

**Looking Toward the Seventh Generation:
Transformation through Traditional Ecological Knowledge
and Feminist Science**

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For all of the miles of this journey, and all of those who helped along the way.

~ In every deliberation, we must consider the impact on the seventh generation.

-The Constitution of the Iroquois Nations

~Science in every form, then, is a story of the world.

-Gregory Cajete

CONTENTS

Introduction: Other Ways of Knowing, the Intersections between Feminist and Native Science	1
Section I. Feminist Science	
Chapter 1: What Feminist Science and Theory Teaches Us about Women and Nature	7
Chapter 2: Critiquing Science through Feminist Theory: Understanding Knowledge Production	15
Section II. Native American Example of Sustainability and Traditional Ecological Knowledge	
Chapter 3: No Philosophy Without Corn: How Anishinaabeg Practices Can Maintain a Healthy Economy and Environment	37
Chapter 4: Native Science and Traditional Ecological Knowledge Add to Western Knowledge Practices	54
Chapter 5: The Myth of the Ecological Indian.....	59
Section III.: Native Science and Traditional Ecological Knowledge Is a Living Example of What Feminist Science Proposes. This Is the Path to Sustainability	
Chapter 6: Why Traditional Ecological Knowledge?	63
Chapter 7: Connecting Traditional Ecological Knowledge and Feminist Science	68
Conclusion: A Sustainable Future Includes Science and TEK	74
Bibliography	77

INTRODUCTION

OTHER WAYS OF KNOWING, THE INTERSECTIONS BETWEEN FEMINIST AND NATIVE SCIENCE

Northern Minnesota and Wisconsin are known for their natural beauty, outdoor recreation opportunities and as places that have provided a good life for their inhabitants for centuries. Currently however, these forested landscapes, interwoven with streams and lakes, are the targets for large mining operations due to the rich resources hidden beneath the earth's surface. These landscapes have also been home to protests and campaigns from both Native Americans and environmentalists wishing to protect these lands, as well as industry leaders hoping to open up these lands for economic development. For some people, the ability to bring in the mining industry to provide jobs and economic wealth to these rural and secluded communities is a welcome concept. For others, the idea of ripping open Mother Earth to exploit her resources for economic purposes is beyond comprehension. Both views illustrate how the same physical landscape can be understood differently and can produce different outcomes in land use and land management. These differences in understanding do not come from simply subscribing to one political view over another; rather, they arise from the creation of knowledge and the ways of knowing that differ between the Western and indigenous cultures. It is known that Western ideology has permeated the globe through colonization, and so it is important to ask: whose knowledge has been valued and why? What are the consequences of replacing knowledge practices of one group to promote another's way of thinking? The consequences of limiting knowledge go beyond Minnesota and Wisconsin, as limiting knowledge also limits the solutions of how to live in a sustainable manner.

As environmental issues, such as climate change, overharvesting of resources, and pollution become irreversible, many seek answers by turning to science and technology.

Although science and technology may certainly provide some answers, as a scholar of science and culture, I find that limiting sustainable solutions solely to those developed by Western science is not only irresponsible, but also, arrogant. It is my contention that the answers to living sustainably will come from exploring a variety of knowledge practices, and understanding that the root of these environmental issues has been born from years of replacing indigenous knowledge practices with Western science. To really understand how and why current knowledge practices in Western society are limiting, both theoretical and practical approaches are needed to fully grasp the reality and harm in staying on course with Western knowledge practices alone. For the purpose of this study, I will turn to feminist theory to provide theoretical groundwork and additionally use Native science to exemplify other ways of knowing the natural world.

Chapter One will examine theory through feminist science to deconstruct how knowledge is produced and influenced by Cartesian and patriarchal powers. Feminist scholars point to the origins of the scientific revolution and Cartesian thought as the beginning of the devaluation of women and nature. Scholars such as Carolyn Merchant and Evelyn Fox Keller suggest that the control of nature and women has pushed patriarchal and capitalist practices into institutions and governments throughout the Western world. In examining the history of the scientific revolution through a feminist lens, one can begin to understand how knowledge is created and propagated to help those who are in control, stay in control. Perhaps the revered practice of science may not be the objective and truthful institution it is thought to be. More holistic and relevant solutions to the complex issues facing society today, and feminist theory and science provides one philosophical framework to do such work.

After examining the history of science through a feminist lens, Chapter Two will focus on feminist science, particularly on how science is constructed through a theoretical lens. For this work, the theory of Donna Haraway will introduce the idea that science is a constructed story in the same way that fiction is constructed. Haraway offers her theory through models of primatology, and science fiction. After explaining Haraway's feminist theory relating to science, an exploration of ecofeminism will bridge the gaps among culture, feminism, and the environment. This final section examines feminist theory and connects the knowledge practices of indigenous people (often women) relating to their environment. One scholar in particular, Vandana Shiva, takes concepts from Merchant, Keller and Haraway to connect the relationships among women, culture, class, and the environment.

After examining feminist scholarship, this study moves to more concrete examples of other ways of knowing the natural world by turning to Native science in Chapter Three. Native science is a discipline that focuses on traditional knowledge practices of indigenous people. For the purposes of this study, the focus will be on one subsection of traditional knowledge practices, known as *Traditional Ecological Knowledge* (TEK). Indigenous knowledge practices have nearly been erased through colonization; however, in recent years, indigenous knowledge systems have been a focus of Native and non-Native scholars alike who want to look to alternate ways of knowing the natural world. In incorporating Native knowledge systems through the reintroduction of cultural practices such as language and arts, a new paradigm can be added to current knowledge systems such as Western science. This movement is happening throughout the world; in North America indigenous cultures such as the Anishinaabeg (Ojibwe) are turning back to the practices, stories and language of their ancestors to live a healthier and more sustainable life. This return to indigenous cultural practices is not meant to stay only within tribal

communities; it is meant to be one more knowledge system that can offer solutions and a new way of thinking about how humans interact with the natural world.

To examine Native science and TEK, several scholars point to cultures and practices that provide examples of how TEK can be used to offer a new perspective. The work of Winona LaDuke, specifically related to wild rice and seeds on the White Earth Reservation of Minnesota, offers an example of Midwestern Native practices and activism relating to the environment and culture. I will examine several of LaDuke's initiatives to illustrate how TEK can be incorporated and valued when solving environmental problems. The first of these examples centers on *Manoomin (wild rice): A Gift to the Anishinaabeg from the Creator*. Wild rice has a story, and is of high cultural value for the Anishinaabeg people of the Great Lakes region. The story of wild rice provides insight into cultural knowledge, as well as the reasons why it should be protected. Conflict between Native understandings, values, and use of wild rice, and the University of Minnesota, offers an example of how different knowledge systems understand and value nature differently. A white paper developed between tribes and the University of Minnesota, on how to work toward a common goal, after years of conflict illustrate how common ground can be found between traditional ecological knowledge and scientific knowledge.

