaculture model "is readily translated into a symbol of and platform for the expression of nature spirituality, utopian and millenarian beliefs, radical environmental politics, and countercultural sentiments in general" (Ibid, 89). In one way, he suggests, permaculture practitioners are affirming the trope of one disgruntled group breaking off from the others and deciding: "'we think we can do better for ourselves over here, rather than over there'" (Ibid, 58). Lemons points out that the kind of experimentation found in permaculture is different in modernity because, among many other things, the risk regarding the likelihood of failure is less than in the past (Ibid). He points out that organic farming models, models practiced by the Amish, as well as the ecovillage model have been of interest to sustainability researchers.

He argues that permaculture is unique among them because others do not: “pursue the goal of low environmental impact by direct intention”, nor do they “have a current pattern of recruiting new participants, especially Western participants” (Ibid, 60).

One of the distinctive objects in permaculture is the Permaculture Design Course which “remains committed to a hands-on praxis of sustainable construction, landscape planting and food-growing techniques along with pragmatic tips and practice sessions for successful community organization and communication” (Ibid, 89). Though I did not do the permaculture design course offered on the farm, I read several of the permaculture manuals in their library and practiced permaculture alongside the makers. While the Permaculture Design Course facilitates the institutionalization and normalization of permaculture, it is not the main directive. Instead, “Mollison's overarching directive guiding how permaculture will achieve its end goal turns out not to be a scientific or design principle but an ethical imperative ‘to take responsibility for our own existence and that of our children’” (Mollison, 1990,1 as cited in Lemons, 2012, 91). Mollison suggests three motivating principles: “‘care for the earth,’ ‘care of people,’ and ‘setting limits to population and consumption’” (Mollison, 1990, 2 as cited in Lemons, 2012, 91). If Mollison were alive today he would be aware of the Anthropocene whose central belief, that humans have become the dominant influence on the Earth’s environment and climate, is embedded in his work. Of course, there is a difference between how permaculture is understood by academic theorists and how it is understood by grassroots activists and laypersons. There is also a difference between their understandings and those of permaculture’s founders (Ibid, 89).

Curious to know how nature is perceived by permaculturists, I looked to Taylor Aiken, who, in *Permaculture and the social design of nature* conceptualized permaculture through the Transition Town movement by outlining permaculture as an ecosophical movement. He tried to

uncover how ‘nature’ is produced in the permaculture movement and how nature was deployed as a resource for the social. He described a “family resemblance” (he refers to Wittgenstein) between “a wide and diverse group of ecologists, social activists, gardeners, architects, thinkers, dreamers, and do-ers” (Aiken, 2017, 175). Aiken focused on the tendency of permaculture adherents to “[adopt] ‘natural’ solutions for agriculture and ecosystems, a complex enough intellectual maneuver, but also for social systems” (Ibid). As he weaves together permaculture’s heritage, he relates the sciences used by permaculture to the understandings and design principles of the permaculture ethos. He specifically refers to ecological sciences and systems ecology (Wallace and Carruthers add thermodynamics) as conceptually important for permaculture, and demonstrates that, in permaculture, everything is relational (Ibid, 177-178).

Aiken argued that permaculture practitioners’ relationship to ‘nature’ was analogous to Kierkegaard’s understanding of existential ‘truth’. He writes:

> For Kierkegaard, Truth means living in truth. For Permaculturists, Nature means living naturally. This is what Kierkegaard called the ‘subjective appropriation’ of how the existing subject relates to the object. As important as what you believe, is how you believe it. Permaculture is as much the what of nature, as it is the how. This then begets the ethical approach integral to ecosophy. Significantly, I am not arguing here that nature does not exist, or there is no such thing as objective nature. Kierkegaard argues not that there is no such thing as objective truth, but that the more existential way of relating to that truth is a far more important, relevant and neglected consideration. Likewise, for permaculture, nature is not to be bracketed out – à la Derrida’s sous rature, nature as nature – as a problematic but necessary concept. Nature is not to be dismissed out of hand, or assumed to be a complete construct. Nature is the thing Kierkegaard would say permaculturists are ‘willing to live and die for’. It is the nature that is true for them (Ibid, 182).

Although he plainly states and particularly points out “that the production of nature – even an ‘objective nature’ – is placed and locally produced” he does not mention how exactly it is produced, and instead focuses on the ecosophical orientation of permaculture groups. He concludes that not only do permaculturists seek to live according to ‘objective’ ecological rules,

but to have them inform their ethics. They do not "[use] natural laws as a stick to beat other people with," though in some cases I saw the opposite, instead "[permaculture] calls for a self-reflection and realignment with the natural. A focusing on the self that reaffirms that what we are dealing with here is an ecosophical subjectivity, beyond the self as I, towards a collective self, where we is distinguished from I not by number, but by depth" (Ibid, 183).

In the West, permaculture is often a symbol of the "urbanite utopian imagination" and becomes, at least in the UK, affiliated with everything from fair trade gas companies, telephone company co-operatives, Greenpeace and the World Wildlife Federation (Lemons, 2012, 94). Lemons believes that its umbrella of counter-hegemonic representation may be its most promising feature (Ibid, 95). Lemons associates permaculture with biodynamic farming, radical environmentalism as well as social activism, primitivism and the raw food movement which all use 'permaculture' tropes to describe their goals (Ibid).

On Manitoulin Island, permaculture was not a reflection of its "sacred texts" as much as it was a symbol of a utopian project. As well, permaculture on Manitoulin is a proposition to do something, permaculture practice, found in both the written texts and on-the-ground practices, it contains instructions for action with key checkpoints, like those of a recipe, along the way to a fulfilled promise, that of an abundant world for all.

Manitoulin Permaculture is described by its founders and current members as focused on building a self-sustaining community on Manitoulin Island. It has been more or less active for six years, changing with the seasons, with farming shifting to other kinds of activity as it gets too cold to live in the tents and geodesic domes on the farm. Situated just outside of Little Current, Ontario, members of Manitoulin Permaculture, in one way or another, try to solve problems. Almost half of those members with whom I engaged were trained as engineers, scientists, or

computer scientists. The other half were artists, craftspeople and activists. Their activism was multi-faceted but in practice focused on designing and implementing a self-sustaining, self-perpetuating farm that would provide food and shelter for people who can't find meaningful employment. Toby is a geneticist who loves instant coffee and without it he gives the impression that he would rather you weren't around. He is starting a cider making business and a Mars-based start-up, and used to work as a Silicon Valley entrepreneur. His parents live on the island and he often moves from their place to a dome on the farm. His start-up had something to do with designing a specific part that would be required for a trip to the planet Mars, though he was careful not to give too many trade secretes away, of course. Rodney, who runs the organization uses a wheelchair and is a software consultant with an MBA. He spent a lot of his life studying permaculture and community organization. He built little explosives in high school and was widely considered a daredevil. His wife, Ana, has recently moved onto the farm and met Rodney online through a spiritual dating site. She has a strong connection to spiritual entities and once told me that I was clouded by a kind of head-sucking spirit. Eugene and Nina met on the farm and Ana claims to have set them up as a couple, noticing and pointing out that they both liked mushrooms and each other. This social engineering is characteristic of Ana's personality as she often saw herself as in charge and as having deeper insight into the nature of things. Eugene and Nina's mushroom business also got its start on the island, as they had enough time and space to experiment with mushroom growing using a small greenhouse and a pressure cooker as well as a microscope and fungi in petri dishes all belonging to Manitoulin Permaculture. Eugene tutored kids in town and taught them basics in robotics, computer science and dungeons and dragons. Eugene and Nina now live in the house on the property where Rodney's mother also lives. Nina has long red hair, is full of energy and has gone so long without shoes that she no

longer needs them because the soles of her feet are incredibly calloused and because the soles of her feet have become completely desensitized. Troy is Eugene's best friend and they both have degrees in engineering. They came across Manitoulin Permaculture during a bike trip across Canada. They said it was the best place they came across and it was so good they wanted to continue living there. When I was last there it was their fifth year away from their original home city of Ottawa. Troy's kombucha business started at Manitoulin Permaculture where he would test different blends of kombucha and share them with people on the farm and is now expanding into stores in Sudbury. Doug is from Waterloo and drives the vehicles that require certification for Manitoulin permaculture's business operations. He is extremely tall and strong and plays guitar, he is a gentle giant, is extremely disciplined, hardworking and is widely liked by his friends. Francine is an artist and ex-graduate student in cognitive science at Carleton. When I was last there another couple, Clare and Parker, were working and studying at Manitoulin Permaculture. Clare thought that she was going to do an internship and build a food forest, but they never did accomplish this during my time on the island and Ana did not give them many opportunities to garden either. Clare tells me that it is because Ana was not willing to let them help with the gardening tasks, which Clare wanted to learn about as an intern. Parker was hired to handle the development of the greenhouse since they had enough experience to do it after working in construction. Clare ran a business in Montreal selling custom clothes, they were in the process of hiring more people and would often check in on their Airbnb clients who were staying at their house. Parker is bulky, has a big beard, a constant smile and I often saw them working with Toby on designs at the outdoor picnic table where we all ate dinner. Margaret and I shared a joke a day for most of my stay. She has spent many years living in a community house in Kitchener for the purpose of experimenting with alternative ways of living. She visited

Manitoulin Permaculture to work and learn about the community organizing going on there. There were many other visitors and people that I met during my stay, but I came to know these people best.

Technology, and beliefs that some technologies are dangerous, was also a part of what animated many of the makers on Manitoulin with whom I interacted. I came to see that the failure of technologies to work 'in the world' was one of the core reasons for the makers on Manitoulin being together, as much as the beauty of Manitoulin Island. I will elaborate on this idea of defect—specifically that they wanted to 'fix' themselves, the world and the technologies around them—more below. Defect reorganizes Manitoulin Permaculture, making relationships of expertise possible. Defect in the world in a more general sense, like defect in the organization of a city, makes this kind of permaculture possible because many of the volunteers arrive because they disagree with how life is organized and the nature of living where they are escaping from. In this sense, defect does not just destroy or halt, but creates a new opportunity.

Some of those opportunities are legal. NOPRI, the legal 'front-end' of the farm (as in the face they show to the world) is intimately connected to other organizations and initiatives of various names: the Ski Club, Heartwood Mushrooms, Heartwood Kombucha, Manitoulin Permaculture and Manitoulin Wellness. The makers are building an eco-village made of small homes on a nearby plot of land down the road from their homestead, as well as a cidery made up of a combination of apple trees and cider processing machines which will someday have its own legally distinct name, I was told. It became clear to me that by acting as many different corporations, the makers are able to strategically promote different initiatives. They can use one corporation as a non-profit, and another corporation as a for profit entity and blend their actions for accounting purposes, for example. However, as far as I know, NOPRI is the only corporation

that has a board with members outside of Manitoulin, has loans in their name and receives government grants. One of the board members of NOPRI, Rodney, manages the farm and Manitoulin Permaculture, which surrounds his family's long-time homestead. Their homestead is the collective of buildings that encompass their original home on the property. All this to say, when I refer to Manitoulin Permaculture or NOPRI or any other legal entity 'run' by someone on the farm, it is more or less the same group. I chose to focus on 'Manitoulin Permaculture' because it has an explicit focus on permaculture and on making. While I witnessed members of Manitoulin Permaculture experiment with their lifestyles by trying new drugs, forms of romantic relationships or business ideas, they also experimented with farming practices and technologies. Technological experimentation was one of the things that drew me to this place, since I was involved in studying the technologies presented by Bill Mollison before I landed on Manitoulin Island.

There are many other farms on Manitoulin Island; I know of one high profile farm on the island and visited another but they are not as populated or as active as Manitoulin Permaculture. Though I only visited other farms briefly and heard snippets about still others, I am reasonably certain that Manitoulin Permaculture is unique among the farms of the island, and perhaps Ontario, because of its focus on permaculture and its central use of technologies. Furthermore, bicyclers who pass through and have passed through admit that it is one of the most unique places they stopped at during their trips across Canada. It is hard to pinpoint exactly what NOPRI does on this farm, as the super-entity which houses Manitoulin Permaculture, but it is defined as a research organization (Northern Ontario Permaculture Research Institute) focused on permaculture. NOPRI is not how one would imagine a research institute. Rather than a glass building hidden in the hills with a slew of people dressed in button up shirts hiding away in air

conditioned rooms, NOPRI is partly composed of geodesic domes with beds and other personal items, an outdoor kitchen, a truck named “Beast” and a tire swing overlooking a beautiful horizon. Nobody is sitting in an air-conditioned room all day, and they wear whatever they want. Though they sometimes dress in costume, often people wear the same thing every day, like I did, or wear little to nothing or they wear whatever they need to do to get the job done like hats, boots and bug suits. If NOPRI is intended to further research on permaculture, it is treated more as a lifestyle than a farming practice. While many would call farming a lifestyle, theirs was even beyond any farming lifestyle I knew about previously.

Manitoulin Permaculture attracts many backpackers, cross country bikers and volunteers. Many of the people who find Manitoulin Permaculture find them through online and offline networks. One such network is Warm Showers, which is a platform for people to offer free shelter for travelers. As well, Manitoulin Permaculture is connected to the local community by a series of personal relationships with other islanders. The makers are well-known, and the farmland has been occupied by the same family for two generations. The makers have built many community gardens and large compost bins that are housed throughout the island. They have also taught various classes on composting, permaculture and the benefits of mushrooms. Although most of the early labor was unpaid, paid positions are opening up and their operations are expanding. Doug may take over Rodney’s bike shop, Eugene and Troy will be hired for upcoming projects, Toby is paid as an intern, while Parker and Margaret were paid to work during the summer of 2018. As Manitoulin Permaculture expands, the technologies used on the farm become costlier and difficult to understand.

Permaculture, as seen through the writings and videos of Bill Mollison, had, to me, before I arrived at Manitoulin Permaculture, what seemed like a unique way to think about and

design technologies. Basically, permaculture is a framework for thinking about technology holistically and the designs are simple, often using 'natural' forces, like the motion of the sun in the sky or the flow of water downhill. [1] I was energized by the technologies in Mollison's literature and videos because they were so unlike the technology I studied in my early undergraduate career as a computer science and math student.

Chapter 1: How I Became Interested in Manitoulin Island

Manitoulin Island, which I came to know after learning about Manitoulin Permaculture, has been a destination for tourists and settlers alike, having experienced tourism for more than 160 years (Pearen, 2001, 11). "The first 'tourist' was Mrs. Anna Brownell Jameson, who visited Manitowaning in 1837. Others had visited before, but for religious, trade, or government purposes. Mrs Jameson was an Irish-born writer and the wife of Upper Canada's attorney general Robert Sympson Jameson" (Ibid). She attended the receiving of gifts given by the government, the grand council of chiefs, a women's canoe race and a war dance (Ibid).

The annual gift ceremony also attracted artist Paul Kane in 1845 prompting him to spend two weeks sketching Indigenous Canadians (Ibid, 12). He observed around "2000 Indians, awaiting the arrival of the vessel that was freighted with their annual presents, comprising guns, ammunition, axes, kettles, and implements useful to the Indian," a sight which he would later publish in his *Wanderings of an artist among the Indians of North America, from Canada to*

[1] Fuller (1954) draws a distinction between the East and the West according to their uses of 'natural forces' like the wind in *The Fuller dymaxion airocean world* and argues that this distinction persists culturally, in their practices, as well as technologically.

Vancouver's Island and Oregon through the Hudson's Bay Companies territory and back again (Ibid, 11).

Laurence Oliphant, author, diplomat and mystic, was also attracted by the annual distribution of presents at Manitowaning in 1854 (Ibid). While there he visited and wrote about Tetit Courant, "a small village inhabited by Indians who gain their livelihood by supplying steamers with wood. We landed on Sunday and attended service in an Indian's log house". He later published *Minnesota and the Far West*, in which he described his fellow steamboat passengers as "emigrants from Europe, speculators from the States, tourists from all parts of the world, rough backwoodsmen and mysterious characters journeying towards the limits of civilization, for reasons best known to themselves" (Ibid). I was a passenger of Manitoulin Island, and what I write about it and the members of Manitoulin Permaculture, those mysterious characters, surrounds my interests as a kind of visitor and is not the final word on any of the topics I will address.

I first became interested in permaculture after being given Maurizio Lazzarato's *Signs and Machines*[2] in 2017 and developing an interest in urban studies and social change as an undergraduate at the University of Ottawa. During an undergraduate (fourth-year) class on social change, a woman came to speak to us about the Learning Garden, a small community garden in the heart of the University of Ottawa's main campus. Until that point, I had never seen it, but once seen, it was hard to miss. This new space provided me with a lot of inspiration for alternative farming methods and politics in practice. After learning as much as I could about

[2] I thought there was a connection between permaculture's 'manufacture' of time as duration, and Lazzarato's suggestion that financial semiotics created a 'loss' of time as possibility.

agriculture, I finally settled on an exciting experiment for myself: I would create a food forest, once I could acquire access to land.

While trying to get the University of Ottawa to broker the sale of the university's compost processing machine, which was stinking up a basement, to a local farm, I met the associate Director of *Just Food,* a local sustainable food and farm organization outside of Ottawa, Ontario. Later, when I asked him if I could try my experiment, the construction of a food forest, he directed me to Manitoulin Permaculture. After a brief interview and a series of emails and phone calls, I arrived on the beautiful Manitoulin Island to study permaculture with the makers of Manitoulin Permaculture in the summer of 2017.

During this summer, I volunteered for three months working on Manitoulin Permaculture's farm initially because I was interested in the farming practice and in learning about composting further to my experiences in Ottawa. While there, I contributed to everyday activities such as cleaning, weeding, cooking and harvesting. I also helped build large compost bins for local community centers and built a community garden inside Little Current. During my stay in 2018, NOPRI was in the process of building a large-sized greenhouse while planning and hosting a wedding for Rodney and Ana, the caretakers and managers of the homestead. While the makers were overtly interested in technology and building material objects, they ended up hosting and preparing for a wedding, leaving their large-scale greenhouse unfinished. However, the state of much of their technology as incomplete, broken or defective helped make it possible for them to generate desired outcomes. Constant fixing created a potential for other projects, inspirations for new endeavors which could be channeled. By channeled I mean that one motivation can lead to another and that next motivation can be guided or lead into new directions. By expressing a motivation in, say, gardening then the problem of the clay soil may

inspire new energies for other projects which are somewhat related to fixing the clay for gardening in the future. During my stay, there was a split between those who worked on the greenhouse and those who worked on the wedding, and one way this split was evident was through different approaches to fixing and making. I came to see in my observation of happenings at Manitoulin Permaculture and through my interviews with makers that defect as it occurred between the makers and their technology can provide an insight into the dynamics of Manitoulin Permaculture.

How I Prepared for My Second Visit

As this was my second time visiting, I had had a lot of time to prepare. I wanted to make sense of some questions I had after my first summer on the island, especially questions about technology. It was not always clear to me how technology fit into the social sciences since I had a lot of trouble figuring out what technology is. I decided to simplify things for myself by calling technology plastic, metal and wooden objects. Once I did that I ran into debates about the form technology takes, especially about the boundary of technology and technological systems, their essence and whether technologies have their own agency. I thought a sociology of translation (Callon, 1984) would help me because it dealt with different actors, human or otherwise and also implied both a mathematical motion, which I was familiar with, and a quasi-linguistic challenge which was interesting to me. I also looked to Michel Callon to explain the figure of the "engineer-sociologist" (1987) because they simultaneously engage with technology and make decisions that have social and political ramifications just like the makers seemed to do. However, I first had to describe technology before I could see it in interaction.

Describing Technology

Describing technology is important for my project because I try to incorporate humans and non-humans in my methodology and am guided by an actor network theoretical framework that attributes agency to things (see more below). I am starting from the position that the non-humans I was interested in can reasonably be called 'technology.' When technology refers to collections of singular objects working together in a complex system that has developed over time and is integrated with humans it is called a 'socio-technical network,' or, more often in the literature, a 'large-scale technological system' (Hughes, 1989). During my literature review I encountered key themes and debates in the philosophy, sociology, anthropology and politics of technology that are relevant for this project.

One of the central debates in the social sciences literature on technology focuses on whether there exists a kind of synergistic phenomenon whereby a collection of non-humans and humans becomes 'autonomous,' capable of exerting its will upon others. Other central questions concern the issues of the boundary around technological systems, like where one ends and where its outside begins, the essence of technologies, as well as their evolution, creation and the transcendence or immanence of technical being. Historically speaking, as the concepts used to describe technological phenomena began to be used to describe never before seen objects and systems around the turn of the nineteenth century, well under way in 1847 (Marx, 1997, 974), the concept technology became so abstracted that it stopped referring to specific tools or techniques. The possibility and consequences of technologies working together with humans to produce desired outcomes became the contested space of the word technology today as the result of transition led by the work of Thorstein Veblen in 1901 and the misunderstanding of the nuances of his use of the term (Schatzberg, 2006, 500). In summarizing these academic debates below, I provide a detailed account of the nature of technology as I define it for this project, as well as a

frame to understand how the makers saw their technology at Manitoulin Permaculture. Although I give a lengthier treatment of the definition of the word technology and other related words found in the literature, I will briefly explain my definition of the term that I use for the purposes of having a conversation about objects sometimes called technology.

"I am not a Lexicographer"

Langdon Winner, who was frustrated with the disorderly conversation about technology in the late 20th Century, which he described as "technics out of control in political thought," diplomatically asserted "I am not a lexicographer" (Winner, 1978, 12). Instead of legislating usage, he attempted to "bring a measure of order to a conversation that has lacked order so far," by modestly proposing a simplistic division of terms (Winner, 1978, 12). In a single stroke, he points to both the expanding linguistic history of the word 'technique' as well as the *non-Greek origins* of the phenomenon the word tries to address:

> [t]he root of this word is the Greek *technē* ("art," "craft," or "skill"), which linguists have further traced to the Indo-European root *teks-* ("to weave or fabricate"). From the earliest times, technique has been distinguished from other modes of human action by its purposive, rational step-by-step way of doing things" (Winner, 1978, 12).

Finally, as he approaches the conversation at the heart of *Autonomous Technology* he clarifies the terms technology, organization and network: "'technology' frequently refers to some (but not all) varieties of social organization -- factories, workshops, bureaucracies, armies, research and development teams and the like. For my uses here, the term *organization* will signify all varieties of technical (rational-productive) social arrangements. Another closely related term -- *network* -- will mark those large-scale systems that combine people and apparatus across great distances"

(Winner, 1978, 12). Winner is frustrated with something that Leo Marx will call the 'semantic void' in 1997 because there has been a shift in the use of the word to refer to the study of industrial arts to the industrial arts themselves. Winner's simplistic division of term is similar in spirit to how I approach this void.

Drawing on this literature on technology, in this project I will use the term technology to refer to metal, plastic, or wooden objects since those types of objects dominated what I came to recognize as technological at Manitoulin Permaculture. Metal, plastic and wood, like all words, are targets for deconstruction, yet they may have fairly unique material signatures that are not worth the time to take apart here, for this project. I recognize that this arbitrary boundary that I am drawing (of metal, plastic and wood as separate for everything else) creates boundaries which I aim in this project to interrogate, but I am framing it in this way to think about the events at Manitoulin Permaculture through the translation of "defect" as a form of motion and sense-making, not technology *per se*.

Many of the contradictions that emerge in the literature on how to define technology seem to focus on questions about the boundary, arbitrary or not, of a technological system (in relation to social ones) as well as the 'essence' of a technology, where essence is a kind of internal logic, like a signature, that could apply to singular technologies as well as those material technologies in socio-technical assemblages. I think that when the makers engage with a technology, they are trying to engage with its essence, if such a thing exists. The debate about where the individual ends and the technology begins is not effective for speaking with these makers. They are simply interested in 'solving' the problem and, in our discussions, Toby often reminded me that I'm merely arguing over semantics when I question the boundary between self and other. Although Toby often surprised me in our conversation with his answers, I often knew

that he was going to say something with an incredible self-assuredness, with no doubt that he was right about it. His background in genetics also came in handy when we talked collectively in the kitchen about end-of-world scenarios like those projected by the consequences of 'gene-drive' technologies. We often joked about this sort of solution because gene drives have been considered for mosquitoes, which were our most annoying predator during my summer stay. He would knowingly chime in and all we could do was listen given the expert status he gave himself and which remained unchallenged.

Methods

In this project, I take up Langdon Winner's approach in *Autonomous Technology* where he proposes epistemological Luddism, which would consider:

> "1. The kinds of human dependency and regularized behavior entering upon specific varieties of apparatus 2. The patterns of social activity that rationalized techniques imprint upon human relationships and 3. The shapes given everyday life by the large-scale organized networks of technology. Far from any wild smashing, this would be a meticulous process aimed at restoring significance to the question, What are we about?" (Winner, 1978, 331).

In this study I think about regularized behavior in terms of the shapes given to everyday life by socio-technical systems and also in terms of a sociology of translation, both of which I will address below.

During my research, I observed the material practices of Manitoulin Permaculture community members with an eye on the role of humans and non-human actants in socio-technical systems. I conducted preliminary fieldwork for three months during 2017 from June to September while living at Manitoulin Permaculture. During that time, I took notes and began to get a sense of the group dynamics while contributing manual labor. When I returned in 2018 I spent three weeks in June helping to build a greenhouse and organize a wedding. I also

conducted three 30-minute semi-structured interviews at the end of my fieldwork with Eugene, Rodney and Toby.

I textually analyzed my field and interview data by hand—by reading and re-reading transcriptions of interviews and field notes—until I arrived at a central and recurring theme: defect. Though that word per se was not used by my interlocuters, they used iterations of defect such as 'incomplete,' 'broken' or 'pointless,' often when describing projects or technologies. I looked for defect in the makers' ideas about patterned social activity since it looked like defect implied a 'specific technology' and that the defect was a sign of veering off of 'regularized behavior.' The way I witnessed defect called into question the idea that technology, as a rationalizing force, left an imprint on human relationships since defect animated 'more than' what it should have at the level of the utility of the technology. Although there are numerous ways to boil water for tea, I regularly used an electric tea kettle to make tea at Manitoulin Permaculture. However, I didn't notice the kettle directly creating the tea making practice, nor did I notice this practice having any extreme effect on Manitoulin Permaculture by itself. Furthermore, since technology doesn't reply to me, as in I can't ask it to explain itself in English, I asked the makers of Manitoulin Permaculture to let me in on what they knew about technology during unstructured interviews.

In addition to interviews, I conducted participant observation according to the 'participant as observer' mode where the participant makes their role as a researcher known to the group and attempts to form relationships with the members of the group (van den Hoonaard, 2012, 83). Everyone on the farm knew that I was conducting field research for a Master's project. I told them that I was looking at their relationship to technology in particular, how they used it,

designed it, built it and thought of it. Since technology was often involved in everything they did, it was worthwhile that I was able to participate in many different projects.

While participating in the ongoing tasks with the makers, I hoped to learn something about their lives and their aspirations. I listened closely and engaged them in conversation. I understand that I had an influence on their behavior, and perhaps an influence on their relationship to different technologies but that possibility was part of what I was exploring. In addition, when I had the opportunity to choose, I chose not to try to influence events in a particular way, instead, I tried to let the group's dynamic prevail, to let the actors associate freely as Callon (1984) recommends, which I will discuss in the next section.

A Sociology of Translation

In Callon's *Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay* he proposes three principles for what he calls a sociology of translation. They are: agnosticism, generalized symmetry and free association (Callon, 1984, 1). He identifies style, sociological disagreements and method as three major difficulties for science studies scholarship. The first difficulty is stylistic in that sociologists often obliterate actors views about Society and retain their views about Nature, creating a "slanted story" (Callon, 1984, 2). The second difficulty is that once one accepts that social and natural sciences are equally ambiguous it is impossible to have them play different roles in the analysis (Callon, 1984, 2). Thirdly, the identities of actors are problematic, for example, it is hard to know their motivations and their importance (Callon, 1984, 2).

To overcome these difficulties, Callon fleshes out his three principles and incorporates them into his story of actors and their construction-deconstruction of nature and society in a contestation over scallop fishing in St. Brieuc Bay, France (Callon, 1984, 4). Three researchers

who came to study the anchoring of scallops made themselves indispensable by asking good questions and by problematizing the situation in St Brieuc Bay. They asked questions like: *does Pecten maximus anchor itself during the first moments of its existence? When does the metamorphosis of the larvae occur? At what rate do the young grow? Can enough larvae be anchored to the collectors in order to justify the project of restocking the Bay?* By asking these questions the researchers made themselves indispensable to the situation.

The three researchers in Callon's study used various devices of interessement to put themselves between actors; This between space is where identities are formed and adjusted during action. "Interessement is the group of actions by which an entity (here the three researchers) attempts to impose and stabilize the identity of the other actors it defines through its problematization. Different devices are used to implement these actions" (Callon, 1984, 8). There are two devices of interessement used during the study: the towlines immersed in St. Brieuc Bay, and the texts and conversations which lure the concerned actors to follow the researchers' project (Ibid, 10).

However, interessement is not enough, its success is determined by actors' enrollment in a narrative. Scallops anchoring themselves to the fishermen's trapping device "is equivalent to a vote and the counting of anchored larvae corresponds to the tallying of ballots" (Ibid, 13). Callon finds that spokesmanship for various actors is not problematic, yet the groups that people speak in the name of are always elusive. In fact, the social and natural 'reality' is a part of the generalized negotiation about the representativity of the spokesperson, consensus and alliance can be contested at any moment. Controversy, to Callon, is the manifestation by which representativity is questioned, discussed, negated and rejected (Ibid, 15). In a controversy,

identity, beliefs and characteristics fluctuate, the implicated actors change as well (Callon, 1984, 10).

Defect provides a similar opportunity at Manitoulin Permaculture. When we were pouring used vegetable oil into a container, to be used as diesel fuel, we discovered, maybe a bit too late, that the oil we had been keeping for years was chunky and needed to be strained further. After I handed Eugene, who had climbed up the ladder to pour the oil into the large plastic tote, he told us that the oil would not work as fuel as it is, so it would have to be processed further. Once this was recognized, a week or so long process began in which different actors and solutions were interested, enrolled and mobilized, until Toby, in what I imagine was a fit of activity, installed the proper item to make the oil able to be processed into diesel. Toby returned one evening with Eugene to find a way to strain the oil so that it could be used as fuel. After their work, it became possible to use the oil, whether it was 'high-quality' used vegetable oil or not. Throughout this and many others translations, I maintained Callon's three principles of a sociology of translation as best I could.

Callon's first principle, agnosticism, was used to prevent him from making any initial division of nature and society. Only through their actions do the researchers reveal the existence or non-existence of the anchorage or of these social groups. Agnosticism allowed Callon to not give any more weight to any one actor over another. Generalized symmetry, the second principle, was achieved by staying committed to explaining conflicting views in the same terms. Similarly, I did not try to explain defect in terms of engineering or social science languages at the time I was on Manitoulin Island. The third principle, free association, occurred because I made no a priori division of nature and society, so things could emerge wherever and however they liked. I did not make such a division beforehand, but afterwards needed to build one to make

things intelligible. Defect as both a technological and socio-political concept seems to fit well within these principles.

The process of translation as described by Callon accurately describes most of any mechanical 'defect' on the farm since to notice a 'problem' among engineers, is to instantly 'problematize' it and begin a process of translation. On the farm, defect became managed and charted according to what the makers described was an 'agile' project management scheme such that 'problems' were always being 'solved' in an orderly and efficient manner, at least on paper. Defect and its problematization involved different means of interessement, enrolment and mobilization. As well as Callon's three principles, I also kept in mind Callon's moments of translation when it came to the makers' projects.

Technology as a Tool for Thinking

In Callon's *Society in the Making: The Study of Technology as a Tool for Sociological Analysis* he argues that the study of technology, turned into a tool for sociological analysis, would elevate the methodological range of the social sciences and ease the understanding of technological development (Callon, 1987, 77). Callon suggests that engineers, by fixing, creating and tinkering with technology, especially when it is in market-based competition, inevitably make decisions which are wrapped up in socio-political concerns and become part of sociological analysis. He writes that "[t]o bring this reversal about, I show that engineers who elaborate a new technology as well as all those who participate at one time or another in its design, development and diffusion constantly construct hypotheses and forms of argument that pull these participants into the field of sociological analysis" (Ibid). During my field work I focused on events as they unfolded and looked for indications that concerns were circulating among the makers. Regarding the role of these engineer-sociologists, Callon explains that

"(w)hether [engineers] want to or not, they are transformed into sociologists, or what I call engineer-sociologists" (Ibid) a role the makers exercised when they engaged with defect. I watched makers with bachelor's degrees in engineering of science, doing things which are considered engineering, like building a greenhouse, fixing an axle, or designing a dock, but I also saw these same people make their own alcohol, emcee a wedding, practice martial arts and grow mushrooms in a pressure cooker. I saw them engaged with many technologies in various stages of development with practices ranging from simple to complex.

To understand the dialogue and material practices at Manitoulin Permaculture I opted to use actor network theory which has its beginnings in the sociology of science and technology and has spread to geography, management, anthropology and philosophy (Cressman, 2009). The major authors that have written about these concepts are Michel Callon, Bruno Latour and John Law, who were the first to use the term 'Actor-Network Theory' to describe their particular approach. Over the past 30 years they, and others, have written books summarizing, clarifying, and critiquing their methods (Cressman, 2009). "The most identifiable intellectual predecessor" of ANT "is the radicalized sociology of science and technology that emerged in the wake of Thomas Kuhn (1962; see also Bloor 1991 [1976]). Along these lines, ANT's most profound resonance is within Science and Technology Studies (STS)" (Cressman, 2009).

In *On actor-network theory: A few clarifications, plus more than a few complications* Bruno Latour explains what an actor is: "[a]n actor in ANT is a semiotic definition – an actant – that is something that acts or to which activity is granted by another...an actant can literally be anything provided it is granted to be the source of action" (Latour 2017, 373). An actor-network, then, is a collection of actants in negotiated relationships with one another. To incorporate non-

humans as actors Latour argues that he responds to both cosmologists and social scientists whose models reveal that humans and non-humans participate in any actor-network.

According to Darryl Cressman (2009), ANT is also concerned with black boxes and the role of the engineer-sociologist in translation/delegation. A black box, a term borrowed from computer science where a black box is used to obfuscate complexity, refers to an artifact, mundane or not, that can be 'opened up' to reveal complex connections and processes that are otherwise obfuscated, or 'black-boxed.'

The term "engineer-sociologist" (Callon, 1987, 78), another useful term, derives from Callon's study of the development of the electric car in 1970's France. Callon found that the story of the electric vehicle in France was missing key actors like the 'fuel cell' and the 'zinc/air accumulator,' whose cooperation was necessary for the development of the v éhicule électrique. Cressman writes:

> What Callon discovered was that the engineers involved in the project were addressing social and technical problems simultaneously, 'the project conjectured not only that the technoscientific problems could be overcome but also that French social structure would change radically' (Callon 1987, 84). According to Callon, the engineers were contributing to a debate between competing sociological interpretations of the future of French society. They were, simultaneously, designing both a technology and social world in which it had a place (2009).