The second example of how to incorporate TEK, introduces two of LaDuke's organizations, *The White Earth Land Recovery Project* based in Calaway, Minnesota, and *Honor the Earth*, a national organization, based in Minneapolis. One component of each of these projects relates to food sovereignty and the value in Native farming and seed saving. Documentation by Honor the Earth provides examples of work done using traditional agriculture, including the work of LaDuke on the White Earth Reservation. These examples of how and why traditional seeds and planting methods are better than mass produced seeds and

agriculture present yet another reason why traditional ecological knowledge and cultural practices should be examined to achieve sustainable practices.

After laying the groundwork of real world examples of sustainable initiatives, a more scholarly approach and understanding of Traditional Ecological Knowledge and Native science will be employed. Chapter Four provides information about the discipline and the scholars that focus on TEK and Native science. The definitions, as well as the applications and limitations to using Native science, are presented to introduce another paradigm to understand the world. Beyond this chapter, a counter argument to turning to Native American systems and ideology will be presented to acknowledge the limitations and mythology surrounding Native American sustainability. This counter argument is important to explore as it includes the current debate surrounding *The Ecological Indian*, a text written by Shepard Krech, critiquing the mythology of the inherent ecological wisdom of Native Americans.

The following Chapters, Six and Seven, begin to synthesize how Native science and traditional ecological knowledge are living examples of what feminist science proposes. Chapter six draws from scholars Melissa K. Nelson and Gregory Cajete who argue that all humans need to re-indigenize themselves and decolonize their minds. The products of colonization in Western science are limiting and have produced environmentally harmful views of nature; however, these views of nature can be changed by incorporating TEK into current scientific practices. Neither Cajete nor Nelson wishes to ignore Western science; rather, they hope they can incorporate other ways of knowing because they believe limiting knowledge is harmful to all people. Chapter Seven discusses how Native science and feminist science call for the same thing; breaking down current ways of knowing and incorporating other knowledge systems to help end the harmful effects of colonial and patriarchal systems.

Upon review of both feminist theory and Native science it is clear that continuing on the path paved by colonial powers and institutions will not provide the solutions required to solve the ecological imbalances facing global societies today. Solutions must come from other knowledge systems to be sustainable. Western ecological science should not be ignored, but it should not be the only solution. As it stands today, ecological science, those that involve the natural world, cannot maintain a reductionist and mechanized view of nature fostered by Western science, this field of science must listen to what feminist and Native scholars propose and turn to TEK to answer the questions science cannot. This study serves as an appeal to scholars from both Western science and indigenous cultures to work together and value all systems of knowledge so that truly sustainable solutions may arise from the knowledge of all people.

CHAPTER 1

WHAT FEMINIST SCIENCE AND THEORY TEACHES US ABOUT

WOMEN AND NATURE

The idea of science as anything other than an institution based on objectivity, fact, and pure data might not come easily to those who have been raised and trained in Western education systems and institutions. The truth of the story of modern science is that it is exactly that—a set of stories that has been born out of human invention and institutions. These human systems did—and still do—retain the bias and values of their origin. Though there should be no argument that modern science is a highly respected and valued institution, it is dangerous to operate under the assumption that science is pure, objective, and free from culture and place. One field that provides some insight into the danger of continuing down the path that views science as strictly objective, is feminist science. Viewing social and institutional systems, such as science, through the lens of feminism can provide understanding and value to these systems, not by simply critiquing them, but by strengthening them. For this reason, to examine how science might be strengthened, and thereby help solve environmental problems, one must first examine how science is constructed and used as a knowledge system and the implication of that knowledge system on both women and nature.

Re-examining science and understanding how science influences ways of knowing and understanding the world

Modern science in Western society is considered a highly valued institution that has been tasked to solve problems ranging from food production to curing cancer. The power of science in Western society cannot be ignored as it is promoted and valued in government agendas and in

education systems, from primary schools to institutions of higher education. This however, raises the following questions, what is science and why is it so valued? How has that shaped how one views the world? To answer these questions it is important to look at the origins of science not only from a basic historical lens, but also from a feminist lens as well. In examining the origins of science, it becomes clear how science has shaped society today, and what strengths and flaws science brings to society. What feminism can offer is a much needed critique to this powerful and highly valued system of knowing.

The term “science” is both known as a subject taught in school and as a knowledge system that helps explain the natural world. Science is defined as “the state of knowing: knowledge as distinguished from ignorance or misunderstanding” or “knowledge or a system of knowledge covering general truths or the operation of general laws especially as obtained and tested through scientific method” and in reference to natural science “such knowledge or such a system of knowledge concerned with the physical world and its phenomena” (Science). These basic definitions of science use one word that is key to the critical examination of science, “knowing.” The study of science or the practice of science is about knowing and being free of ignorance and untruths. Knowing, and the ways of knowing are science’s domain; however, it hasn’t always been that way, as one can see with a critical examination of the history of the rise of modern science.

History, like many disciplines, has been examined and critiqued by feminist scholars looking to offer another view, a more complete view, of how we know the world– in this case its history. The relatively new fields of the history of science and the environment have helped create a space for feminist historians interested in explaining the evolution of science, how it was shaped and how science proceeded to shape gender and nature. Through a feminist lens,

historians have reviewed the history of the scientific revolution and its impacts on colonialism, the devaluation of women, and the devaluation of nature. One scholar who has had a particularly large impact on the fields of the history of science and feminist theory is Carolyn Merchant. The groundbreaking work done through Merchant's first book, *The Death of Nature: Women, Ecology and the Scientific Revolution*, published in 1980, set up a conversation that would help scholars from many disciplines understand the complexity, motivations and consequences of the scientific revolution.

Merchant's *Death of Nature* illuminates the scientific revolution through feminist scholarship and allows the dark and painful consequences to be seen not only historically, but also is recognizable in current understandings of science, knowing, and of nature and women. Merchant states, "To write history from a feminist perspective is to turn it upside down—to see social structure from the bottom up and to flip flop mainstream values" (xix). This idea, that one can understand (and perhaps re-order) value systems is something that Merchant focused on while examining the results and impact of the scientific revolution. The outline of *The Death of Nature* takes scholars from the ways of knowing the world prior to Francis Bacon through the current understanding of how nature is viewed in the Western world. Through her examination of primary sources ranging from poetry and artwork to utopian visions and scientific works of scholars from 1484 to 1716, Merchant builds her case that current (Western) understandings of the natural world and the value system attached to this understanding are the result of the birth of modern science and the death of nature.

Merchant describes a distinctive and destructive shift from knowing the earth (or nature) as female, and animate, following more pastoral and Arcadian views, to a machine like, masculine, and mastery view of nature born from the scientific revolution (2). Before the age of science,

humans knew the earth through their cultural practices and beliefs, many of which associated the feminine with nature and the natural world. As Merchant states, “Popular Renaissance literature was filled with hundreds of images associating nature, matter and the earth with the female sex. The earth was alive and considered to be a beneficent, receptive nurturing female” (28). Not only was there imagery that related the feminine to the earth, but a system of belief about nature was centered around the idea that the earth was alive and both male and female components of nature were required for balance and life to carry on. Merchant provides examples of early philosophy that explain reproduction, the hierarchy of plant and animal life, the formation of minerals in the earth, and the production of food and resources that all rely on the idea of a mothering, nurturing earth that is alive and active (10-20).

What is most important in Merchant’s work is how “the death of nature” comes from a change in values that pits economics against nature and women. The value surrounding nature as a living and equal entity posed problems for a changing economy that required domination over nature. Certainly, as Merchant points out, domination paradigms did exist prior to the scientific revolution in Greek philosophy and Christian religion; however, they didn’t take flight and spread until the scientific revolution began to grow (3). The issue of the earth as a nurturing and living entity did not become a problem until changes in the economy would rely on goods such as forest products, minerals and water. To have an economy such as this raised moral questions as actions depleting or using nature’s resources would hurt or harm a living being that was equal to humans and highly valued (3). According to Merchant, “The image of the earth as a living organism and nurturing mother had served as a cultural constraint restricting the actions of human beingsAs long as the earth was alive and sensitive, it could be considered a breach of human ethical behavior to carry out destructive acts against it” (3). What the scientific revolution

allowed was a new way to know and value the earth so that it would no longer be considered unethical behavior to consider the earth as an inanimate resource for human domination.

The scientific revolution arose from the work of many scholars; however, the man who has earned the title, the “father of modern science,” is Francis Bacon. According to Merchant, “Bacon has been eulogized as the originator of the concept of the modern research institute, a philosopher of industrial science. . . and the founder of the inductive method by which all people can verify for themselves the truths of science by the reading of nature’s book” (164). However notable Bacon might be in the scientific world, feminist historians do not quite see or regard Bacon in the same light. Both Merchant and Evelyn Fox Keller, a feminist philosopher of science, agree that Bacon’s new scientific model simply produced a mechanized way to have dominion and power over nature. Merchant points out that Bacon “developed the power of language as political instrument in reducing female nature to a resource for economic production” (165). The product of this new language and politicization of knowledge was the ability to transform the earth into commoditized resources and a waiting object ready to reveal her resources for economic value (Merchant 165). Keller adds more to the conversation in her book *Reflections of Science and Gender*, and states that Bacon viewed science “as power” and regarded scientific knowledge as “salvation” (3). Keller quotes Bacon: “I am come in very truth leading you to Nature with all her children to bind her to your service and make her your slave” (qtd. in Keller 36). What Keller sees is Bacon’s call to refute past science based on the feminine and give birth to a more masculine science, what might be called the birth of modern science. This birth of science not only included the loss of the sacred feminine, but also the beginning of what Bacon hoped for “man,” that he would be master over nature, and science and knowledge was what would help that vision happen (Keller 34).

Francis Bacon's work in creating a vision and value of mastery over nature also provided a shift in how both nature and gender were created and valued. As mechanization and mastery/domination over nature grew, so did the devaluation of nature and women. The once valued and living female earth was transformed into inanimate resources to be exploited and used for man's use and benefit. The result of this shift in thinking was not simply the exploitation of the earth, but also the devaluation of women. Since nature had been constructed as female, in order to exploit the earth, gender had to become constructed in different ways, ways that would harm women. What Keller suggests happened as a product of the scientific revolution, even if indirectly, is that it "did both respond to and provide crucial support for the polarization of gender required by industrial capitalism" (63).

Products of the scientific revolution: Dichotomies and dualisms.

The polarization and politicization of gender has had a critical impact on society, science, and the environment. Keller and other feminist scholars suggest that the scientific revolution brought about dualisms that harm certain factions of society as one half of these dualistic relationships often suffer. Examples of these dualisms offered by Keller include male-female, culture-nature, private-public, facts-feelings, knower-knowable, animate-inanimate, and objective-subjective (70). For Keller, the examination of these dichotomies is of much importance; she states, "The most immediate issue for a feminist perspective on the natural sciences is the deeply rooted popular mythology that casts objectivity, reason and mind as male, and subjectivity, feeling and nature as female" (6-7). As Keller suggests, the construction of these dichotomies is not just a way to structure the world to help explain it, but it is also a way to create values on both sides of the dichotomist relationship. Feminist scholars suggest that one side of these polarized relationship is highly valued in Western, patriarchal society at the expense

of the other. For example, in today's economy the idea of private land and land ownership is highly valued, while public land or communal land use is often viewed as less valuable. In reviewing these dualisms, a pattern is revealed about what is valued and what sides of the relationship are related to each other to keep the current economic machine alive. Concepts included on one side of the dichotomy— male, culture, private, facts, knower, animate and objective, while on the other is female, nature, public, feelings, knowable, inanimate, and subjective, and according to scholars such as Keller, Merchant and Haraway, this is done by design. As Merchant explains in her chapter, "Nature as Disorder," "Nature-culture dualism is a key factor in Western civilization's advance at the expense of nature," and if we are to look at America as an example, the American movement west was also made possible by this dichotomy (143-44).

In understanding how we value and use nature, it is critical to grasp how connected these dichotomies are to each other— most importantly, male-female and culture-nature. The relationship between these dichotomies is a critical component of much of the scholarly work in feminist science as it explores the construction and value systems associated with gender. Merchant discusses the death of nature through these dualisms stating, "living animate nature died, while dead inanimate money was endowed with life" (288). She goes on to say that it wasn't just nature that was harmed in this process, but those situated on the same side as nature: "Nature, women, blacks and wage laborers were set on a path toward a new status as 'natural' and human resources for the modern world system" (288). This foundation of understanding social dichotomies is a key component to further feminist analysis of science and its impact on nature, women and indigenous cultures.