Callon believed that "[t]o transform academic sociology into a sociology capable of following technology throughout its elaboration" would mean "recognizing that its proper object of study is neither society itself nor so-called social relationships but the very actor networks that simultaneously give rise to society and to technology" (Callon, 1987, 93). To do this, he used the actor-network, distinguishing it from traditional social actors since the category of actor would usually exclude non-human components. He stressed, however, that the actor network should not be confused with "a network linking in some predictable fashion elements that are perfectly well

defined and stable, for the entities it is composed of, whether natural or social, could at any moment redefine their identity and mutual relationships in some new way and bring new elements into the network" (Ibid, 87).

Another approach to including technology in contemporary thought has been attempted by Maurizio Lazzarato. Unlike Leo Marx, who doubts the importance of material technologies and focuses on the social aspects that are involved with them, Lazzarato takes the position that the machines, rather than the people that set them up, should be at the center of critical theory. Lazzarato accuses contemporary critical theory of neglecting the machinic factors in the specific functioning of capitalism, in which studies of large-scale technological systems would be integral (Lazzarato, 2014, 12). According to him, contemporary critical theories have lost sight of what Karl "Marx had to say about the essentially machinic nature of capitalism: 'machinery appears as the most adequate form of fixed capital; and the latter, in so far as capital can be considered as being related to itself, is the most adequate form of capital in general" (Ibid). Contemporary theory, by focusing on subjectivation and subjectivity, does not confront the kinds of machines in which humans and non-humans work together as parts in a corporate system and other assemblages (Ibid).

Leo Marx, however, cautioned that the "chief hazard attributable to the concept of technology, as currently used, is the mystification, passivity, and fatalism it helps to engender," and saw that technology serves as "a surrogate agent, as well as a mask, for the human actors actually responsible for the developments in question" (Marx, 1997, 984). Although Leo Marx became frustrated with the misuse of the term "technology", a misuse which I will elaborate on later, he writes:

> "By attributing autonomy and agency to technology, we make ourselves vulnerable to the feeling that our collective life in society is uncontrollable. The popularity of the

> belief that technology is the primary force shaping the postmodern world is a measure of our growing reliance on instrumental standards of judgment, and our corresponding neglect of moral and political standards, in making decisive choices about the direction of society.[3] To expose this hazard is a vital task for the human sciences" (Marx, 1997, 984).

It is along these lines, those of the persistence of the idea of a lack of control, that I would like to pursue technology as an object for thought, where technological defect animates the makers at Manitoulin Permaculture in ways that are unpredicatble. I noticed that 'technology' was occasionally a catalyst for different kinds of responses from the makers. When we were working in the pit, there were many jokes about technology. One of the jokes involved working with the shovels, who, if they were used properly, would make the physical strain less for the human. Parker and I joked about "letting the shovel do the work" and inviting the shovels to scrum. This joke was couched in the ideas, which we and others were familiar with, about automation and labor. This idea came about again when we used the tractor to move gravel, which we would then flatten to make a foundation for the greenhouse. While Doug did not want machines to completely take over this task, Parker was happy to let the machines do the work, as it would mean less stress for him and us. Doug shrugged and wondered aloud what would happen if machines became so sophisticated that Rodney, the leader or "patron" (as described by Eugene) of the farm, would be out of a computer science consulting job? If Rodney could not pay for the farm with his computer science skills, then the farm would cease to exist. At the same time, if

[3] When on the farm, during a conversation about robotics and state-sponsored surveillance, one of the farmers mentioned "the world is already sci-fi," possibly pointing to what they saw as a fundamental shift in society, where fiction, arising beyond their control, becomes reality.

the threat of losing their livelihoods to machines was not a part of their discourse, Manitoulin Permaculture would not be arranged in the way it is.

Their experiments with technology, though many have their origins in mistakes and defects, eventually garnered attention and support. In the literature of permaculture, technology is 'simple' and borrows from ancient technology, while at Manitoulin Permaculture, they often adopt technologies which are not ancient. Instead, they promote simple technologies as a response to frightening advances in existing technologies on the one hand, and exploit advanced technologies whenever it becomes economically as well as socially feasible on the other. The pit is a good example of this because someone in the sauna told me that by not hiring a crew or using more advanced machines our volunteering was saving thousands of dollars. Although I am not drawing a connection between ideas about technology as a whole, I noticed that one way to look at defect at Manitoulin Permaculture was to look at how it manifested in specific instances, rather than as it referred to, in a discourse, something 'historically larger' like an industrial revolution.

Defective Technology

Francine once called the makers of Manitoulin, also referring to herself, "the island of misfit toys," where all of them had their own idiosyncrasies. At the same time, they were all incredibly competent. There was little they couldn't do. Where was the 'mis' in the misfit? I watched one of the makers climb a mountain completely naked with no gear, while I had great difficulty following them. I watched them win two cardboard boat races with a single boat, when most boats collapsed before one race ended. I was happy to learn carpentry, electrical wiring and a bit of masonry, and while stacking rocks turned out to be a passion, I can't say I was

enthusiastic about weeding, harvesting or mixing cement. The misfits had incredible stamina and courage and accomplished physical and mental feats regularly. They consistently overcame obstacles to achieve their goals. When one of them wanted to have their wedding on a nearby island, they built their own docks by hand for boats to arrive in. The group quickly went from 'misfits' to a recognizable, but difficult to name, entity on the island. Much of the narrative of this thesis is organized around the idea that defect, especially technological defect, acted as an organizing force at Manitoulin Permaculture. The idea that something is broken is more powerful than its brokenness.

According to Langdon Winner, the orientation of humans to technology is one of aspiration, however damning. He saw that, like Prometheus, we reach up to the sky to seize technology, but suffer punishment for our crossing the boundary between the sacred and profane. Relating Prometheus's situation to ours, Winner insists that "humankind faces a woefully permanent bondage to the power of its own inventions. But if it is still thinkable to dismantle, to learn and start again, there is a prospect of liberation. Perhaps means can be found to rid the human world of our self-made afflictions" (Winner, 1978, 335). One of the ways thinkers have tried to liberate the human world is by thinking about what technology does and where it does it.

Winner believed that technology did more than what it was designed by human engineers and designers to do. In particular, according to Winner technologies necessarily embed ethical issues and therefore raise moral responsibilities related to the use of technology. He writes:

> In controversies about technology and society, there is no idea more provocative than the notion that technical things have political qualities. At issue is the claim that the machines, structures, and systems of modern material culture can be accurately judged not only for their contributions of efficiency and productivity, not merely for their positive and negative environmental side effects, but also for the ways in which they can embody specific forms of power and authority" (Winner, 1980, 121).

Winner believes that some of the most interesting research in technology and politics attempts to reveal in a concrete way how transit systems, water projects, industrial machinery and other technologies actually mask social choices of profound significance (Winner, 1980, 127). In *Do Artifcats Have Politics*, Winner wonders whether some technologies are inflexible and, as a result, can only provide a particular form of political life, or, better yet, are strongly compatible with certain forms of life (Winner, 1980, 128). Winner calls the ordering of power and authority by the very design of technologies techno-politics. Winner refers to the impressive evidence found in Alfred Chandler's *The Visible Hand* which shows that the construction and day-to-day operation of many systems of production require the development of large-scale, centralized hierarchical organizations administered by highly skilled managers (Winner, 1980, 131). "The interesting question, however, has to do with whether or not this pattern is in any sense a requirement of such systems, a question that is not solely an empirical one. *The matter ultimately rests on our judgement about what steps, if any, are practically necessary in the workings of particular kinds of technology and what, if anything, such measures require of the structure of human associations*" (Winner, 1980, 132). Yet what is 'practically necessary' is often misunderstood, and the requirements of these systems are hard to find, making defect a unique way to confirm what is 'practically necessary.'

Along with Prometheus, Langdon Winner engages Mary Shelley's *Frankenstein* to describe his views on technology. He maintains that the "issue truly at stake in the whole of *Frankenstein* [is] the plight of things that have been created but not in a context of sufficient care. This problem captures the essence of the themes my inquiry has addressed" (Winner, 1978, 313). The monster is altogether angry about being rejected since it didn't ask to be born, its

existence is an error, a defect, which he is wrongfully punished for.[4] I believe that one of the reasons the context of a technology, the difference between the system and its environment, is so complicated is because of the consequences for notions of responsibility among actors in a socio-technical system.

If socio-technical systems, and singular technologies (like a can opener), are similar in constitution to Frankenstein, then it is no wonder that Karl Jaspers, in his analysis of human-technology relations, observed that "man lives in a world of self-created imperfections, many of which become an integral part of his character, yet he believes and cannot be convinced otherwise that technology is perfect" (cited in Winner, 1978, 218).

Prometheus brings technology from the gods in Winner, but at Manitoulin Permaculture, technological change was a product of frustration via defect, rather than divination. Technology on Manitoulin Island is more monster than Prometheus. This is surprising because technological change was seen as critical for success and the role of the inventor was mythologized in people like Elon Musk at Manitoulin Permaculture, but defect seemed to contribute to what made the makers 'successful.'

This thesis attempts to build an account of technological defect using actor-network theory and the principles of a sociology of translation. Defect arose as a central theme as I reflected on my field work. Instead of seeing defect as a purely technological event, it is contextualized and politicized regardless of the effectiveness of any 'solution,' thus making it available to analysis. It is both technological and socio-political, linguistic and spatial. What I saw from my analysis of fieldwork data was that defects organized people around them and

[4] Winner also explores this idea through Milton's poem in *Paradise Lost* which prefaces *Frankenstein*:
Did I request thee, Maker, from my clay
To Mould me man? Did I solicit thee
From Darkness to promote me? (Paradise Lost X, 743-745

generated competing knowledge claims, opportunities for care and new and unforeseen projects. Narratives of defect also allowed Manitoulin Permaculture to capture 'defectors' for labor and financial gain. By perseverance and ingenuity, makers on Manitoulin Permaculture are able to consistently overcome challenges across technological, social, political, environmental and other dimensions. The makers translate for and through defective machines and are translated to spaces of new possibilities, namely those of a redrawn actor-network with new problems and new hierarchies, whose changing motions might be felt in the experience of 'fixing' or caring for technologies.

I am using the word "defect" not only as something ascribed to technological malfunctioning, but also as a ghost-like object that is a key part of a way of looking at the world that seemed to be held by my interlocutors. In addition, only a handful of people at Manitoulin Permaculture were born on Manitoulin Island. The rest all described stories of not finding their place, of hardship or of being unsatisfied elsewhere, they had to 'defect,' as in leave one cause to join another, to arrive. Their experiences reached a point where they chose to leave major Canadian or American metropolitan areas like *Ottawa* or *San Francisco*. They landed on an island to improve themselves, a farm and the world. The defectiveness of the wider world was one of the most obvious reasons for the makers assembling on the island. In particular, they all appeared to hold the view that the use of technology in society broadly, the very way of life of *elsewhere*, was wrong. Yet the source of that wrongness started to become clearer when I heard Margaret mention that "machines are easier to understand than people" before she spent her frustration by fixing a broken machine named Mr. Chunky.

When I returned to the island in 2018, I learned about the spinning machine adoringly called Mr. Chunky. Mr. Chunky was designed to 'chunk' Styrofoam blocks so that the

Styrofoam could be processed by a smaller, industrial strength, shredder that the makers purchased. Mr. Chunky was badly made because its makers, both from inside and outside Manitoulin Permaculture, were either underpaid or undertrained, according to Toby and Rodney; but the makers persisted with Mr. Chunky's development after 'his' initial creation. The axel was poorly welded by an amateur and the engine was installed in reverse, yet somehow the makers would fix it. While Toby and I were literally deconstructing Mr. Chunky he explained that he was burnt out by working on the farm. A highly-trained geneticist, Toby was displeased with the haphazard way things were done on the farm. As a Silicon-Valley entrepreneur, he must have been used to coherent organizations, displays of competence and manageable outcomes. I think this story, that things were better elsewhere, that in Silicon Valley things were free, was animated by his engagement with Mr. Chunky's defect (among a series of defects) and also allowed Toby to position himself as an expert in technology and organizations.

He elaborated on this story when, one day, while moving a compost toilet outhouse using a tractor and a lot of labor, Toby chimed in while I was talking to Margaret about her work on the she-shack. As a joke, he admitted his view of the situation at Manitoulin Permaculture to me in more straightforward, if poetic, terms: *"We are complete in our incompleteness, a tribe of the incomplete, we were going to burn an effigy to incompleteness, but we never finished."* While the defect and incompleteness– something missing or not being right –was a source of frustration, it created spaces for new behaviors and unforeseen outcomes. Defect was one of the first things I realized the makers made. It was a badge of honor, a currency that, when expressed, seemed to reveal a truth about defect at Manitoulin Permaculture: that defect occurred everywhere and in everything. The appearance of defect was especially obvious when it came to their intentions or

desires. When Mr. Chunky, or anything else, does not conform to the ideal, it becomes defective and sets off a narrative of defect.

The Defective Greenhouse and the Wedding

My task when visiting the island was to help build the greenhouse. When I made my proposal, that was the intention. However, the wedding got in the way of that. Everything that follows is an attempt to make sense of the defective greenhouse and the defective actors that organized us while we tried to make the best of what we had.

FedNor, the government of Canada's economic development agency for Northern Ontario, has pledged money to Northeastern Manitoulin and the Islands, some of which is going to the greenhouse project at Manitoulin Permaculture. The land that was leased to Manitoulin Permaculture in Little Current was used to build a community garden in 2017, and more land has been leased there for Eugene and Nina to build a larger scale mushroom growing facility to supply gourmet mushrooms to local restaurants. It was nice to see the labor they had put in from the summer before was paying off in the form of more opportunities and built structures. As well, other businesses on the island had expanded, whereas the convention center has never had a bus route, and the health foods store was owned by local friends, now there is a cheap bus route from Toronto and the health foods store was purchased and is now under new management.

When I arrived at the pit, I had a lot of experience with manual labor from my last summer with them, and I knew I didn't want to end up toiling away. The pit was supposed to be my workstation, where the foundation for the greenhouse was going to be built. Although I planned on following the greenhouse as it was developed, trying to trace whether its development contained an inkling of what was to become of it as if the way something is born

gave any clue to its future, I discovered just after my proposal that a wedding would be taking place during my stay as well.

I was torn, as were the makers, between devoting time and energy to making the greenhouse, to the wedding and to our own separate projects. When I attended my first scrum, which is just a fast-paced daily early-morning meeting, the words 'BEFORE THE WEDDING PRIORITIES' were written across a chalkboard inside the schoolhouse. I was less surprised by the appearance of a chalkboard than the role Margaret was playing in the meeting, because the last time I visited we did not have someone leading the meetings in the way she was. Margaret is a funny girl with dreadlocks and a deep voice. She always kept things light and fun until you crossed her, and if you did, then watch out! Although she was lighthearted, she could work extremely hard and was visibly energized and committed to the projects she was tasked with. Rodney and Ana made her responsible for both getting the homestead prepared for the wedding, as well as building the 'she-shack,' a sanctuary for the bride. Margaret was hired by Rodney and Ana as their wedding planner as well as their lead carpenter because of her experience living in community houses, carpentry and managing teams of 8-20 people. Meanwhile, Parker was hired to manage the construction of the greenhouse since he had worked construction before.

During my last summer on the island, there were a lot of hold-ups keeping us from working on the greenhouse. A large pit was waiting for our energy. First, we would need to level the ground in preparation for the foundation of the greenhouse. It took a while before we could find the right laser level and order a tamper as well as some Styrofoam sheets. Our first laser level was broken, and we were due for a shipment of gravel which we would need to lay the foundation of the greenhouse by tractor, shovel and rake. Once we realized that the level wasn't going to work we stood in a circle looking at it and brainstormed different solutions. The first

thing we did was try to see if we missed an obvious 'on/off' button. Rodney, Parker, Doug, Toby and I all looked at it, and others went to the garage to look for different laser levels but had no luck. I was surprised that the level looked like it didn't have an on/off switch. Our head scratching actually slowed us down quite a bit because we couldn't go any further until we established the frame of the foundation which required a level. Later, though, Parker would be blamed for his incompetence since the project was moving too slowly, yet he had no control over the tools that were going to be used. To solve the laser level problem Rodney decided that Parker would order a laser level and pick it up at Rona. While eating, we showed one of Rodney's old friends, who was visiting briefly, the laser level, just in case we missed something. He looked at it and joked that he had no clue what was wrong. I didn't see the new laser level, but supposedly we found one because within a week we had started to lay the foundation. While there is a hardware store on the island, it did not have a suitable laser level for the project, so we had to order one. Though Manitoulin Permaculture is somewhat far away from Little Current, it is not too much trouble for the makers to get access to materials, whether they order them or go into town to get them. Instead, they might choose to solve technological breakdown by starting with fixing and repairing as a means of staying frugal. Meanwhile, everyone but Parker would be helping with the wedding unless they had a business of their own to take care of.

Every day during our morning meeting, Margaret would give everyone in attendance tasks to do with the wedding and her plan to get us ready for it. I knew that the greenhouse was the most expensive project that the makers had ever undertaken, yet it didn't feature on the blackboard. Instead, Margaret and Ana told us what to do while many of the other people that I expected to be there were not there, or were there but then spent the day working on their own thing. I appreciated Margaret's excellent leadership skills, and I was only really there to see

something and do my own project, but I got the sense that there was something happening that wasn't according to plan.