One feminist scholar who has taken the idea of dichotomies even further is Donna Haraway, who goes beyond the idea of dichotomy and dualisms to introduce readers to the blended ideas of dichotomies. These blended notions take both sides of a dichotomist relationship and put them together to form a new understanding that does not pit one against another. Haraway uses the term “naturecultures” to challenge these dichotomist relationships. The blending of nature/culture creates space to rethink how we understand both nature and culture. Haraway is credited with introducing this revolutionary way of thinking that has had an impact on understanding how knowledge and science is produced. In *Primate Visions: Gender, Race, and Nature in the World of Modern Science*, a voluminous text published in 1989, and credited as a breakthrough work in feminist science, Haraway lays out one of her goals in examining the history of science, stating: “I want to find a concept for telling a history of science that does not itself depend on the dualism between active and passive, culture and nature, human and animal, social and natural” (8). Much of the history of science has excluded the creation and social construction surrounding science, and therefore excludes the limitations and flaws of an institution that has shaped the world. Haraway’s call is for scientists and non-scientists alike to see science as “a collection of stories,” and stories that are “always written out of specific historical times and places” (Schneider 28). By understanding science as story, complete with flaws and limitations, current knowledge practices can be critiqued while new knowledge practices can be produced. This vision of a new and more complete understanding of science is required to solve many of the problems global societies face today. Old methods and information will continue to produce the same issues and problems, which is why an examination of the work of Haraway and others is critical to move forward and find more complete ways of knowing.

CHAPTER 2

CRITIQUING SCIENCE THROUGH FEMINIST THEORY:

UNDERSTANDING KNOWLEDGE PRODUCTION

To understand that science has been constructed by a particular group and is simply a collection of stories written in a particular time and place is a powerful position if we are to break down both knowledge and knowledge creation (Haraway 4). Though the ideals of objectivity may be appealing to many in the Western scientific community, they leave gaps in alternate knowledge production and knowledge practices. The tools and theories that Haraway offers can open up more meaningful and inclusive understandings of the world, and may be just what is needed to tackle some of the environmental and social problems facing global society today. For Haraway, the answer to creating a better science is found in understanding that science is a meaning-making practice based on stories and locations. This understanding will be critically important when contrasting the way with how Native American practices, cultures, value systems, knowledge and knowledge production with how scientific knowledge is produced and valued. Much of what she calls for in her work creates a space to understand that knowledge from indigenous cultures through story, practice, art, and other forms is as valuable and created as Western science is. For that examination we can turn to Haraway's work, starting with *Primate Visions: Gender, Race, and Nature in the World of Modern Science*, published in 1989.

Science as a story, dioramas illustrate the creation of knowledge.

Primate Visions begins Haraway's argument that science is a story-making practice that takes place in a time and location shaping the story told. She uses subjects, in this case primates, to illustrate her point and build the case that science may not be quite what it appears, that fact

and fiction are both created by humans. In *Primate Visions*, there is likely no better example of how science has been created than looking at her chapter on museum taxidermy entitled, “Teddy Bear Patriarchy.” Here, Haraway first illustrates science as story and begins to challenge readers to understand the borderlands between nature and culture. Haraway takes readers to the Museum of Natural History, located in New York City, a building she describes as having “many visible faces,” stating, “It is at once a Greek temple, a bank, a scientific research institution, a popular museum, a neoclassical theater. One is entering a space that sacralizes democracy, Protestant Christianity, adventure, science, and commerce” (27). Haraway also points out that this island of knowledge situated near the island of nature, Central Park, is a place where one is given the opportunity to learn about and contrast nature with the culture of the city (26).

Inside the Museum of Natural History, visitors enter new worlds through exhibits to learn about history, nature, and humankind. Upon entering the museum, there is an expectation and assumption that what they are viewing is fact, albeit an artistic representation of nature but one based on science and facts. What is not seen is how much of the display is pieces of nature sewn together to create a story told by white, European patriarchy. Haraway sets the scene in “Teddy Bear Patriarchy” of what visitors see as they enter the Akeley African Hall, created by Carl Akeley in the 1880s and completed in 1936 (26). This exhibit, meant to allow civilized city dwellers to understand nature at its most primal and as an “untouched” place, is the focus of Haraway’s attempt to illustrate the construction of knowledge and to place that knowledge in a time, space and locatedness that is found in any scientific “discovery.” Akeley’s African Hall, full of elephants, gorillas, and other large African mammals, was for Akeley a way to give visitors a “peep-hole into the jungle” (Akeley qtd. in Haraway 29). What Haraway points out, is

that this “peep” into the jungle was a lot more than a view of the species of flora and fauna one might find in Africa. She states that:

. . . each diorama presents itself as a side altar, a stage, an unspoiled garden in nature, a hearth for home and family. As an altar, each diorama tells a part of the story of salvation history; each has its special emblems indicating particular virtues. Above all inviting the visitor to share in its revelation, each tells the truth. Each offers a vision. Each is a window onto knowledge. (29)

Haraway is saying that each diorama is a story; it is a created “nature” to illustrate what the artist envisions or wants to create (29). The difference here is that the intent is not for this to be viewed as created; it is meant to represent the “true nature” of Africa. What viewers walk away with, after seeing carefully selected mammals in poses and compositions that support the idea of the nuclear family, or that one species or sex is dominant over another, is that this view is what nature intended. There is a sense that what they are viewing is organic and ordered, in other words, what is meant to be. One such diorama that conveys this message more than others is the gorilla group.

According to Haraway, the gorilla group stands out against the other dioramas, not simply because it is large in scale, but because of the situatedness of the story it tells (31). What viewers don’t know, as they view a large silverback gorilla located above a group of other gorillas, beating his chest, surrounded by gardens with steaming volcanoes and a lake in the background, is how foundational this scene was to Akeley. This scene represents, the location where he killed his first gorilla, and “felt the enchantment of a perfect garden” (Haraway 31). For him, this representation was more than piecing together of a gorilla group; it was a way to

represent natural man, a version of nature untainted by culture and society. As Haraway states, “Hunter, scientist, and artist all sought the gorilla for his revelation about the nature and future of manhood” (31). To Akeley, the gorilla was an earlier version of man that could offer information about natural man, or man before culture. The gorilla was also a monster, and another version of himself that told a story of mankind, yet had to be destroyed to maintain civility. The diorama, featuring the pre-human primate, served as a reminder of what would become of man if humans did not continue a path of mastery over nature. For Akeley, to illustrate the “nature” of a world without civilization provided scientific evidence that man was right to control nature and work toward a cultured existence where nature was no longer in control.