I think someone realized that the wedding had taken over the scrum (maybe the BEFORE THE WEDDING PRIORITIES, which was written on the planning blackboard, gave it away) because on my way to bed one night I overheard someone whispering that those who wanted to work on the greenhouse were going to have a secret meeting outside the greenhouse 30 minutes before the scheduled scrum time of 9 o'clock. Parker and I wandered up the driveway and waited outside the greenhouse pit at 8:30. Rodney came to meet us. The discussion was mostly inconsequential, and I wasn't needed. They talked about finding the right laser level and figured that there wasn't much they could do until such a level was found. Doug, the gentle giant, arrived closer to 8:45 wearing his signature muscle shirt and carrying his favorite mug which read "size really does matter." As I could see that I wasn't necessary since I didn't have any idea what to do next and that the time was approaching for the 9 o'clock scrum, I returned to the outdoor kitchen and waited to be called into the schoolhouse. While there I watched as people were assigned roles for various tasks. I noticed that there were much fewer people there, and that some people were at neither scrum because they were busy doing other things like working on their businesses or at their jobs. I was conscripted into moving rocks and woodchips into the sacred circle. The sacred circle was the planned location for the wedding ceremony which would be hosted on the farm. A small stone bridge lead to a tiny round landmass that jutted out from a river and connected to the road. The sacred circle preceded the path that lead to the she-shack. The she-shack was supposed to be a refuge for the bride in the days until the ceremony as well as

the location of Rodney and Ana's honeymoon. Initially, no boys were allowed to help in the carpentry required to build the she-shack.

Clare and I spent many days preparing the 'sacred circle' for the wedding ceremony. We had to move rock from one end of the homestead to another so that we could line the circle. During one of our many trips to the rock pile, wheelbarrow in tow, we ran into Margaret before she tried to get us the tractor to make our job easier. Although she was running the she-shack project during the day, she still felt responsible for us. She was, in fact, responsible for the material aspects of the ceremony at the farm like the she-shack and the hay that would cover the sacred circle, she was basically the boss of Clare and I. She spoke with Ana and Rodney. I couldn't hear much but I did hear her loudly proclaim that 'team institution of marriage' was in conflict with 'team greenhouse.' She lost the battle over the tractor so team greenhouse got to keep the tractor for the time being. There was a clear split between the men and the women who chose 'team greenhouse' and 'team institution of marriage' respectively. These two teams often competed overtly and covertly throughout my time there, at least until the wedding ended.

Four days after the skirmish over the tractor I headed off to the pit to help level the foundation for the greenhouse. Although Parker and others had been working away, it wasn't until the wedding group didn't need me or want me that I could join the greenhouse team. I used a shovel and rake to move gravel so that the foundation was level. Someone on the tractor would drop a pile of coarse gravel onto the square foundation pillars, while everyone else would use their tools to level them. My work on the greenhouse foundation punctuated the work required for the wedding. As the days approached the wedding, there was less and less work to do, all of it regarding the wedding.

Ana was running around causing problems due to stress so often that people didn't feel capable of dealing with it, I suspect, and scheduled trips or parties for themselves as excuses to escape. She sometimes joked that she was acting like Bridezilla and I got the sense that people were in silent agreement. As a result, a massive exodus from the homestead occurred when it was felt, at least in my mind, that Ana was going to impose too much work that was not completely necessary. Once we all returned, we were excited for the wedding, and only had to take care of small tasks. People were able to avoid doing extra work everything got done on time and to great effect. Though some people still got out of doing extra work.

Although I was not initially invited to the wedding, I got to participate in the dress rehearsal and the ceremony as a 'runner' who fetched the bride and groom, escorting them to the sacred circle. On the day of the wedding any of us danced in the kitchen before noticing it was time to get moving. Joanna, Ana's sister, mentioned to me that I would get Ana and her dad from the she shack instead of the house. Francine realized that she should make her way to the bridge with the cloth. I wanted to follow but knew that it would be a while before everyone went up. Throughout it all I felt nervous and excited. I asked if everyone felt this way and not everyone did. I stayed for a while trying to assemble everyone as well as avoiding being assembled myself. I wanted to go up with my friends instead of the mass of people. When we finally did go we approached Francine silently and grabbed our cloth from her basket. A guitar was being played softly in the background. We all stood in the back row so we wouldn't disturb the guests who had already arrived. No one was sure if we would fill all of the seats so we opted to stand at the back. I knew that I would have to leave during the ceremony so I tried to be near the aisle. Margaret and Toby had put long plants with thick ends in their hats. Margaret's was so long that it would brush up against people behind her. Her lack of awareness as she smacked people with

her plant was the cause of much joking and laughing. Inside I felt the urge to get them to be quiet and respectful, but on the other hand I tried to convince Monica to look left and then right so she would disturb Eugene. I think the tension between the drive for silence and respect with the hilarity of our unique situation drove our group to laugh and play even more than usual. For instance, when I finally sat down beside Francine, which was a sign that everyone had gathered, a considerably large grasshopper had landed behind my shirt.

I could tell Toby, Margaret and Eugene were laughing at me so I turned and looked, trying to figure out what they were laughing at. They told me don't worry about it and to turn around. Then, when I did, they would laugh more. I felt confused because I didn't know what was so funny, and I had just been having such a good time with them. Troy and Nina, behind me, eventually told me about the huge grasshopper. When I looked over at Toby and Margaret, Toby explained that it was huge, that they didn't want to ruin it by disturbing me and that it eventually moved anyway. Eventually Joanna gained command of the circle. She reminded us why we were gathered here today. She asked us to bless the cloth in our hand. First, we blessed it for Ana and Rodney. We set our intention for them to have an expansive relationship. Then we blessed it again for the position the marriage would occupy in our community. She told everyone that these blessings would be made into a quilt later to be given to the couple.

Francine started to collect the cloth, when she was near done I got up to collect the groom and his mother while Joanna said a few words. It was painful to walk over the woodchips in my bare feet. I walked quickly and with reverence. I was silent and invisible. I had already devised my path to the tent, and the appropriate timing to cross the circle to get there. When I arrived at the house, Rodney told me I was doing a good job. I watched them at a distance and stayed out of sight until I could see through the bushes that they were approaching the altar. I walked

between the back rows and made my way to the tent. Ana and her father were crouched inside the tent. After shooting upright Ana thanked me and hugged her dad. They walked into the circle and I stayed near the tent so no one would see me. Afterwards, I hustled to my seat before Joanna began talking again. As a result, I missed the small gestures, for instance, I am not sure if Ana was 'given away' or not, nor how everyone greeted each other at the altar. I also did not see, but learned later, that while I was getting Ana, Jack, Rodney's best man, had dropped the ring and was desperately searching for it. Luckily for him, Ana did not arrive in time to notice. He joked that he had spent all this time reminding everyone how not to drop it yet he dropped it himself. I was satisfied with the pace of the speeches and vows. Both Rodney and Ana had the same vows, and when Ana put the ring on Rodney, she did make the funny sound she made the day before as a little inside joke for everyone at the rehearsal. I could hear Nina crying behind me. I saw that a few of the women had tears running down their faces when we all turned to exit after the bride and groom. I was pushed forward by the crowd and accidentally hopped past giving my congratulations and hugs to Rodney and Ana. I joined back in the line and when my turn came Rodney and I had a witty exchange about my research. I tried to pretend like the photographer wasn't there and slipped past her to the kitchen. Eventually Troy, Eugene, Nina and others were hanging out in the kitchen trying to figure out where the group pictures were going to be and who was driving whom to the ski club. Jack and Troy decided they would make a chain of cans for Beast, the truck, before Ana and Rodney hopped on. They rushed to get that done while I talked with everyone and we danced in the kitchen. I tried to copy the dance moves of everyone else, but they eventually started to experiment with some of the other styles that they had seen and tried a few gymnastics moves in partners which I did not know how to do.

An older gentleman was talking to Toby about his big land purchase; he explained that his land was 150 feet off the ground, and that it was some of the last land for purchase on the island. Eugene asked me and Toby if he should mention in his speech that Rodney was already married before? We said that that was probably a bad idea. Some people were curious about when the photos were being taken. We joked that we must not have been invited. Eventually a large group of people were standing outside the kitchen and the photographer corralled us into the garden. We all stood in rows of tomatoes while the photographer hopped on top of a picnic table and took our photos. We even got a photo of just the farm crew. I am still happy to be in one of their promotional pictures. People were laughing and joking about how close they were to each other. People made sure others were visible by moving them around.

When we were being herded into cars at the farm to go to the top of the ski hill for the wedding reception, I saw Jack and his wife discussing whether it would be smart to do the cans on the back of Beast. I saw an opportunity to tell them that Troy would help and that it would be done quickly. Jack was sure we had enough cans laying around. I decided not to take the opportunity and let the idea die. When I saw Troy later I told him that it wasn't going to happen and he seemed disappointed. Troy, Nina, Francine, Doug and I climbed into Troy's car and hurried up the ski hill. When we got to the lodge, there was no parking so we went further up the hill. We inadvertently led others up with us into no man's land, forcing some of our other friends to park beside us in poison ivy. Ana and Rodney blocked off the path and asked if one of us would help Rodney get out. Doug went to help out and Francine, Nina, Troy and I walked towards the ski lodge. The rocks were harsher than the woodchips on my feet. An after party was held at the homestead. We drank 'blueberry juice,' our fun word for wine, and other concoctions until late into the night, well past the recommended wedding bed time.

It wasn't until after the wedding that things started to ramp up for the greenhouse. When the wedding ended, there was a period of inactivity and relaxation. By this time, I had developed a sophisticated way of killing flies and was practicing it before Rodney interrupted me. He asked me to help the others work on the steel frames which would support the pillars of the greenhouse foundation. I was told to cut wire and so I did. I watched as Troy and Toby argued about how best to tie the steel bars together. Toby explained that this was done only to appease the lawmakers. He explained that some concrete buildings still stood despite centuries of use and occasional earthquakes. He thought that the way construction was legislated lacked an understanding of ancient techniques, or any techniques for that matter, and merely promoted what the building code was told to promote.

I spoke with Rodney in May 2019 and the greenhouse foundation and skeleton is completed. Now it can provide for the people of Manitoulin Permaculture and consumers on the island. Rodney and others described or implied that the greenhouse was an economic as well as an ecological boon. Now that Manitoulin Permaculture can grow things inside their greenhouse, they can use this growing space to produce plants that would otherwise not be possible to grow in the clay-ridden soil of the island. In fact, the quality of the soil was one of their biggest disadvantages because it prevented them from growing many things. It would take a long time to transform the soil. I do not know why the soil there is clay-ridden, but it is and what's worse is that the land is overridden with an extremely pernicious weed called twitch-grass. To make their existing soil work, they have started a many years long project of transforming the soil to make it work for them. With the greenhouse completed, they seem to be continuing the transformation of Manitoulin Permaculture into a more, what Rodney called, "legitimate" entity. I wondered if the way they thought about their business was similar to the way they thought capitalist business was

conducted—a kind of business they felt rejected by or were choosing to reject. Manitoulin Permaculture is a socio-technical network that I had the opportunity to witness. By calling Manitoulin Permaculture a socio-technical network I mean that Manitoulin Permaculture is, among other things, a network of discrete and/or interconnected technologies that are operated by people working together with people and technologies.

The actor-network of my story comprises Mr. Chunky, Margaret, the greenhouse, Rodney, Ana, Eugene, the wedding (which only exists as something material, but temporally long), Toby, Doug, Troy, Nina, Clare and Parker. Eugene and Nina were partners, as were Parker and Clare and Rodney and Ana who were getting married. Later, I will explain the articulations, and sisarticulations, of this network using Callon's concepts. While many of them had partners, some of whom I didn't include in my actor-network, they were often open to having new partners. Maybe their desire to experiment technologically inspired experimentation across other dimensions or vice-versa. There was a small class-like division between the interns, the employees and the owners of the homestead. Toby and Margaret often got along because they were not happy with this division, especially since they were not being paid enough, they said. These tensions almost reached a head during my stay as Margaret, who had a lot of experience with community organizations of this kind, attempted to address her concerns by hosting an 'emotional circle' which never materialized. It would give the makers opportunities to make themselves heard collectively. I suspected that this would spell the doom of Manitoulin Permaculture, at least of the form that I knew. One of the reasons she suggested this was because it would allow them to deal with things as a group instead of having many smaller conversations. I consider the emotional conversation a kind of technology, but not the kind I wanted to witness. I chose to focus on material over immaterial technologies because I was exploring empiricism,

matter is within the bounds of the senses, under the assumption that observation is the interplay of intersubjective realities. While debates about matter and observation are fascinating, I am suggesting my position this one time, I am not going to address them fully in this thesis.[5]

Even though there were many intellectually interesting things going on at the level of the immediate social environment, I doubled down on material technologies. I had the most fun watching the makers tinker and brainstorm. I was the beneficiary of several experiments with mead making that eventually germinated a cidery business. Toby explained that he was the scientist on the mead team, while Troy was the marketer and taste-tester. Troy had extensive restaurant experience alongside his engineering degree. He was also expanding his kombucha business into Sudbury and further across the island. Toby had a master's degree in genetics and was altogether an outstanding scientist, who knew much about many topics and had received benefits from his work in Silicon Valley. Each time they shared their mead it was better than the last. I warned them that if that trend continued, they would have quite the mead business. I also participated in Francine's blossoming art and design career by helping her paint a mural for a mural festival and sourcing fabric from a tradeshow. Margaret has since continued her construction and carpentry business as well. All of these things that makers did required

[5] The book that inspired my approach to the material form of technology is Karen Barad's *Meeting the Universe Halfway* and I am grateful to have seen it. Using Bohr's 'philosophy-physics' Barad (2007) complicates actor-network theory by incorporating the role of the 'apparatus' that measures reality. She proposes a posthumanist performative approach to 'objectivity' which challenges representationalism by calling into question the idea of an "observation-independent reality." For her, the construction of reality is agential, in the sense that, through action, humans and non-humans are creating the "phenomena" that appear. What is unique about Bohr's philosophy-physics as it relates to actor-network theory and technology as a tool for sociological analysis, is that concepts are "specific physical arrangements" (109), which reveal things that are "exhibited under *complementary* -- that is *mutually exclusive* -- *circumstances"* (106). In effect, Barad revitalizes Bohr's suggestion that "*classical physics, along with classical epistemological and ontological assumptions on which it is based, is fundamentally flawed*" (106). She provides a way to include technology and its *materiality* in critical theory by employing some of the results of quantum physics. In my view, though I do not develop it, the constant reconfiguration of the world through defect created new potentials, while the existence of defect signaled the negation of some conceptual but complimentary manifestations, like complementary colors.

engagement with a material object that looks like a technology to succeed. Eugene and Nina combined forces to pursue a gourmet mushroom business. They experimented with pressure cookers and super-worms for months and started to build relationships with other growers nearby as well as at weddings and events. In 2019, Nina and Eugene were granted a business loan and space in Little Current for their mushroom growing factory.

Chapter 2: Defect at Manitoulin Permaculture

Francine makes art, she makes dye, she makes bags and other accessories. She also makes people laugh. I know that the makers make good friends, as they did everything to make me feel comfortable and accepted. They are making a self-sustaining permaculture farm, as far as NOPRI or the government is concerned. Rodney speaks proudly of the many romantic relationships that have happened between visitors on the farm, as if Manitoulin Permaculture made these couplings, and some eventual marriages, possible. I was made into a 'level 1' (self-described) mason when I learned how to break huge rocks with a chisel as well as how to make cement. They made adventures happen by always going on them and parties happen by having them. When it comes down to it, it is hard to separate their making from their surroundings, especially as they are far away from the largest town on the island. Their remoteness forced them to adapt to and change their environment. For example, we made money by making compost bins for others, but the connection between the making and the results are tenuous at best. When the local communities arrived to help us install the bins, we made friends and we also made ourselves tired. In a way, we made an opportunity for future business too. Although it may have been the efforts of Eugene and Rodney who spent time promoting the benefits of compost across

the island that made us money, it could easily have been a connection that Rodney made at a trade show, as it was when he secured us an abundance of woodchips from a nearby chipping operation, which ended up saving money for Manitoulin Permaculture. Although I am willing to entertain the idea that the connections are not there, and that the separation from making and reality is weak, I have to make this separation to observe connections and actors, to see who is acting and the relations of action.

I tried to understand what the makers made by thinking of the makers as inventors and borrowing from the literature on inventors. On Manitoulin, I spent the bulk of my time watching these makers "improve" their technologies. Sometimes they even asked me to make new technologies for them. New technologies were usually asked for because of very specific needs. One day Rodney asked me and Jack, a visitor, to build a wire heater that would heat wire temporarily so that heat could be applied to the 'hive-frames,' a honeycombed panel framed by wood that is used for bees to produce honey. Jack and I had a lot of fun trying to figure out how to build this and ultimately failed. Jack was on a biking trip across Canada and wanted to experiment with the permaculture methods he had been reading about. He wasn't sure that they were all permaculture methods at Manitoulin Permaculture, but he still wanted to try experimenting with technology. We didn't really know what to do, but eventually we landed on something that seemed to work. In the end, it did not so Rodney and Toby modified our design to work for them.

While Jack and I failed, others often succeeded. For example, Toby, who was running from the stress of the wedding and the new and unpredictable demands that could be made of him, visited the ski-hill warehouse and found a way to filter the chunky vegetable oil that they planned to use for their diesel-powered truck named 'Beast.' They had been going around to

restaurants collecting their used oil for three years. As well, they collected compost from a health foods store and restaurant in the heart of Little Current in exchange for free and distilled water which was seen as healthier because of the process that distilled it. These relationships were built over several years and Rodney is responsible for many of them. However, everyone had the opportunity to invent or contribute to the development of new technologies, it was encouraged.

That being said, if technical objects require an inventor, but afterwards exceed the designs of this inventor, what, then, is the role of the inventor in technological change? Many authors think that inventors do very little. For instance, Ellul charges that "[t]echnique, *ipso facto*... selects among the means to be employed. The human being is no longer in any sense the agent of choice. Let no one say that man is the agent of technical progress… and that it is he who chooses among possible techniques" (Ellul, 1965, 80). Yet, for the makers of Manitoulin Permaculture, it was never obvious which method would work, making the influence of technique somewhat doubtful.

Barnet expands on the role of the inventor, at least affording them a sensitivity that 'tracks' the machinic phylum "to detect critical points which indicate potential bifurcations," referring to them as channelers (Barnet, 2004). As technics takes on its own dynamic, or technique becomes autonomous, in either case, the inventor is sidelined. "Human thought merely selects the best possible forms for the realization of technical tendencies: he 'channels' them in the manner of a medium (De Landa) or 'combines' in the manner of a bricoleur (Gille and Leroi-Gourhan)" (Ibid). Yet, among humans "[t]he engineer or the scientist, for example, is closer to the machine; they have a privileged perspective on the lineage in this sense." This privilege can sometimes manifest as expertise, which I will address throughout. It is also a privilege in the sense that the credit is given to the inventor, but not the responsibility.

When it comes to locating responsibility in technological systems Winner writes:

> Commenting on the views of A.L. Samuel on this matter, Marvin Minsky writes, 'His argument, based on the fact that reliable computers do only that which they are instructed to do, has a basic flaw; it does not follow that the programmer has full knowledge (and therefore full responsibility and credit for) what will ensue. For certainly the programmer may set up an evolutionary system whose limitations are for him unclear and possibly incomprehensible'" (Winner, 1978, 304).

Minsky suggests that technology does more than what it is told, but in a specific way. In this case, the computer is part of an 'evolutionary system' that is beyond comprehension, whose activation questions commonsense notions of command and control. In addition, I believe that technology can do *many more* things that are not part of its patent, blueprint, or model, that have little to do with technology from a "programmer's" or inventor's point of view. During my field work I found that the notion of 'practical necessity' was coupled with makers' ideas of defect. By locating one I could locate the other, since defect often related to something not working in a practical way. Defect was key to understanding that technology does much more than it is designed by its inventors to do, if it even does what it is designed to do at all.

However, the name 'inventor' is not exactly accurate and has been contested. Instead, Robert Multhauf offers, what I think is, a more accurate name. He explains:

> "The improver of technology has not always had a generally accepted name, nor has its improvement been thought of as a continuing activity until recent times. Historically, the improver has most frequently been called an "inventor," but as invention has been more narrowly defined by patent law, this name has become inadequate. 'Engineer' is now the fashionable name for the improver of technology, although scarcely more adequate, as it originally, and essentially still, refers to the expert practitioner of one of the arts, who may or may not also be its improver. Because of these difficulties, we will here refer to this individual as an 'improver' of technology, an accurate though awkward description" (Multhauf, 1959, 38-39).

I am borrowing from Multhauf to refashion the term maker as a description of the occupation of persons at Manitoulin Permaculture. The term maker is still more accurate because making

implies a kind of exchange which the ‘improver’ is inadvertently a part of by way of their exchange with technology. While Multhauf explains that the ‘inventor’ and the ‘engineer’ are not as clear as the ‘improver’ of technology I am arguing that the ‘improver’ of technology at Manitoulin Permaculture is more ‘maker’ when they engage with technology because of the rapid and self-directed technological change on the farm. However, the characterization of the inventor in the literature is also a good characterization of the makers at Manitoulin Permaculture and so I would like to use it. The makers were inventors, improvers, engineers and more.

That being said, inventors are not mythical figures. Barnet writes:

> “[t]he inventor is not a divinely inspired genius... he or she is a 'combinatory' genius, selecting the best technical forms effected along limited combinatory possibilities, to embody a technical tendency... the combinatory act itself requires a unique perspective on the part of the inventor; the ability to see the technical phylum from a more global level. It requires a degree of foresight, an awareness of what exists and what does not exist, of what is possible at this point in time… The inventor anticipates new technical forms from limited possibilities within a particular technical system and a particular historical epoch” (Barnet, 2004).

In Barnet, the inventor has a unique relationship to technics, but it is contextualized and dependent on existing possibilities. While the inventor combines and captures, the things they combine and capture are related to what they have access to. However, the capacity of the inventor seemed to be lusted after at Manitoulin Permaculture since it would bring the makers great fortune. For example, Toby explained to me a process of “collecting lottery tickets” by participating in tech start-ups and collecting shares as payment. If any of them should ‘win the lottery’ then the effort of merely being near invention (or innovation or whatever activity would inspire a financial response from ‘the market’) would turn a profit. In some ways they believed that by being a part of this great technical machine, they would be taken care of by it.

Toby once explained how his bio science start-up got off the ground. He said it was run by two buff Russian guys who were pretty committed to the ideas around radical life extension and created a company that synthesized DNA or products that facilitated the synthesis of DNA. He told me that eventually they convinced investors to buy into their product, despite the possibility that their technology would become obsolete in the medium-term. Toby dropped out of his PhD at Cambridge to pursue work at this start-up, and since then his life has had many dramatic changes. He partied a lot, dated a socialite and had a brush with death and disease. I thought that Toby was fearless, if a bit too 'logical' and out of touch with others emotions. He was incredibly strong for his size, and would push us to move faster when we came to a barrier. He was able to climb a mountain naked, without getting lost or being phased by the presence of an active bear cave. He loved to sleep in and drink instant coffee, throw great parties and was into video games and writing stories, since stories opened up people's imagination, allowing them to be more open to new ideas, he thought.

Regarding the character of inventors, Hughes' perspective echoes and magnifies the inventor in Barnet's analysis. He affirmed that inventors sensed things about the conditions prevailing at the time, finding that "[t]hey rightly sensed that the large organization vested in existing technology rarely nurtured inventions that by their nature contributed nothing to the momentum of the organization and even challenged the status quo in the technological world of which the organization was a leading member" and found that "[l]arge organizations sometimes reject the inventive proposals of the radicals as technically crude and economically risky, but in so doing they are simply acknowledging the character of the new and radical" (Hughes, 1989, 53). One of the reasons inventors pursued their projects had to do with the character of existing

organizations, which are unable to take a risk on them. The difference in goals between an organization and an inventor might also be a source of the stigma associated with 'defects.' One of the reasons Manitoulin Permaculture is successful is because of the economics of their technologies, which allow them to gain small margins by cutting the material cost of their operations. Mr. Chunky is a component of a system that would process Styrofoam, a form of waste which costs next to nothing to acquire, and turn it into concrete which can be used to build things for profit. Once the makers grasped how to use the building code and how to make styrocrete, they would be able to purchase the land on the island and populate it with low-cost styrocrete structures. What's more, they could simply sell styrocrete and styrocrete processes to other organizations. Their biodiesel infrastructure worked in a similar way by using free or low-cost goods as inputs, thereby cutting their operating costs significantly while still abiding by the practices of permaculture or environment-saving or enhancing practices. They could add vegetable oil, a common by-product of cooking fried foods, to their diesel-powered engines (they knew how to make gas-powered engines into diesel powered ones) and pay nothing for gas.

Although the makers are working on problems around what they saw as environmentally friendly or lucrative technologies, Hughes points to the fact, which I think applies in this context, that inventors, in this case I am referring to the makers, are not just choosing problems for political or economic reasons, they also want to solve problems because they may be one of the few "special" people able and willing to solve them. However, "[p]rofessional inventors have other reasons for their problem choices. In avoiding problems on which engineering departments and industrial research laboratories were working, independents narrowed their problem choice. The challenge of sweet problems that have foiled numerous others often stimulates the independents' problem choices. They believe their special gifts will bring success where others

have failed. Not strongly motivated by a defined need, they exhibit an elementary joy in problem solving as an end in itself," (Hughes, 1989, 54) *it is this joy of problem solving whose presence among the makers I would like to emphasize here* since it was prevalent at Manitoulin Permaculture. The existence of a defect, one that makers thought they could tackle, was enough to propel them into action. As I will discuss below, solving problems was part of any project and was tackled and ordered according to priority as they were noticed. There was often no way of predicting. For example, Rodney and Ana wanted to serve chickens at their wedding, but they could not because they did not have a certified abattoir. However, they knew of one nearby and tried to convince them to take our chickens. Ultimately, this failed and they hired a local caterer instead. At the wedding, this choice was advantageous for Eugene, Nina and Troy who saw some mutually beneficial opportunities to do business with this caterer.

As well, a typical announcement among engineers, a term many of the makers would use to describe their role, is that they are problem solvers (Winner, 1978, 11). "'Tell us the problem,' they demand. 'We will find a solution. That's our job," was often a behavioral refrain "But you may not presume to question the nature of our solutions. You are not a member of a technical profession and, therefore, know nothing of relevance. If you insist on raising questions about the appropriateness of the means we devise, we can only conclude that you are antitechnology" was part of or the whole of the subtext (Winner, 1978, 11). Certainly, at Manitoulin Permaculture, they were not quick to accuse anyone of being antitechnology, for example, Doug goes so far as to describe himself as a Luddite, but they definitely would not consult someone without similar training.

Nonetheless, Toby occasionally leaned on technical solutions when it came down to the wire ad suffered for it. For example, when he was keeping his parents' squash in the vegetable

gardens at Manitoulin Permaculture there was an outbreak of some pest, a beetle. Instead of relying on Manitoulin Permaculture's anti-pest method, he chose to use the chemical pesticide Roundup, even if that meant contaminating the other plants. Although he received a stern talking to, that event was enough to tell me that Toby was willing to use whatever means he needed to achieve his ends and that he was not committed to permaculture for its own sake. When Toby decided to use pesticides, he set off a hidden conflict between belief systems at Manitoulin Permaculture. Tensions between worldviews became apparent when I witnessed Toby's talking to. I imagined Rodney, whose goal it is to maintain the stability of the network, pulling the strings behind the scenes, as he must have discussed this with Ana, his soon to be wife. What I believe happened was a conflict between scientific, holistic and community building interests that were the result of the relationships between the people, the plants and the pests. The plants, by being vulnerable to the advances of the beetle, startled the community by acting and displaying their vulnerability by dying. When the holistic approach, applying natural remedies, did not seem to work fast enough, Toby made it a priority to protect his family's squash. He thought that the most effective way to protect the squash would be to use pesticide, whatever the cost to the other plants and the environment, despite the relatively low economic value of a squash compared to an entire crop. However, Toby did not go through Rodney, the obligatory passage point of decision making regarding the use of chemicals at Manitoulin Permaculture. Toby identified a problem, but he did not interest his network in the problem. Meanwhile, members of the community who saw that he was applying pesticides became angry because they saw Toby's act as a flagrant denial of everything Manitoulin Permaculture stood for. Rodney, on the other hand, who I believe is more sympathetic to Toby, but not by much, has to manage the larger picture of building a community. He made sure not to reprimand Toby in such a way as to

make him so upset that he would leave, but enough to appease those who were angered by his actions. The squash acted by responding badly to the pests and slowly to the natural remedies which set the stage for the emergency use of pesticides by an aggravated actor acting alone. Yet, when the community decided, it was not only the human actors'—in particular the economic interests of the NOPRI leader—but also the interests of the plants who were responding to the chemicals. The plants attempted to, in actor-network theory terms, co-opt the farmers to not use pesticides but failed this time. Toby also failed to co-opt the other farmers to sacrifice their interests for his. The humans attempt to speak about the prevailing conditions at the time, like the strength of the beetles, the effectiveness and consequences of various pesticides, but often without a whole picture of the situation because many of the actants and their relationships are black boxed. The humans are unreliable, or at least, in actor network theory terms, inconsistent translators or mediators of the plants. Nevertheless, while the makers solve material problems, they also have to find a way to solve sensitive issues in the community or else they risk losing their bonds, the network is always at risk of becoming unstable, the actants must continue to work together to achieve their interests inside the network.

That being said, Thomas Hughes writes that an exploration of this kind of 'problem solving' is important for the social sciences. He wrote that "[h]istorians and sociologists of technology should join psychologists in exploring the act of creation" an act which I also associate with invention and which also goes hand in hand with defect (Hughes, 1989, 56). Yet, I couldn't exactly pinpoint where or what the technology was. I did not know exactly what was technology and what was not, nor did I know where it was when it was acting as a technology if I made assumptions about what technology was.

Technology has relatives in the words *techne* as in craft, *technik*, a German word which originally meant technology as a study of *techne, technique* which, in brief, meant the totality of *techne,* and *teks* which meant "to weave or fabricate" and may have origins that pre-date Greek culture. Regarding Greek culture, the heuristic of *tehcne* as making and *logos* as thinking is helpful to understand the shift in meaning of the word as its description changes from technology as 'thinking commanding making' to technology as 'making commanding thinking.' At Manitoulin Permaculture, making is thinking. Although I claimed that I was looking at technology, it was incredibly difficult to define, even though I worked closely with makers who worked closely with 'technology.'

In his search for the meaning, if any, of the word 'technology,' Leo Marx identifies a semantic void that was well under way in 1847 with the rise of the electrical and chemical industries (Marx, 1997, 974). In *Technology: The Emergence of a Hazardous Concept* he writes, "The word, based on the Greek root, *techne* (meaning, or pertaining to, art, craft) originally came into English in the seventeenth century, but it then referred to a kind of learning, discourse, or treatise, concerned with the mechanic arts. At the time of the Industrial Revolution, and through most of the nineteenth century, the word technology primarily referred to a kind of book; except for a few lexical pioneers, it was not until the turn of this century that sophisticated writers like Thorstein Veblen began to use the word to mean the mechanic arts collectively" (Marx, 1997, 966). Marx claims that a "novel entity -- a distinct new kind of sociotechnical formation… called a 'large-scale technological system'" was responsible for the semantic void that brought about the then-new concept 'technology'" (Marx, 1997, 978-979). This semantic void arose as discrete technologies became a part of complex socio-technical systems; the word technology was tasked with describing this new dimension. While technology previously referred to the study of

industrial arts, it came to refer to the industrial arts themselves. When I studied technology at Manitoulin Permaculture, I referred to technology in the first sense but thought about it in terms of the second. I looked at the 'books' to draw conclusions about the 'collection of books'.

Defect also created a 'semantic void' which makers could exploit to distribute power and agency amongst themselves at Manitoulin Permaculture. It was the identification and the way in which defects were handled which helped distinguish members of Manitoulin Permaculture. In the second half of the nineteenth century, Technik became so central to the self-understanding of the rising German engineering profession that most German-English dictionaries gave "engineering" as one translation of Technik (Schatzberg, 2006, 494-495). With their new understanding and goals of advancing German Technik, came a struggle for a superior position in the German social hierarchy (Schatzberg, 2006, 494). Engineers attempted to achieve their status "through Bildung -- meaning, roughly, education in the principles of high culture. The elite engineers of the VDI, for example, spent considerable time arguing over whether engineers should be required to learn Latin" (Schatzberg, 2006, 495).

Another part of this struggle for status "involved a philosophical discourse of Technik centered around engineers" (Schatzberg, 2006, 495). This kind of status struggle was evident at Manitoulin Permaculture when defect emerged among engineers and non-engineers, as well as when it came to questions about the world and its technology. Philosopher Carl Mitcham calls this discourse the "engineering philosophy of technology" and dates its origin to the 1877 publication of Ernst Kapp's *Grundlinien einer Philosophie der Technik* (Schatzberg, 2006, 495). In the early twentieth century, this discourse turned into a heated debate, sparked by Eduard von Mayer's *Technik and Kultur,* about the relationship between *Technik* and *Kultur* wherein the engineer-philosophers of *Technik* sought to defend the status of the engineers from humanist

intellectuals (Schatzberg, 2006, 495). Schatzberg explains that "[t]he counterattack was led by the entrepreneur and inventor of X-ray instruments Friedrich Dessauer, who applied a Kantian framework to defend Technik, stressing *the individual, creative character of invention*," which I have already called into question (Schatzberg, 2006, 495). As Mikael Hard explains, Dessauer sought to give Technik a "spiritual dimension" in order to make it acceptable to the learned elite (Schatzberg, 2006, 495).

Thorstein Veblen first used the term technology in his critique of capitalism and with considerable sophistication (Schatzberg, 2006, 498). In *"Technik" Comes to America: Changing Meanings of "Technology" before 1930* Eric Schatzberg argues that the "German discourse of Technik transformed the concept of technology, shifting its meaning from a field of study to the object of study -- that is, *from the study of the industrial arts to the industrial arts themselves*" (emphasis added) (Schatzberg, 2006, 511). Schatzberg describes the primary steps and results of this transformation by Veblen:

> "Technology assumed a significant place in Veblen's writings shortly after 1900, when he turned his attention to the relationship between business enterprise and the 'machine process,' or modern industry. Like Marx, Veblen sought to explain the fundamental contradictions of modern capitalism by uncovering its historical dynamics. His original term for the technical aspects of these dynamics was workmanship, but this carried a strong sense of handicraft and lacked the breadth needed to cover the practical arts from earliest agriculture to large-scale electrical systems. Veblen found this breadth in the German Technik, but needed an English word of comparable scope. Technology, even in its original meaning as the science of the arts, was as applicable to prehistoric human beings as to MIT graduates. In appropriating technology, however, Veblen also transformed it, moving its meaning away from a field of study and closer to material practices and craft knowledge" (Schatzberg, 2006, 500).