This example of Akeley and the gorilla diorama is a visual, and in many ways, a literal illustration of how knowledge is produced and perpetuated. As visitors to the exhibition leave each diorama, they are not walking away with knowledge that is simply pure facts laid out before them, but a construction of some truth, created at a point in history by a person very much located in a time, place, body, and society. Haraway wants to make clear that she is not disputing the fact that certain truths, knowledge or meanings exist in the world; rather she believes that “some stories are better than others and can be defended as such” (Schneider 35). She is saying that as science is produced, it should be understood as a story told out of a location and a place. It is valuable to understand who produces knowledge and where knowledge is produced so that it can be examined and challenged. If the story, knowledge, and meaning is strong, if it has been critiqued understanding how the story/knowledge came to be, it can be defended and valued more than if these questions and critiques had not been applied. For the gorilla display presented in “Teddy Bear Patriarchy,” Haraway illustrates Akeley’s bias of presenting mastery over nature by showing what man could have been without culture. This story, presented through diorama,

though compelling, certainly calls into question how truthful Akeley's presentation of gorillas really was.

For Akeley, the importance of creating the best version of the true nature of Africa came with an expectation of perfection; one example in particular illustrates the social influence in knowledge production. The process and collection of the many specimens needed for the African Hall was very important for Akeley, who worked tirelessly to find the ideal or perfect version of each species. Haraway points out that the ideal or typical specimen is something that must be defined by somebody. Haraway questions how Akeley came up with the definition of a typical specimen and points out that this need and instance of finding a typical specimen has been a fundamental problem throughout the history of biology (40). It is here that we get a sense of humor from Haraway about the solution for such a problem, and that is to set one's own standards for finding perfection. For Akeley's African Hall, that meant finding trophy-worthy specimens where the perfect specimen must not only be of the right color, size, and symmetry, but it must also be male (41). Though he would hunt and take females, they could never be perfect specimens. In addition to finding the perfect specimen, he also sought after creating groups that were considered whole. One such example is a photograph and hunt of four elephants that made up a perfect family grouping, which according Haraway, illustrated for Akeley, "nature's biographical unit," a "reproductive group" which, "had the moral and epistemological status of truth-tellers"(41).

This quest for a perfectly typical species is an example of how knowledge and stories are created based on ideals and perceptions of certain sectors of society. In this case, Akeley created dioramas that were representative of his version of perfection and what nature intended—patriarchal and heteronormative representations of nature. This work then re-inscribed and re-

enforced Akeley's opinions onto his exhibits and back into the public sphere where they would live another day, not as a story, but as evidence of science and truth.

The “Nature Movement,” the meanings of nature and culture and man’s place in the world.

Akeley's work was part of a larger movement in the late 1800s and early 1900s, a movement Haraway titles the “Nature Movement” (54). This movement reached its peak as technology was changing civilization, and as monopoly capitalism began to take shape and take hold of the Western world. As Haraway states, “The woes of ‘civilization’ were often blamed on technology— fantasized as ‘the Machine’” (54). The solution for many who viewed technology as the root of the problem was to turn to nature, for “she” represented innocence and was a symbol or representation of the world without technology and without man (54). Haraway introduces readers to this “Nature Movement” to illustrate who used this movement and nature to further certain sectors of society and how the lines between nature and culture are blurred.

Though most would consider technology as created by man and nature as a “place” without technology and man, Haraway suggests that neither is true and that participants in creating, funding, and supporting the American Museum of Natural History used nature and science to help support their capital monopoly through the technology of the museum. In Haraway's view, the museum is a visual technology and the dioramas are “meaning— machines,” all serving the purpose of helping certain sectors of society gain and maintain control. She states, “The owners of the great machines of monopoly capital were, with excellent reason, at the forefront of nature work- because it was one of the means of production of race, gender, and class” (54). The work of “the owners of the great machines” was to turn to what she called

“naked eye science” to help promote a vision of “peace and progress” by buying and promoting a renewed vision of “jungle peace” (54).

At this period of history, science was at the root of several charges to help “strengthen” society through the work of the American Museum of Natural History. The museum used “naked eye science” through exhibits, the promotion of conservation and eugenics to fight what Haraway terms “decadence” that threatened the body politic. This decadence threatened the roles of race, class and gender in society that had kept white, wealthy, Western men in power. Examples of the decadence that threatened society included middle class women earning an education, the influx of non-white immigrants with high birth rates, feminism, labor strikes, and sexual disease (Haraway notes that many things were included as sexual diseases including “leprosy, masturbation, and Charlotte Perkins Gillman’s’ need to write”). The argument made to deal with this decadence was that these diseases and disorders of society were threatening the limited energy in society and productivity. The task at hand for those in the museum was to protect public health by addressing these social threats to manhood through their work in exhibits, conservation and eugenics (55). Haraway sums up the impact of these three foci by saying that, “exhibition was a practice to produce permanence, to arrest decay. Eugenics was a movement to preserve hereditary stock, to assure racial purity, to prevent race suicide. Conservation was a policy to preserve resources, not only for industry, but also for moral formation, for the achievement of manhood” (55). Through this work, the ideals of imperialism, capitalism and the continued predominance of white culture could be maintained and even made to flourish.

In reviewing the motivations and actions of those involved in the American Museum of Natural History and certainly the work of others involved in the “Nature Movement,” it is clear

that science did not operate out of fact and truth in any objective way; rather it had funding, and social agency by those in power. This paradigmatic example allows one to see that the product of this science is that there has been a continued effort to separate culture and nature to “know” the world and man’s place in the world. The issue of this paradigm is that nature and culture can never truly be separate and science can never truly be objective. This idea is at the core of Haraway’s argument in *Primate Visions*. Haraway aims to convince scientists and non-scientists alike that the work of both natural and human sciences are “inextricably *within* the process that give them birth.” In other words, no knowledge or meaning making work can be done outside of the system in which that object, subject and researcher “lives” (12). According to Haraway, the challenge for many scientists is accepting the idea that we should question “what stakes, methods, and kinds of authority are involved in natural scientific accounts, how they differ, for example from religion or ethnography,” and that “the natural sciences are culturally and historically specific” (12). Haraway calls readers to understand that there is no logic in asking or believing in something that is as impossible as finding “a form of authority that escapes the web of highly productive cultural fields that make the accounts possible in the first place” (12).

Haraway believes the real danger in not understanding that science is located and in continuing to believe in the fiction of “the detached eye of objective science” is the reductive and invalidating products of that science; producing scientific knowledge that is in effect incomplete. In believing in the fiction of a truly objective science, scientists are operating in a fiction that is intended to leave out and hide “how the natural sciences really work” (13). What Haraway claims is that by understanding the limits and ideological influences in the natural sciences, the products, understanding and knowledge gained is actually more productive than if we ignore or live in the fiction of objectivity. Her call to action is to realize that science and the scientist are

situated or located, and that cannot be ignored if the goal is to have a fuller and more complete understanding of the subjects, objects, and processes studied.

Haraway understands that her argument has consequences and challenges; however she addresses them up front and succinctly, furthering her call to debunk the myth of objective science. One consequence she points out is that natural sciences will be

legitimately subject to criticism on the level of ‘values’, not just ‘facts’. They are subject to cultural and political evaluation, ‘internally’, not just ‘externally’. But the evaluation is also implicated, bound, full of interests and stakes, part of the field of practices that make meanings for real people accounting for situated lives, including highly structured things called scientific observations. (13)

The idea, that the natural sciences would be subject to critique on a personal, internal, and values level is not widely accepted or welcomed by those in the scientific community who wish to maintain the ideals of the scientific method, objectivity and knowledge production of facts. For scientists, a critique at this level often means diminishing their work, bringing in questions to the facts and knowledge called for in and highly valued in scientific research. Haraway addresses this concern by stating that these “critiques cannot leap over the crafted standards for producing credible accounts in the natural sciences because neither the critiques, nor the object of their discourse have any place to stand ‘outside’ to legitimate such an arrogant overview” (13).

Further, she makes it clear that there is a difference in understanding the “story-ladenness” of science and “standing nowhere talking about nothing but one’s biases” (13). She is calling for an understanding that science is a story-making process, and that fact and fiction are both created

and located; she is not asking for scientists to spend all of their energy trying to “stand nowhere and talk about nothing but one’s biases” (13).

The challenge for scholars to make this leap into understanding that science is a situated and located practice and product, is the deeply embedded value and call for objective and analytical practices within science. The root of this ideal of analytical science comes from Aristotle and “the transformative history of ‘White Capitalist Patriarchy’ ...that turns everything into a resource for appropriation” (Haraway 13). The product of this thinking gives value to those who become the knowers and a different sort of value to the object of study. Haraway understands that “White Capitalist Patriarchy” drives the action to make “the world” an object of study, something objectified and without any agency of its own (13). As the world has become objectified and without agency, it becomes merely matter to be organized and understood by the human knower. This action has consequences in the knowledge produced, who the human knower is and the “facts” and “truths” discovered through this process.

One product of understanding the world as matter, intended to be defined by a human knower, is the creation of nature and gender. Haraway wants to be clear that nature and gender are created and are part of binary thinking that defines and shapes how science and society are used to dominate some and give power to others. She states, “Nature is only the raw material of culture, appropriated, preserved, enslaved, exalted, or otherwise made flexible for disposal by culture in the logic of capitalist colonialism. Similarly, sex is only the matter to the act of gender; the productionist logic seems inescapable in traditions of western binarisms” (13). What Haraway is articulating is the creation of both sides of the binary, such as nature/culture and sex/gender; however, one side tends to be viewed as more concrete and stable, in this case nature and sex, while the other tends to be viewed as created from other matter. The danger in following

binary thinking and ignoring the many spaces between these poles, is that one side becomes a tool to define the other, with potentially dangerous consequences. If nature is the raw material of culture, then how one views nature (based on situatedness in the culture) will likely be a reflection of his or her culture, or a definition of nature to help support or validate cultural practices, views or values.

This idea is challenging to many who have learned to view nature through a scientific lens. This scientific view is not only reserved for scientists, but also for those brought up in a culture of objectivity and science education. The product of this way of thinking is that many do not challenge their assumptions of what nature is, or what culture is. Western thinking continues to reinforce binary thinking to keep the wheels of Western, patriarchal and capitalist agendas moving. This however, cannot be maintained as these ideologies have created the environmental problems facing global societies today. It will be important to understand the feminist principles presented by Merchant, Keller and Haraway to challenge current thoughts and look to the places in between binary thinking. It is in this intersection of nature and culture, or borderlands of these binaries, that give insight and more knowledge than if one were to focus on nature and culture as separate and opposite. It is in this place that we must start looking for answers through science, culture and feminism if we are to solve the problems that white, capitalist, patriarchy has produced in recent centuries.

Ecofeminism and Reductionist Science

Feminism offers many perspectives to critique, challenge and strengthen science; one branch of feminism that specifically focuses on issues relating to ecology and the environment is ecofeminism. According to Karen Warren, the editor of *Ecofeminism*, “Ecological feminism is

the position that there are important connections between how one treats women, people of color, and the underclass on one hand and how one treats the nonhuman natural environment on the other”(xi). The range of topics covered by ecofeminism span from connecting environmental injustices to race, class and gender, to using feminism and feminist science to understand how women and the earth are connected and degraded by the same systems of oppression. The goals of ecofeminism are to bring attention to the intersections between the environment and women to help stop the oppression and devaluation of women and the earth. This relatively new segment of feminism, born from the ecology and feminist movements of the 1970s, brings in another lens with which to examine science and its limitations.

One scholar who specifically examines the product and processes of science through a feminist lens, critiquing reductionist science and white capitalist patriarchy, is Vandana Shiva. Shiva, a physicist, a philosopher, and a feminist, is considered a leader in ecofeminism and in the critique of sciences. What helps Shiva gain credibility as an ecofeminist is not only her background as a physicist, but also her origins as an Indian woman, as ecofeminism often examines the intersection of race, class and social structures related to the environment. Shiva’s contribution to ecofeminism has been vast and thorough, however two main points dominate much of her work: a strong critique of white capitalist patriarchy and the dangers of patenting and commoditizing life itself.

The groundbreaking work of Merchant’s *Death of Nature* allowed for ecofeminism and scholars such as Shiva to build upon and expand the connection between the devaluation of the earth and women through the scientific revolution. In *Ecofeminism*, a text by Vandana Shiva and Maria Mies, published in 1997, the principles of Merchant’s work are evident as Shiva and Mies point out that the once celebrated “truth” that humans were dependent on Mother Earth, was

quickly replaced by the contrary ideals of “Francis Bacon and his followers, the fathers of modern science and technology” (18). In *Ecofeminism*, Shiva and Mies begin to explore the result of this shift from the celebrated Mother Earth to the scientific revolution, the birth of capitalist patriarchy from the death of nature. According to Shiva and Mies, a world system of capitalist patriarchy has been born that asserts the North on the South and has damaging impacts on the environment and women alike. Mies is from Germany and represents the North or Western ideals, while Shiva is from India and represents the South or Eastern ideals. They state “This system emerged, is built upon and maintains itself through colonization of women and of ‘foreign’ peoples and their lands; and of nature, which it is gradually destroying” (2). For Shiva and Mies, there is no question that nature and women are innately connected and that women are also closer to the earth, although they say that “women in the South are nearer to it than urban, middle class women and men of the North” (20).