Schatzberg also points out that "the meanings of technology also changed in response to gender and class struggles over industrialization, as Ruth Oldenziel has argued" (Ibid). Notwithstanding the strength of these factors, Schatzberg maintains that the explanation for this shift lies with the

German discourse of *Technik* (Ibid). The shift in the meaning of the word technology has caused confusion and left a void that is still contested.

Defect created another space which can be exploited through knowledge claims, because defect creates a space for the redrawing of new boundaries. Yet, as far as I can tell, defect has no origin, or at least, it cannot be pointed to, sometimes it seems to have no location. Although defect circulated among the makers, I could not figure out where it was that they were locating the defect. I assume that they located the defects inside the objects, but from what I saw of their behavior, the defect sometimes left objects and entered the way Manitoulin Permaculture was organized. If they referred to the way Manitoulin Permaculture was organized, then there was no obvious way to locate it. This same 'phantom-like' quality is available in Leo Marx's criticism of the use of technology as a concept as well (1997).

Before I met Mr. Chunky, I heard a funny story about one of the makers' friends. Their friend ordered a device, and actant, called the Clear Intentions Plant Wellness Device that could detect how happy a plant was feeling. One day the device and the plant were in a state of disarticulation, the device did not detect any signal while attached to the plant and the actors in the network began to shift, enrolling a new actor in the process. Thinking thats the machine was defective, their friend called customer support, the new actor, and explained the situation. The device wasn't working they said, it wasn't reading any plant signals, they confessed to the agent. "Your intentions aren't clear enough" the agent assured them. As it turns out, the batteries, a key component for the successful action of the device, were dead. The actants, the plants and the artefact, are not communicating properly with the human actors. There is a defect, a breakdown, in the working of the situation, but in this case the customer service representative reports that the technology and the plant work perfectly, the real problem is you, the user. By

acting as mediator, the customer service agent can translate the behavior of the device, telling a story to co-opt the others into agreeing that they, the users, are defective in some way, not the device. Perhaps the situation allows actors to pass the defective label around like a token as described by actor-network theory.

Before the Clear Intentions Plant Wellness device there had to be the supposition that plants have feelings. Although I have never encountered this belief while reading the permaculture texts, I suspect it fits neatly within the permaculture ethos because it is entirely opposed to how plants are dealt with in monoculture theories. As well, the plants have responded favorably to their treatment at Manitoulin Permaculture. The texts in the Manitoulin Permaculture library may be acting on the makers. Having read many of the most important books in the makers' library, I am relatively certain that none of them directly mention the idea that plants have feelings or that they respond to our feelings, but I am fairly certain that such a possibility is implied. This is because much of the literature there is scientific, science fiction, non-fiction, self-help and occasionally fringe. Outside of the permaculture manuals I noticed the dominating influence of Kim Stanley Robinson's work in their library, especially the *Mars* trilogy. I also noticed the implicit and sometimes unconscious influence of another work in the library called *From Being to Becoming: Time and Complexity in the Physical Sciences* where Ilia Prigogine, a Nobel Prize winning physical chemist, whose work in the realm of complex systems has overlaps in the theories of permaculture techniques. While much of his work dealt with thermodynamics and complex systems, especially irreversible processes, the intention of his book "is not to 'reduce' physics and biology to a single scheme, but to clearly define the various levels of description and to present conditions that permit us to pass from one level to another" (Prigogine, 190, xiv). In the same way that Prigogine asks the reader to follow along from one

level to another, so too does permaculture ask the practitioner to begin to make connections across boundaries, networking different actants despite conventions. Perhaps the beliefs that plants have feelings and that they can feel our intentions have something to do with the thinking of Prigogine as well as the work of permaculture, which also deals with complex systems, including those with sentient beings embedded in them in a networked way. Indeed, these beliefs, especially that the human mind has a strong influence on reality, are fundamental to permaculture techniques as well as permaculture at Manitoulin Permaculture. They may also explain why Manitoulin Permaculture is so successful, the belief that plants feel and respond to the practitioners is fundamental to their beliefs, why not to their success as well? Indeed, the plants do respond favorably to their treatment. The plants have successfully co-opted the makers into helping them survive, and provided the successful outcome as an exchange. Just as Prigogine asks the reader to follow between levels, so too might defect, as well as the process of defecting, explain both the means and reason by which the makers at Manitoulin Permaculture defect.

While not outright expressed, it may be the case that beliefs about the nature of mind and the quality of mind of other creatures created an opening and a push for the makers to leave their lives. They all share the belief that they do not want to be artificially limited in the mainstream world, which, by various means, seeks to hold them down. Manitoulin Permaculture is a community of people who self-conceive as both defecting from the wider world and defective in the sense of being different from the norm, even possibly superior.

The final book that I encountered was brought to my intention by Rodney, the leader, who said that the community was inspired by the book *Gaviotas: A Village to Reinvent the World* by Alan Weisman. In this book, a small network forms and begins to succeed economically through

its relation to its neighbors, overcoming war and other surprising obstacles. I suspect that Manitoulin Permaculture, like Gaviotas, will try to succeed economically to prove its abilities and, by succeeding, demonstrate the weaknesses of the world which they rejected. What once marked them as defective becomes the source of their strength.

Everyone there whom I was close with told me that they were unsatisfied by their lives. Their networks began to dissolve because the communication between actants stopped serving their interests. Francine was a master's student, she had prestigious work in a virtual reality lab doing cognitive science. The work she was doing inside the network she was in acted upon her to make her think that there was more to life than this, and so she acted to leave the network and allow it to dissolve as such. She entered a new network and changed into an artist and craftsperson, designing, sourcing and marketing everything herself. Eugene and Troy both left Ottawa with engineering degrees, having worked a few jobs in different sectors including solar power. When they biked across Canada, they didn't find a more suitable community for them, nothing with as much energy and possibility. Toby left his PhD at Cambridge in genetics to work at Silicon Valley but became frustrated with life there as well. He wanted something deeper, more meaningful and returning to Manitoulin was the best option. While in the US he was struck with a life-threatening illness and survived. Not only did the networks of Silicon Valley inform his decision to join Manitoulin permaculture, but also the influence of cells who exist because of their internal disarticulation. He admitted that projects were easier to accomplish on manitoulin Island because he had access to the obligatory passage points, the local officials, which would have taken him years to get elsewhere. Their leader, Rodney, had studied widely, across many different disciplines and places, before returning to Manitoulin to build a new network through Manitoulin Permaculture and the Northern Ontario Permaculture Institute. He mentors and

protects the makers of Manitoulin Permaculture, offering his knowledge and expertise on everything from cooking to entrepreneurialism. Indeed, the entire life of the mushroom business is nearly impossible to do in the heart of a city, especially without university backing, yet Eugene and Nina are succeeding through and with Manitoulin Permaculture. All of the makers found extraordinary opportunity to build themselves and their businesses from the ground up, from nothing, because of the extraordinary environment at Manitoulin Permaculture. Perhaps one of the reasons the environment was so successful had to do with the idea that plants, and other beings, have feelings and that they feel our intentions.

I do not know directly of the time when Rodney first founded the organization, but a member of the wedding party told me that he and several others were present when Rodney revealed his vision for the land, for this organization and for changes in the world. This vision was put down approximately seven years ago. Eugene and Troy were some of the first members to join the network, as well as Toby and Nina who found a place in the organization early on. Later Francine and Doug joined, and I arrived five and six years into the vision. I met Margaret, Parker and Clare during my last visit, and I heard stories of other people who made their way into and out of Manitoulin Permaculture, sometimes with a spouse and a business in hand. Rodney was very proud to translate many of the varied visitors of his farm through different stages of life. Manitoulin Permaculture began as Rodney's dream on a small plot of land on an island with less than 10,000 people, but his work has touched the lives not only of the islanders, but of those travelers who Manitoulin Permaculture takes under their wing for as long as visitors need.

Regardless of the boundaries of a network, or the location of defect, the difficulty in studying technologies within these networks lies in the answer to the question "(h)ow can we go

about getting those in whose name we speak to speak for themselves*?"* (Latour, 2005, 99). Since neither party knew the exact defect, the customer support agent who spoke for the device doubled down on the narrative of intention until the friend had enough intention to find a battery.

In Bruno Latour's *Politics of Nature* one of the ways that that non-humans are able to participate in the discussions of humans is through the "lab coats," in this case the customer support agent, who "have invented speech prostheses" for "when humans become perplexed about the participation of new entities in collective life" (Latour, 2005, 67). Latour problematizes the "self-evidence" with which a separation between nature and culture is "taken a bit too hastily" in popular and academic writing on environment and politics. This kind of self-evidence, as well as the space between primary and secondary qualities can also inspire a cadre of experts.

At Manitoulin Permaculture, everyone shared an outdoor kitchen, cookware and all. Some of the hottest commodities in this kitchen were the cast iron pans. None of these pans were defective, they were far superior to the others, if treated properly, Troy said. The cast iron pans were in a network of human and non-human actors all communicating at different levels with different valences. It seemed as if no actor completely understood any of the others, nothing seemed to fit perfectly with everything else. Cast iron vessels for cooking have been in use for a very long time, but the first mention of them in English occurred in 779. It wasn't until the stovetop that cast-iron skillets came into popular use. It became a favorite of home makers in the 20th century because it was cheap and durable. Although the cast-iron skillet has fallen out of favor except among campers where it is used in outdoor settings, it still represents a small part of the cookware market because of its reliability. Cast-iron cookware is able to maintain higher heats for longer than any other cookware material. Today cast-iron cookware is made by specialty manufacturers and is occasionally recommended to people suffering from iron

deficiencies, as iron is known to leak into the food. After dinner, the person who cooked could relax while the rest of us cleaned. Frequently, someone would be instructed about the proper way to clean the cast iron pots while all of us were in the kitchen. A handful of people knew the rule and would instruct offenders (those failing to clean these pots and pans correctly). I couldn't help but feel embarrassed when the criticism landed on me. How could I not know that one was supposed to use only water and not soap on such pans? This sense of shame co-opted me into the regime of informing others of their misdeeds begun by Troy. The pan reacts poorly to being washed with soap. If washed with soap it loses its "seasoning," which means that it will rust, lose its ability to prevent food from sticking to it, and lose some of its excellent cooking properties. The pan, as an actant, threatens defect and forces the human actors/cleaners to be wary about how they interact with it. When seasoned, the pan emits high levels of infrared radiation which helps to cook the food, as well as through the heat conduction of the oil, it acts to create and sustain heat. Seasoning is created through the polymerization of oils and fats; it is done mostly by applying a layer of animal or vegetable fat as well in combination with heat to the cast-iron pan. A seasoned cast-iron pan provides excellent benefits, whereas an unseasoned pan creates more trouble than it is worth, it can sometimes spell death for the pan, so the pan acts to prevent that by having the arrangement of properties that it does. It may even benefit by allowing its users to care for it, prolonging its use, and perhaps the success of the cooking, through the need of others to care for things. Troy, who has had the pans' needs communicated to him through experience or perhaps research is trying to protect the pan and reap the benefits secondarily of being knowledgeable about the actants' needs. When Troy explains how the pan needs to be treated to other makers, he is engaging in a game of telephone with the pan's new users as the mediator, but only when the game has already broken down or been defected, the pans have

already been washed with soap and will lose their seasoning. The bond between the oil and iron has, in theory, been broken by the introduction of soap. Significantly, Troy used this moment of breakdown as an opportunity to establish himself as expert and shore up his role as cooktime leader. In the language of actor network method, Troy is the necessary translator of the pan whose properties are invisible to the naked eye, impossible for an uninitiated to know by sight. The pan, on the other hand, is not able to intervene during this instance directly because its spokesperson is not able to demonstrate the effect of washing it without soap at this exact moment. In effect, Troy uses this moment of miscommunication between the pan and the cleaner. He is able to use this moment of miscommunication because he claims to be a spokesperson for the pan. Troy uses defect, or in ANT terms, disarticulation, as a political resource. He establishes himself as powerful, necessary and expert. In this triadic relationship, the pan is communicating by being, if it is seasoned food will not stick to it, it will not rust, and it will maintain high heat. Although one conversation about the pan has ended, it is always communicating its properties by acting in the network and so we can see whether or not either cleaning regime, soap or not soap, is working. Everyone wants the pans to stay healthy, even the pan

After I witnessed many infractions occur, I couldn't help but laugh, and sometimes I instructed newcomers to the right people in order to confirm 'the right way." Since they were from Texas, I imagine that it was difficult to relate to others, both human and non-human, in a different country and an entirely different context. While it took me months to get used to how things worked, they only had a week or so to get a handle on what might have been a new system. For example, the outdoor kitchen and the sharing of food may have been a hurdle, as

well as the fact that we all share dinner at a large table outside, although the older people tended to sit by themselves inside or at a table removed.

If the bride's family ever encountered the cast iron pan, I was not there to see it. I do remember, however, feeling unsure how to approach them or explain why the kitchen was the way it was. Since the cast iron pans were the only pans available, and since eggs were abundant, I suspect that eventually the bride's family connected the eggs and the pan for breakfast and faced the secret of the pan. Ultimately, it was clear to me that the pans are believed to be defective under one regime of practice, and superior within another. If cared for, the pans worked well, if not, Troy and Doug said, the pans would be ruined. People used their knowledge of how the pans are supposed to be cleaned to scold, teach, warn, or make a joke, usually a mocking one designed for the absurdity of the situation.

Absurdities were so common that the makers displayed "lessons to help with everyday absurdity" inside the kitchen for everyone to see.

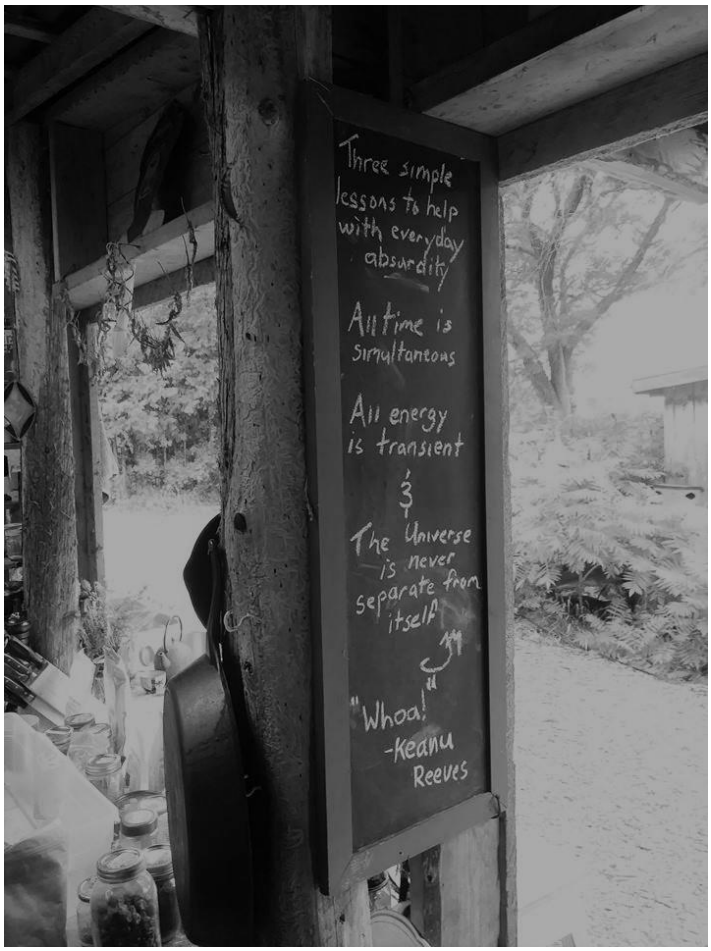

Figure 1 Kitchen chalkboard that offers makers "lessons to help with everyday absurdity."

As far as I could tell, the pans were not just used to cook, but to establish and limit agency in a network. The 'defect' that took place between person and pans exists in a network, it was not independent of the pan, but a system of practices and social relationships. These relationships can be used to determine when exactly someone or something is at fault, it is a way to exert and distribute power and expertise. Since the actual working of the pan is a 'black box,' to borrow a term from actor-network theory, people can variably claim to understand it with different degrees of success and different outcomes for the network. I am still skeptical. I have read about five recommended washing techniques, they are: never wash the pan, wipe the pan after use, use hot water and a stiff brush to wash it, use mild soap and water then reapply fat or oil or use coarse

salt and a paper towel. I don't remember seeing the pans rusty, but I do remember seeing rusty pans, I have also never suffered the experience of losing a cast iron pan to rust. Needless to say, there are circumstances where the pan will rust and that it has to do with the seasoning of the pan, which should be maintained if the pan is to be maintained. Trying to maintain the pan is important, but the valences in the telephone game of communicating for the pan are not always warranted, the pan's mediators are not always kind. Since the seasoning is invisible to the naked eye, there is no reason to think that the pan would not be treated like every other pan. It is only through communication with the pan that anyone can learn about it. The pan acts in the network by way of a dual use: to be a conduit for heat in cooking and to seem to have a hidden secret about how it is properly cared for which depends on humans to speak about it. Caring for the pan is problematized through the story of its required care, a story which then interests some people to learn about it and mobilizes those knowledgeable humans around its care which, in a community, requires that others are enrolled in the project of caring for the pan. Defect, as a story, is a tool for people to assert themselves. Although the right way of the pan could be seen as harmless it might also be used to show that one is knowledgeable of kitchen technology. In fact, Troy, because of his knowledge of the kitchen and cooking, was able to claim the kitchen as his own and to dazzle people with dishes. By keeping the pans in his back pocket, so to speak, he could wield them to make himself more comfortable. As well, the makers were mobilized when the defect of a technology was critical for their health.