Shiva’s focus on the connection between women of color and/or women of the South and the environment stems from her belief that reductionist science benefits and supports white, colonial, patriarchal, and capitalist endeavors. Shiva maintains that modern science purports to be an objective, value-free and logic-based system that sets out to explain “almost everything” (“Reductionism and Regeneration” 22). This objective science is reductionist and mechanical and it projects Western values (Shiva, “Reductionism and Regeneration” 22). What feminists see from this product of the fifteenth and seventeenth century is “a Western, male orientated and patriarchal projection which necessarily entailed the subjugation of both nature and women” (Shiva, “Reductionism and Regeneration” 22). By necessity, in order for Western science to be successful, this new reductionist view of nature and a hierarchical order of both nature and women were required. What Shiva and other scholars such as Merchant and Keller want to

convey, is the direct and pointed way in which women and nature are subjugated and dominated by men and culture and technology. The more that nature is turned into a machine, the more it can be controlled and commoditized, and because of the correlation between women and nature, this also means that women can be controlled and commoditized. This scientific view of the world has had dangerous consequences for both nature and women, and this is exactly what Shiva wants to bring attention to.

As mechanized and reductionist science took over, it replaced prior knowledge systems and also began to change the value of that knowledge. More systematic and specialized knowledge born from the scientific method and the scientific revolution became the only knowledge of value. According to Shiva, the domination of nature and women also came with “an arbitrary barrier between ‘knowledge’ (the specialist) and ‘ignorance’ (the non-specialist). This barrier operates effectively to exclude from the scientific domain consideration of certain vital questions relating to the subject matter of science, or certain forms of non-specialist knowledge” (“Reductionism and Regeneration” 22). In addition, specialized knowledge practices became institutionalized, which by the nature of any institution, meant that an agenda was often attached to the object or subject studied. Institutions of medicine, religion, and government all turned to specialized knowledge to help maintain or gain power. Those who practiced specialized knowledge were also those who fit the model of the institution, meaning male, Christian, and often white or European. What was lost in this time was the non-specialist knowledge that had thrived for centuries, the knowledge of indigenous people, both men and women.

What is of particular concern in devaluing non-specialist knowledge is the amount of knowledge and kind of knowledge lost that relates to how humans know nature. Reductionist

science has done two things according to Shiva. First, it reduced the amount of knowledge or “capacity” of knowledge relating to nature by excluding non-specialists and “other ways of knowing” born from non-specialist knowledge practices. Second, by changing nature into inanimate, and “fragmented matter” (“Reductionism and Regeneration” 23). The product of this reductionist science is not only the loss of non-specialist knowledge and ways of knowing but also the redefining of nature itself. What Shiva argues is that reductionism turns nature into parts of a machine, where all systems are more or less composed of the same discrete and atomic makeup. This mechanical understanding of nature has had an impact on how society views nature, in essence a new relationship and understanding of nature is born out of reductionist science (“Reductionism and Regeneration” 23). Because of these new understandings and definitions, greater society is altered and has had an impact on the interactions and value systems between humans and nature. The alternative to mechanized understandings of the world are found in a more organic worldview where, rather than the “divisibility and manipulability” found in mechanized views of nature, there is “interdependence and reciprocity” (Shiva, “Reductionism and Regeneration” 23). The more organic metaphors and world-views are what have been replaced and devalued as the rise of reductionist science has grown.

What often allows this reductionist science is not simply the mythology surrounding objectivity and logic, but also the systems and institutions science serves. One of the main benefactors of reductionist science is capitalism and commerce. Shiva claims that in this reductionist worldview, industry, capitalism, technology and the economy are all a part of the same process and system (“Reductionism and Regeneration” 24). As these sectors of society look to fragment and reduce their industry into parts of a larger system they also work to break down complex ecosystems into smaller parts. The goal of this work is to further manipulate and

control ecosystems for higher profits. She provides an example of this process and how strongly related the economy or capitalist agenda is to the “management” or view of complex ecosystems. She turns to a symbolic ecosystem, the forest, as an example of how a complex system is broken down, manipulated and controlled through scientific forestry.

The forest, like many other ecosystems has been subject to the process of commercialism and reductionist science. Shiva claims that reductionist science breaks down the forest into “a single-function, single component,” in this case, commercial wood, pulp, and fibre (“Reductionism and Regeneration” 24-25). Not only is the holistic nature of the forest ignored, but it is also manipulated to help achieve the most productivity for the wood and paper industry. Because of the value given to trees alone, scientific forestry looks to control and manipulate the forest in a way that reduces diversity with the goal of increasing production of forest products. Although it is likely that there is much scientific understanding of a forest ecosystem as a larger whole, the value system of capitalism rewards a reductionist view of the forest, allowing nature to be viewed and valued as a natural resource for capitalist gain. The result of this view of nature is what Shiva describes as “the root of the growing ecological crisis, because it entails a transformation of nature that destroys its organic processes and rhythms and regenerative capacities” (“Reductionism and Regeneration” 25).

From this understanding of how we know nature, we find that some knowledge is revered at its expense, while devaluing the knowledge of others. This idea of whose knowledge is valued, what knowledge is produced, and what systems keep certain knowledge practices and systems in control is certainly a key question of feminist science. As Shiva examines the created boundaries between knowledge and ignorance, and the boundaries between what is valued and not valued, she brings attention to the idea that mechanistic values destroy systems considered to have no

value (“Reductionism and Regeneration” 25). The result of this reductionist, mechanical science is to use science and technology to continue to understand nature in this way to control and profit using the secrets of nature and science. For Shiva, this has happened through colonization of lands and people in the past and it continues to happen today in one of the last frontiers of colonization, women’s bodies and seeds. These are the sites that she considers to be places of “regenerative power,” and where much of the work of colonization is occurring today (“Reductionism and Regeneration” 25).

According to Shiva, the goal of colonizing forces of patriarchy and capitalism is to have control over matter, nature, and “the world” for profit and production. These last frontiers of colonization, women’s bodies and seeds, are now being targeted by advances in technology with the intent to turn them into “ ‘passive’ sites” that can be controlled and known by experts in order to give them value (“Reductionism and Regeneration” 25). Just as land that was once shared as a communal resource for all to know, use, and care for and was turned into owned properties and commoditized, so now are the very seeds that sow that land. As a product of the scientific revolution, scientific agriculture, and industrial agriculture have taken hold of much of the food production across the globe. Included in this scientific agriculture is the ownership, patenting and scientific study of seeds. This work, according to Shiva is just another frontier for colonization, and the colonization of seeds and their genetic make-up have become a focus for ecofeminists.