I asked Clare about the water pump and its maintenance on the farm and she explained:

> *When they're not working they really, really don't want to work. I spent weeks trying to get pumps in water lines to work and after some amount of time I began just swearing at the machinery itself, like that's going to change anything but it doesn't because it's just physics. There is an air pocket somewhere. There is a leak somewhere. It also becomes personal after a while. When pumps are humming well though, it's a wonderful thing. Actually, when pumps stop on the property they take*

> *absolute 100% first priority. Whenever any pump is broken down we drop stuff until that pump is fixed because we have to, because if we don't the hygiene goes, the food goes…if we don't, then the cooking like…everything hinders on the fact that we have enough clean water and working pumps means that we have that. Troy and I spent nine or ten days in the summer…both pumps, the irrigation pump and the sauna water pump, both of those went within 24 hours from each other. We spent nine days getting those back online.*

In effect, Manitoulin Permaculture depends on the water lines, yet it also depends on the breaking down of things, like the water pump, and this breakdown is not simply physical, but arises between object and observer. When I asked Eugene about what happened last time their pump broke he said:

> Yes, that was probably about three or four months ago. It was definitely challenging. We approached it first by trying to fix the part itself. So, taking it apart seeing what's wrong, seeing if we could fix it, then salvaging other pumps we had lying around, to Frankensteining nonexistent pumps, to saying 'fuck it Rodney, you need to buy a new pump,' which is what ended up happening, as well as fixing the issue that caused the pump to break in the first place.

The breakdown of the water pump at Manitoulin Permaculture revealed details about the hidden 'contingencies' and approaches to defect that the makers experienced. When the pump broke down the main actors were Rodney, the pump, Manitoulin Permaculture, Eugene, Nina and Troy. The problem, I think, for them during the breakdown of the pump is 'will we be able to fix the water pump while keeping our principles intact?' Their interest in the problem of the water pump is based on the pump's relation to their health since a lot of their lifestyle depends on this water pump. Although I helped with a pump breakdown when I arrived in 2017 I may have made the problem worse. In fact, when something 'technological' breaks down, only those (Nina, Troy and Eugene) who have experience with the specific technologies themselves (like this particular water pump system, which was built by the makers) are enrolled in the problem

solving. Their enrollment is further organized according to expertise as well as on-the-fly observations and intuitions as problem-solving is underway. After the makers have adequately studied the problem and after exhausting all other options, like the junk pumps that may or may not be housed somewhere at Manitoulin Permaculture, the can ask Rodney to buy a new pump.

Further, Manitoulin Permaculture seems to acts 'atmospherically' to create the set of assumptions about the conditions of solving the problem like the fact that the pump system as a whole needs to work in the way it does. As well, Manitoulin Permaculture may or may not have the parts laying around for a specific fix as they collect parts often but not in an orderly way. The pump, as Eugene would later tell me, is expected to break down again in 4 to 5 years since that is how the models they buy work in the system they have. Instead of being changed, the pump's breakdown will be handled like just another contingency in the future, though where and how the pump breaks is not necessarily known. The makers act as a group to solve the problem together, and Rodney acts as a support character who could reasonably resolve the problem if it ever became too difficult or frustrating.

Their initial response to defective technologies is to look directly at the object for flaws, then, if they can identify the flaw, to fix it with their existing tools, sometimes salvaging older parts. After exhausting those options, they realized in the case of the water pump that they would need to buy a new pump, and prevent the problem from occurring again. As defects arise, they are factored into a management regime, prioritized, inserted into an online planning tool and are often the subject of the morning meeting. The 'scrum' was a morning meeting which gave certain people, during my second stay it was the bride and the wedding organizer, the opportunity to promote their projects and help us organize the details amongst ourselves. Although the business of the group shows signs of "growth" their practice is often to repair or

pre-empt repair and breakdown. Instead of a discourse about creating new technologies, a discourse of fixing technologies or otherwise dealing with problems dominates.

Winner points out that social scientists are in agreement that "Who governs?" is the right question to ask in thinking about technology in society, but, least in 1978, they found that "lost in the perspective is an equally interesting question: What governs?" (Winner, 1978, 173). Winner suggests that this bias in thinking is a result of presumptions of technological dystopianism; When the character of individual or organized technologies are scrutinized, the scrutinizers are accused of being anti-technology. Winner replies that "[i]t is not antitechnical because those making the claim assume that technology is neutral and the only thing an intelligent person could debate is that of wise and unwise" (Ibid, 225). Winner believed that "[t]he point of techno-politics is to look at the whole structure" not individual technologies (Ibid). He found that there are two domains of thinking regarding technology and they depend on a difference in insight and commitment (Ibid, 323):

1. Technology is a problem, it requires legislation.
2. Technology is legislation

Although Winner favors the second claim, he is not able to fully explain how an object or organization of objects is legislating without the help of humans. In his extensive review of the literature in *Autonomous Technology: Technics-out-of-control as a Theme in Political Thought*, Winner discovers that "[r]esponding to the staggering proportions of the problem, thinkers have gravitated toward Scylla on the one hand, Charybdis on the other – between an altogether crass reductionism and a wild, multifactorial confusion" (Ibid, 176). Winner believed that one of the sources of this confusion was the tool-use model of technology. He saw that we "do not *use*

technologies as much as *live* them," this is especially noticeable when one considers that "tools include persons as functioning parts" (Ibid, 202). However, it is not clear where the pan's use ends and Troy's use of it begins.

In a parallel fashion, in the *Real World of Technology* Ursula Franklin describes *prescriptive* and *holistic* technologies, arguing that prescriptive technologies create the habit of servitude. Her argument should not be interpreted as a "belief in the automatism of technology per se" (Franklin, 1990, 20, 57). An example of a prescriptive technology at Manitoulin Permaculture is the construction of the greenhouse because the steps of getting the greenhouse approved by engineers, architects and city administration set the program of action for anyone who wants to build such a greenhouse. An example of a holistic technology at Manitoulin Permaculture is the way the water is applied to the hot stones in the sauna, which requires careful observation to not burn down the sauna or overwhelm the sauna goers. The steam is managed by observing and responding to both the sauna goers as well as the reaction of the water with the stones and the strength of the existing fire, all of which do not have quantities or protocols readily associated with them. To Franklin, holistic technologies are different than prescriptive technologies in that they are more like a craft than a step-by-step process, where the doer is in total control of the process. With prescriptive technologies "the making or doing of something is broken down into clearly identifiable steps" (Franklin, 1990, 20). With holistic technologies, the doer makes decisions in real-time and participates in the 'growth' of a product (1990, 18). Now I will address what it looks like when the makers lose control of their control system, when technology escapes the guise of expert knowledge.

Like the pan, the greenhouse computer did not always receive proper care from makers on Manitoulin Island. This is a case of "the plight of things that have been created but not in a

context of sufficient care" (Winner, 1987, 313). When I asked Eugene, 'What is the last challenge you have faced and how have you approached it?' he described fixing a machine that, according to the specifications, was not performing as needed:

> "One of the most challenging things was working with the greenhouse and control systems after the computer got hacked. We spent months trying to figure out how to fix it, how to reinstall firmware, how to reinstall the operating system. It took me about a month and a half to realize that I actually didn't have the right power source for the computer. I was 200 milliamps short of what the computer actually needed and so it would intermittently shut off Wi-Fi and capabilities. So, my configuration process would just get halted and would kind of error out and proceed and I had to reinstall the operating system. I was doing that eight, nine times… until I was able to diagnose the problem. That was frustrating."

He discovered that the device was not receiving enough energy. He took responsibility for this defect and eventually 'solved the problem.' He showed a great degree of care for this technology. He "spent months trying to figure out how to fix it" and eventually the trial ended because it was discovered that the machine wasn't working not because of its configuration, but because of the configuration of the larger world. The reason the machine ran out of power was because of a roaming algorithm, a computer program, which hijacked the control system for financial gain. Once Eugene installed basic security, a firewall, the control system did as it was programmed to do. I think, though Eugene had never encountered this problem before and could be forgiven for not knowing the protocol, what happened to him is an example of engaging with non-human life and trying to translate it.

For instance, the research into unknown worlds of entomology, the arts, philosophy and the new technologies, though inspired by the question of how to grasp or 'prehend' experienced worlds beyond our own, were ultimately left up to translation and transposition (Parikka, 2010,

73). As one entomologist of the Indian tropic wrote, unlike mammals, insects have no indicators of the emotions that guide them. When we see their antenna, which has no counterpart in higher animals, its activity "conveys nothing to our uninformed brains" (Ibid). As well, some machines, just like insects, do not have obvious indications of their inner workings, especially to the uninitiated, if one could be initiated into such things. However, machines and insects supposedly have a different existence entirely, they co-exist, but along different regimes, modes and capacities. Their different existence could be variously understood by the makers.

One of the ways that technology has a different existence from humans is found in Belinda Barnet (2004) who tries to demonstrate that technological evolution, which she sees as different from biological evolution, is non-linear. Innovations from the past can be transported from one generation to another without undergoing evolution through reproduction. She recounts the story of the collector Niles Eldredge who collects both biological life and musical instruments called cornets. When Eldredge tried to construct a makeshift genealogy of the cornets, as he might with his biological specimens, he found that their evolution was 'retroactive,' which was not found in nature. According to her, technical memory facilitated this kind of non-linear evolution.

Following Stiegler, she argues that technical artifacts are a part of a transcendental object in human history called the 'epi-phylogenetic structure' that has its own material genealogy (Barnet, 2004). She argued that because of this structure, purely human knowledge becomes impossible (Ibid). As a result, I chose to think of the makers as translators of a sort, since they are encountering, in some sense, non-human knowledge. Barnet writes that "[i]t is impossible to deny the participation of human thought in the essence of machinism. But up to what point can this thought still be described as human?" (Ibid). Stiegler placed language, technics, technique

and technology into this structure because "they are forms of inscription, transmission and ultimately, transcendence" (Ibid). While these are "larger than ourselves; they exceed our death as human beings,"

Stiegler gives technics (as techne) a special place such that "[t]echnics constitutes its own domain, it has its own relationship to time and inheritance, its own dynamic radically different to what we find in nature" (Ibid). It is entirely different from human knowledge. Although the makers did not explicitly tell me that they were participating in the expansion of transcendence, they acted as if they were responding to forces beyond their control or capacity to perceive, especially as they responded to changing conditions in the wedding and the greenhouse from a logistics point of view as well as an affective one. To understand the networked nature of the relationships between humans and non-humans I chose to use actor-network theory (ANT) as my theoretical framework. It also supported me as I thought about socio-technical systems, sometimes called socio-technical networks and to place humans and non-humans on the same plane.

When I tried to look at the technology at Manitoulin Permaculture I ran into the problem of figuring out where the technology was. When I arrived on the farm, I wanted to do certain things, but I discovered that they were impossible because of the motivations of the people on the farm. For example, both Clare and I wanted to build food forests when we arrived a year apart. We were both heartbroken to learn that creating a food forest was not feasible, we were told by Rodney. One of the reasons it wasn't feasible was because of the seeming constraints that Manitoulin Permaculture faced. One of those constraints was the intensity of motion towards other projects. Clare was told by Rodney that the new greenhouse, when built, would make it easier to build a food forest in the future, but for now, it couldn't be done because we didn't have

easy access to the necessary resources. That being said, Rodney once told me that the reason we can't design living systems with perfect feedback at Manitoulin Permaculture is because he is "not God" and so seeing all of the interconnections would be impossible. It is these interconnections that contribute to making 'technology' difficult to grasp.

Leo Marx argues that whatever might describe technology as it refers to 'large-scale technological systems' is susceptible to reification. Borrowing from George Lukacs's definition, Leo Marx invokes the concept of reification which occurs when "a relation between people takes on the character of a thing and thus acquires a 'phantom-objectivity,' an autonomy that seems so strictly rational and all-embracing as to conceal every trace of its fundamental nature: the relation between people" (Lukacs, 1971, pp. 83-87 quoted in Marx, 1997). A characteristic result of reification observed by Karl Marx, Lukacs reminds us, is the power exerted by commodities over human beings; when it came to the power of the concept of technology, the social relations between people that made 'technology' possible were mysteriously given "an objective, even autonomous character" (Marx, 1997). Leo Marx questions both the boundaries and essence of technology and technological systems to arrive at technology as a phantom. He asks "Which aspect is technological? Where, exactly, is the technology?" (Marx, 1997, 979). Although there are indispensable material components in large-scale technological systems, those indispensable materials, over time, come to make up a small part of the whole. "Think of the computer chip!" he writes, it "only constitutes a part of the whole system, yet the rest is so inclusive, so various, and its boundaries so vague, that it resists being clearly designated… technology narrowly conceived as a physical device--is merely one part of a complex social and institutional matrix," and thus the boundary of technology and technological systems becomes problematic (Marx, 1997, 979). I believe that something similar has happened with technology, which has taken on

an objective character, as if it existed independent of its human creators, and is capable of making strong suggestions. Yet, the idea of systems persists, and the makers want to know how to work systems.

Eugene asked me a question about systems when he wondered how to keep the businesses of Manitoulin Permaculture working together into the future. He was worried that Troy's kombucha business or Toby's cidery would not need Manitoulin Permaculture or Eugene and Nina's gourmet mushrooms anymore. Was there a way to design their organization so that their working together would be assured, he wondered? Toby explained a similar problem to me when he told me that even with a dozen or so people working together at Manitoulin Permaculture, it was impossible for one person to keep track of everything they were doing. As well, Francine wanted to improve the business connections on the island so that resources would be shared among more people, maybe by creating a chamber of commerce. All of these conversations we had had to do with the way 'things' work together in a 'system.' When Leo Marx questions the ability to refer to this system he neglects that some people, regardless of the likelihood of such a system are interested in how one might work or be manipulated. In effect, "where is the technology" is an important question for both the literature about technology as well as the makers at Manitoulin Permaculture, else they would have no way of identifying which things need to be connected and where the connection is located as Leo Marx suggests. In this case, they want their businesses, especially their machines, to have some sort of consequential or determined connections, as a bank balance might have a consequential connection to withdrawals. However, the makers were not concerned with the ongoing debates about where these systems end, or what the essence of those systems or their components is but rather in how one might use these and other systems to their advantage.

While Leo Marx wrote that the term 'large-scale technological systems' is clumsy, it persisted in the social sciences, particularly in the social studies of technology, the social construction of technology as well as science and technology studies. Thomas Hughes, in his essay *The Evolution of Large Technological Systems* builds on the idea of technological systems, though still in line with Leo Marx, by seeing that they "are both socially constructed and society shaping" (Hughes, 1989, 45). He lists some of the components of a technological system, writing:

> Among the components in technological systems are physical artifacts such as the turbogenerators, transformers, and transmission lines in electric light and power systems. Technological systems also include organizations, such as manufacturing firms, utility companies, and investment banks, and they incorporate components usually labelled scientific, such as books, articles, and university teaching and research programs. Legislative artifacts, such as regulatory laws, can also be part of technological systems. Because they are socially constructed and adapted in order to function in systems, natural resources, such as coal mines, also qualify as system artifacts (Ibid).

Although he views systems as composed of artifacts, artifacts are related almost mechanically, such that if there is a change in say, resistance or load within a power generation system, then there must be changes made elsewhere to compensate. Technological systems try to solve problems using whatever means are 'available and appropriate,' at least what is deemed appropriate by their human operators (Ibid, 59). Heidegger used this kind of ordering of the world to define technology, thinking of technology as the means to an end. In Hughes, systems are under the control of human as well as "artifactual operators" (Ibid, 51). Inventors, scientists, engineers, managers, financiers and workers in the system are components, not by-products of the system (Ibid). I try to situate the makers of Manitoulin in the context of larger systems which are visible in their engagement with the greenhouse and wedding projects throughout time.

Hughes argues that the characteristics of components in a technological system derive from the system. “For example, the management structure of an electric light and power utility, as suggested by its organizational chart, depends on the character of the functioning hardware, or artifacts, in the system. In turn, management in a technological system often chooses technical components that support the structure, or organizational form of management” (Ibid, 46). While technological systems “solve problems or fulfill goals using whatever means are available and appropriate; the problems have to do mostly with reordering the physical world in ways considered useful or desirable, at least by those designing or employing a technological system” (Ibid, 47), this belies the likelihood that they will have to deal with practical concerns. Hughes provides case studies of technological systems and finds that practical concerns are often the supposed reason for changes in the system and that those practical concerns directly affect the components of that system, thus values and human decisions about what social problems are important condition the implications of technological systems.

Permaculture is fundamentally motivated by defect: One of the facets and motivations for permaculture is not only “back to the land” but to “restore” or repair the land. The permaculture project has many practices that are capable of reforming land from desolation to abundance. As a practical critique of capitalism, permaculture trades the recognition of a defect in capitalism for the defect of capitalism itself, what Massumi calls “surplus-value of life.” If we were to think about vegetation as something that we ‘spend on,’ where Bataille might think of permaculture practice as a form of expenditure, then, kilojoule per kilojoule humans are in a deficit. When I described Ellul’s vision of a technological society to Louise, she explained that this vision describes our relationship with the plants. She said something like ‘Well, we already serve the

plants. If you think about it as an energy exchange, we put in way more work than the plants do. Kilojoule per kilojoule, we basically keep the plants alive.'

Defect is not only a void for competing knowledge claims, an opportunity to care for an inanimate object or to clear out a dangerous one, it is an animating factor, animating behaviors as well as stories, at Manitoulin Permaculture, whose own project was occasionally seen as defective or not worthwhile. This defect, instead of repelling, encouraged others to contribute their knowledge and effort. This story about not working also worked things for the makers. One night, playing the game *pente*, Toby and I were talking about artificial intelligence. Having worked in Silicon Valley, he was sure that "unless you are working on machine learning everything you are doing is pointless," perhaps because machine learning would 'solve' all of our problems.

Since this was the story he was telling himself, he was able to be frustrated with the work he was doing while being liberated to explore whatever he wanted. Eugene, despite the rhetoric surrounding the proliferation and success of machine learning, is able to learn about control systems because he is interested in them and sees an immediate use for their application. Interestingly, he is thwarted by well-known properties of complex systems, as well as relatively recent, though established, developments in computer technology. The intervention of outside technology interested him by creating a problem, enrolling him, and mobilizing him to solve it. All the while Eugene learned about more than just the control system. Similar things happened with everyone at Manitoulin Permaculture. Their being together was brought about by defects, rather than their 'solutions.' They are not together to solve problems but to notice them, talk about them and then solve them. Defects emerge much faster than problems are 'solved' and so the accumulation and reorganization of material is not a product of 'solving' so much as

problematizing and translation of problems. The group is not, in my mind, solving problems, but encountering the endless defects that emerge in their confrontation with the 'outside.' Yet, they continue to transform rather than break down.

By the end of the winter after my stay at Manitoulin Permaculture, the makers had put up their large-scale greenhouse and are ready for more adventures. As far as I know, some of the makers have successfully built their mushroom growing facility in Little Current, working throughout the winter, a very cold winter, to accomplish this. NOPRI is planning to hire a farm manager for the next year, and I'm sure that there are many other changes going on that I don't know about.

There were also examples of technologies that appeared to my participants to act in autonomous and even monstrous ways. One example was found during an exodus from the farm and its hectic wedding mood. It appeared that people were reacting to Ana's behavior as her and Rodney's wedding approached. Toby, Felix, Troy, Lola and Francine all left the homestead to work or have fun. When I met with them before returning to the homestead myself, they all confessed that they were avoiding the situation at the homestead because they were worried they might get caught in some wedding crossfire. Felix and I spent the next day, before returning, working on cleaning out his garage and setting up a cider-making machine that he bought from Germany. His home is on the water, across from the island Felix was married on, it has a dock and a sauna, the garage is between their berry-patch and their vegetable garden. While Felix and I were cleaning his garage with his mom, we eventually made our way to the Imperial brand ping pong table. Before I began taking the table apart, Felix and his mother, Sherry, discussed what they wanted to do with it. They asked whether they would take it apart and pawn it or just scrap it. Sherry related a few stories of how the table harmed her or tried to kill her. It needed to go,

she said. In the beginning the plan was to pawn the disassembled pieces, so I placed the parts together neatly and made sure to keep everything organized. As I was taking it apart Sherry seemed to relive some of her experiences and repeated that the table should go. Looking closer, I found it odd that the fixture pieces were in strange places and required different screwdrivers. I wondered if the pieces were designed or manufactured separately before being shipped. As I was removing an odd fixture the table made a sudden and unexpected move to crush me, but was blocked by one of its mangled appendages. Sherry jumped at this and exclaimed that "this table needs to go." Felix made sure to help me with the other steps of the process.

The way these people were experiencing the defect of the ping pong table was 'more than' artefactual. The 'rationalized technique' of ping pong or its table had little do with how it was experienced. Whatever internal logic governs ping pong or the ping pong table had little to do with how the ping pong table, in that moment, was experienced. If I were competent with the table, I could have prevented it from collapsing. I did not understand what was required for the table. We could not 'communicate' anything but a defect and as a result the table was thrown away to be melted, shredded and reprocessed. Instead, the final cause of the table became something unforeseen and it met with an environment that was incompetent with its form (myself). Rodney put it neatly when he said, referring to a missing guard for an angle grinder, "when something breaks it tends to wander off." Breaking, not being understood, or being lost are death sentences for technologies. Yet, for humans, they can be an indication of beauty.[6] They can also be death sentences.

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[6] In *Creation of the Universe,* which put classical Chinese cosmological accounts in conversation with recent measurements and theories about the cosmos, Fang Li Zhi and Li Shu Xian trace the *Origin of Asymmetry* and find that, as far as the universe is concerned "beauty = symmetry + defect" (1989, 115-129). Although saying so amounts to very little, I think it is a valuable thought for this project. They go on to highlight fundamental questions in physics, namely the question of the 'first move,' and how they eventually relate to anthropos and the anthropic principle. Where is asymmetry of Manitoulin Permaculture and could it condition its existence?

One way of thinking about what is created by technologies that is greater than their intended use is through Parikka who asserted that "the technics of nature relate to the idea of positing a plane of immanence on which the issue of categorical differences between animals and humans, nature and technology is bracketed and the view of affects, movements, and relations among parts is posited as primary" (Parikka, 2010, 72). The "affective potentials" of interactional entities, specifically, "the affects they are capable of, what they can do, with whom, when and with what results" become most important (Parikka, 2010, 74). The separation of the human from the center of their ontology might coincide with a recognition of the qualitative character of value, rather than its common quantitative and utilitarian characterization. By replacing the term affective, which I do not understand, with the word qualitative I show that technologies do more than they are designed to do at Manitoulin Permaculture and have values other than use-values.

In his *99 Theses on the Revaluation of Value* Brian Massumi makes several striking observations about the specific functioning of capitalism and its failure to properly locate value. Massumi persuasively argues that value is the "qualitative character of its own occurrence" (Massumi, 2018, 25). One of his first steps on the way to decoupling value from quantification (his 5th thesis) was to argue that the use-value of an object is not well known or clearly defined. In fact, it seems that the use-value is entirely subjective. This means not only that we can't know what a thing does or is going to do, we also can't count on price to measure its use-value. This did not mean, however, that value was transcendental, instead, he insisted that value should be *"this-worldly"* as well as qualitative (Massumi, 2018, 4). According to him, "[a]ppealing to transcendental values, styled as moral qualities, only raises the strictures of normativity to the absolute" (Ibid). He claimed that it was a "qualitative *surplus-value of life* that provides the fuel

for capitalism's quantifications" (Ibid, 20). In other words, necessity is not the driver of life, but life the driver of necessity, which we fail to recognize. He goes on to suggest that "profit is a surplus-value of life before it is an economic value" (Ibid, 27).

I am not conflating capitalism with technology, though this appears to be a trend in the literature, however, I am borrowing Massumi's conceptual work-around for capitalistic procurement of life energy by thinking about his theses within my own. Instead of the 'originary heuristics' of a technology, which Barnet described as if they were a property of the physical forces that condition a technology, the qualitative character of the 'experience' of specific technologies was the focus within my study of the makers. For instance, when Massumi asks what we would consider the value of a quality of life he reveals that "a qualitative life value is something that is *lived for its own sake;* something that is *a value in and of itself, in the unexchangeable 'currency' of experience*" (Ibid, 25). Alongside but not equivalent to Massumi, I am thinking of human and non-human relationships in terms of an 'exchange' of sorts, as a *translation* with a qualitative character.

He defines surplus-value by the "generation of an excess of effect" (Ibid). "Its occurrence cannot be explained by any particular underlying factor, because what it spins off from is the way in which multiple factors come together: it is an irreducibly *relational* effect that comes to more than the sum of its parts" (Ibid, 26). He revealed that both quantity and quality come together in the event, but that quality is primary in relation to quantity when it comes to processes (Ibid, 101). His 95th thesis wondered how a "creative process engine that stays true to its mission of producing surplus-value of life" could, and this is just like Manitoulin Permaculture if it were conceived of as an 'engine,' "at the same time tie itself to an economization process capable of interfacing with the dominant economy in self-sustaining

ways" (Ibid, 124). He thought that the only way to do this would be by exploiting the way in which qualitative and quantitative processes embrace each other, which would be essential for a transitory phase in a postcapitalist society. A project that stays creative while blending with the local economy is just like the one I saw at Manitoulin Permaculture, where there was a surplus of life. Although not everything worked, eventually things worked very well.

When Lazzarato wrote that "(r)evolutionary possibility can always be identified by the impossibility it makes real, and by the fact that a *process* erupts secreting other systems of reference at the very place where the world was once closed" he was not referring to how defect opens up the world of human and non-human relations (Lazzarato, 2014, 20). However, he affirmed that "(a)s in all creation (whether artistic, scientific, or social), the suspension of the ordinary course of things first of all affects subjectivity and its forms of expression by creating the conditions for new subjectivation. This process must be problematized" (Lazzarato, 2014, 20). In a way, defect, technological or otherwise, provides a microscopic look at an 'interruption' which creates conditions for new subjectivations which I conceived as equivalent to actor-network boundaries.

While permaculture is focused on living in harmony with nature, it seems that disharmony or defect was an important factor in the arrangement of actors at Manitoulin Permaculture. When I looked at defect, it was not directly about the practical concerns or the way objects worked. Instead, it was about the 'surplus' that occurred in the relations between humans and technologies. I 'followed' the defect through the community to see what was animated when defect appeared.

Winner declared that "[c]entral to the various manifestations of the systems approach is the attempt to describe with total economy the structure and performance of self-regulating

systems whose telos is a state of equilibrium, [where] sources of conflict, disruption, or opposition are defined as dysfunctional states, aberrations to be overcome as soon as possible" (Winner, 1978, 223). An equilibrium state is explicitly *desired* in permaculture, and in the literature on permaculture things are problematized as they stray from the desired path, especially the path towards a healthy planet.

At the level of socio-technical systems, "'modes of protest and transcendence'" provided by metaphysics, spiritual practices, existentialism and bohemian lifestyles, Herbert Marcuse suggests, "are no longer contradictory to the status quo and no longer negative. They are rather the ceremonial part of practical behaviorism, its harmless negation, and are quickly digested by the status quo as part of its healthy diet. Co-opted, popularized, and made socially acceptable, deviance is a useful safety valve for a society, one whose remaining problem is psychological tension" (Marcuse cited in Winner, 1978, 211). Lazzarato locates, in the sixteenth century, the start of the process that leads to the co-optation of 'deviance,' where, by appropriating the 'megamachine' capitalism "progressively reduced the number of 'recalcitrant and unreliable' human operators and multiplied the more reliable 'mechanical, electronic, and chemical' ones" (Lazzarato, 2014, 33). In a way, Manitoulin Permaculture has 'co-opted' or 'channeled' the rhetoric of a defective world for labor power and profit. However, from what I understand, the makers of Manitoulin think of their presence there as the result of a *choice to leave* the way things were, sometimes identified by them as capitalism.

For example, Nina was not interested in technologies so much as how technologies could help she and her friends. When asked, 'What do you think the farm is about?' Nina said that she is "trying to leverage the capitalist system and provide as much good as I can for the farm." She locates capitalism outside of the farm, a source from which she can draw on to support herself

and her friends. Capitalism, the evil outside force, was also a motivator and sometimes a vehicle for the makers' activities and energies. In a way, the defective or harmful nature of capitalism in the eyes of the makers was what motivated their work and made it possible. Without "defects" to animate them they would not be organized in the same way nor would their friendships take the form they do. Manitoulin Permaculture could not take the shape it does without the perception that things are breaking down elsewhere. This breakdown, in the views of the community, does not come only from technology, but arises in a relation between the makers and the outside world. As such, for the makers, defect provides an endless supply of activity, excitement and opportunity for transformation as well as money-making. Manitoulin Permaculture integrates the idea of defect to channel energies into their organization. Yet, the makers protest this endless defection.

Chapter 3: Conclusion

While defect, or something breaking down and failing to work, is a productive, catalyzing force at Manitoulin Permaculture in the lives of the makers and it is effective for anthropology. Not only can it animate communities, but defect can be an interesting and compelling object to 'follow' in social science research. I used several theories and concepts from science and technology studies as well as critical theory to look my fieldwork experience. I tried many different approaches that may not have always worked well together. Mainly, I saw that defect worked as a kind of 'ghost,' since I couldn't locate it, that organized people around it, not always for their benefit, but sometimes, in a bigger way, helping the entire community change or transform. As a concept that appears frequently when engaging with technology, defect might be a worthwhile object to pursue not only as a typical 'problem-solver' like an engineer or computer

scientist but as an anthropologist or sociologist. At Manitoulin Permaculture defect motivated action and prompted the recognition of more and critical defects in not just the technology but Manitoulin Permaculture as a whole. Yet, despite the acceleration of the awareness of defects, the organization expands and may one day encompass the island. Although there are probably many iterations of defects and the mobilization of defect, I saw that defect created spaces for competing knowledge claims, the reorientation of energy and attention, for instances of care and for redrawing boundaries.

Manitoulin Island has a long and interesting history that is underexplored. I was merely a passenger on the Island and, though I tried my best, I don' think I scraped the surface of what is going on at either Manitoulin Permaculture or on Manitoulin Island. Defect operated, to me, like a 'magical' thing because it was invisible but it still did things that were more than what could be expected of the things that were themselves seen as defective. To look at defect I used actor-network theory combined with a sociology of translation and technology as a tool for sociological analysis which combined the work of Latour (2005) and Callon (1984, 1987). One of the ways I chose to talk about technology was by borrowing from Winner (1978) who claimed to not be a lexicographer. I chose to look at material technologies and their breakdown because immaterial technologies were hard for me to speak about, whether I noticed them or not. Although I couldn't connect different technologies with certainty, I tried, by looking at what happens with a single technology and different numbers of people who engage with them, to draw my own conclusions about the function of what Hughes called large scale technological systems. I saw the potential for this kind of system in Manitoulin Permaculture. If I were to think of their business as an accountant or appraiser I would guess that its monetary value as a whole is

increasing rapidly, though Rodney and toby explained that it didn't look like it to them, perhaps because they were so far in it that they couldn't see its outside.

As well, I noticed that understanding technology is extremely difficult whether as an art or a science, but, either way, I think trying to think about technology as something non-human with the potential for non-human knowledge is important. Non-human knowledge might be important for our engagement with nonhumans like technology as well as insects or plants. I may not have been able to figure out how to fit non-humans into a meaningful discussion, but I get the sense that non-human knowledge and non-knowledge are essential, as well as fun, pursuits.

In permaculture, things are known and set out in various programs of action. At Manitoulin Permaculture, the ability to change and manipulate matter was prized. I was mostly ineffective at doing that. When I sat with Toby to fix Mr. Chunky and he told me how much he struggled with an organization that depended on volunteers, I realized that the group seems to want, or at least has the successful conditions built in for a certain kind of person to arrive and revolutionize their technology.

Though the greenhouse didn't finish while I was there, it will finish eventually and bring even more changes and defects to the organization. For me, the greenhouse was the main reason to go, but that changed when it was interrupted by the needs of wedding over and over again. It also showed me the priorities of many of the actors that I was interested in by looking at the way they coped with this difficult and complex situation. For example, those who owned businesses were free from the tumult of the wedding preparations as they could go off and work on their business alone. Others were not so lucky.

Finally, the specific technologies that I looked at, like the ping pong table, or the cast-iron pan, were all examples of how defect is mobilized at Manitoulin Permaculture in a way that is

more than what they are designed to do. What's more is that the response to different defects in different situations could be revealing and create novelty in any community because some defects and their circumstances are so novel. Instead of studying working itself, I ended up studying defect so much that my ability to study defect and communicate about it became questionable. If technology can be used as a tool for sociological thinking, then maybe the breakdown of technology, from a social science perspective, might indicate something deeper about the uses of technology in community life.

Future Research

I enjoyed exploring the subjects that fell in the intersection of permaculture, technology and social science as I visited them. There were three aspects of this intersection that I wanted to explore but could not: the 'critique' of computer hardware and software, a handful of portals from my permaculture experience, and the explicit translation of social science to quantum physics and back again.

I suppose that there will be a way to analyze or criticize the social aspects of technological hardware and software, despite the incredible difficulties with seeing them from the point of view of an 'originary heuristic.' It would mean seeing them as if the workings of computer circuits could themselves be criticized, despite being a language among computers, not a language among those who are engaged with them. What if the hardware and the software were the texts? Unlike a text, it is possible to arrive at the "source" of a code. When it comes to material objects, this "source" is completely lost, and its existence is doubtful. However, it is important to try because of the existence of technological change and our capability to participate in it. I also wanted to study industrial mechanics.

As much as it is likely that the 'working' of a technology is decoupled from its 'effects,' as I learned from the makers' translation of defect, it is still possible, though unlikely, that technologies could have political consequences embedded in them at the level of hardware and software, as well as inside the 'logic' of a technological system. This would be an important task for people interested in computer science because some biased algorithms are identified *after* deployment when negative outcomes occur, rather than before. The first place I would look is in archaeology and art history. If Barnet and Stiegler are to be believed, the computer, for example, has a lineage based on 'originary heuristics,' rather than category. I think one likely precursor of the computer is the loom, for example. I was curious about the "code" that underlies the internet, especially the TCP/IP which Lessig showed had an outsized influence on the law of the internet (2008). I'm sure there are plenty of ways to go about critiquing computer technology at this level, but in my review of the literature I did not see anything that succeeded.

I saw a division of labor in permaculture practice at Manitoulin Permaculture that was not obvious from the texts nor expected from my review of the literature. The harder jobs could be forced on the less experienced. I found that humor was the only way to find space to breathe. I noticed that the labor was formally and informally divided according to gender as well, which became more obvious as we prepared for the wedding. The people that I met had fantastic stories and were inspiring people. I wish I could have heard more about their lives. I also had other ideas that were generated by my study of permaculture that were not directly related to permaculture.

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