Shiva examines the role of women and others from the ‘South’, and their knowledge of seeds. The concern is that the more that knowledge of seeds is valued only by science and no longer by indigenous peoples (or as classified by the scientific community as “ignorant” or non-specialists), the less sustainable and healthy the planet’s future becomes. Shiva states

The scientific revolution was to have rolled back the boundaries of ignorance. Instead, a tradition of knowledge that has viewed nature and women only as a resource, and nature's limits as constraints, has created unprecedented man-made ignorance— an ignorance which is becoming a new source of threat to life on this planet. Colonization of the seed Profits and power become intimately linked to invasion into all biological organisms. (“Reductionism and Regeneration” 29)

The concerns of colonizing seeds and genetic materials lies in the power of owning life itself and the myth that biological processes can be overlooked, and controlled. This idea that humans can control, dominate and reduce nature down to corporate, commercial and patented materials is disturbing because of the devastating environmental impact of such actions.

The process of reductionist science in seed production is both a visual and symbolic model to help understand the danger of using reductionist science to ecology as a whole. As a symbol, the seed represents life at its most primitive and basic level. A seed encompasses genetic material and life that is just waiting for nature to allow it to grow, thrive, and regenerate new life from the plants and flowers it produces. There may be no better symbol for life and creation than the seed, yet it is this symbol, this primal source of life that is under the threat of colonization within a capitalist economy. As corporate science and genetic technology advance, a science of hybridization and genetic manipulation takes over the role of seed producer and knower or owner of life (in the seed form). The seed is transformed from a self-regenerating entity and reduced to its components of genes and germ plasm. This “reductive” view of seeds is what Shiva calls the commoditized seed, a seed that is “ecologically crippled” (“Reductionism and Regeneration” 30).

This “ecologically crippled” seed is defined as such for two reasons according to Shiva. To start, the seed, manufactured by industry is not capable of reproducing itself, something that is of great ecological importance and by the very nature of the word seed, tends to go against nature. In essence, this seed has been transformed into a non-renewable resource, an idea contrary to the value that seeds held for centuries (Shiva, “Reductionism and Regeneration” 30). The second reason these “reductive” seeds are ecologically unsound is that a modified seed cannot “produce by itself.” These seeds are created to need outside sources and inputs in order to grow and thrive. The elements needed by these modified seeds are often chemical compounds created by the same industry that controls the seed and seed production (Shiva, “Reductionism and Regeneration” 30). The result of this new controlled and commoditized seed bank is an unsustainable and displaced source of life that can no longer be accessed by certain sectors of society, in essence adding another barrier between humanity and nature.

Beyond the unsound ecological practice of corporate seeds, there are social implications and knowledge losses that have critical consequences on the sustainability of life on the planet. As an ecofeminist, Shiva makes the connection between the corporatization of seeds to the displacement of local knowledge and the diversity of life (Shiva, “Reductionism and Regeneration” 30). In *Biopiracy: The Plunder of Nature and Knowledge*, published in the same year as her text, *Ecofeminsim*, she digs more deeply into the subject of biotechnology, explaining how, not only is it unsustainable and harmful to the planet, but also, that it is a modern version of piracy. The history of colonization includes the taking of lands that were viewed by Western interests as unused and wasted by Native peoples. Colonizers justified their actions by claiming that the lands once held by indigenous people would be improved and more productive if they were to take ownership and control over the resources held on that land. This colonizing

justification has now moved into the realm of seeds and plants. According to Shiva, “The same logic is now used to appropriate biodiversity from the original owner and innovators by defining their seeds, medicinal plants, and medical knowledge as nature, as non-science, and treating the tools of genetic engineering as the yardstick of ‘improvement’” (*Biopiracy* 4). Essentially, colonizing forces defined indigenous knowledge as nature and non-science, and gave “real” meaning to seeds and their value with the introduction of modern science, in this case genetics. The product of this process effectively and systematically erased prior knowledge of seeds, their value, and ultimately, sustainability.

In discussing biopiracy, Shiva asserts that patents and genetic engineering are the new colonizing forces shaping and changing how we know life and seeds. In addition, she claims that by resisting biopiracy, we are not only helping save life itself, but also the future of non-Western knowledge, traditions and ways of knowing nature (*Biopiracy* 5). This understanding of how these new colonizing forces both harm culture (knowledge, people, traditions) and nature (the environment, land, water, food supply) is of critical importance when examining sustainability.

The process of the colonization of life, according to Shiva, has a distinct component of privatization and displacement of less specialized or common knowledge. The colonization of life meant that knowledge found in the commons, held by all members of a community, was replaced by knowledge owned and operated by institutions of higher education and industry. The biodiversity found in nature has always been a product of nature itself, and has been considered a common resource. However, as agriculture and other science-based institutions transition from common resources to private ownership, biodiversity has too become part of what is owned by science and out of commons. This means that biodiversity can be defined by those in power in order to serve those institutions. The institution of agriculture is an illustrative example of this

process, especially when we examine the knowledge of seeds. Seeds and the knowledge surrounding their value, use, and breeding were once in the domain of the commons; they were exchanged as gifts, distributed to help the earth and people alike (Shiva, *Biopiracy* 68). Seed production today is the domain of industry looking to gain a profit by selling their product, and it is no longer the property of the inhabitants of the land, it is in the hands of corporations.

The result of this shift in ownership of seeds is disturbing in many ways. Shiva knows that this loss in common knowledge of biodiversity must be reversed to change the path of unsustainable practices and futures that face us all. The solution Shiva presents is clear. For science to really help solve problems relating to the environment, it must recognize and treat indigenous “knowledge systems as futuristic, not primitive” (*Biopiracy* 77). One core source of knowledge that has, until recently, been valued and successful in conserving biodiversity and maintaining a healthy planet, has come from women of local communities. This knowledge, “needs to be strengthened if the foundations of biodiversity conservation are to be strong and deep” (*Biopiracy* 78). In addition to changing how science and greater society view these knowledge systems, economic systems must also be examined, as market values should not come before all other values such as sustenance and cultural meanings (*Biopiracy* 77).

The combined approach to value other sources of knowledge and to rethink the value of the economy over all else is at its core an ecofeminist position meant to challenge scientific knowledge practices with a goal of achieving sustainable practices and a sustainable future. The challenge of examining economic benefits over ecological and cultural sustainability is an immense issue societies across the globe face today. With poverty, health crises and violence growing due to economic hardship, it seems insensitive not to work to boost struggling economies at any cost. This view, however, seems short sighted, and in review of the work of

Shiva and other feminist scholars, seems limited. The answer is not found in recreating the same systems that caused poverty in the first place. Focusing only on the economic values using the tools of capitalism alone cannot be the only solution. This ideology has been the method of displacing people from knowledge practices and the land that once supported them and is not sustainable. Though economic factors cannot and should not be ignored, should a review of other models, even if they seem Arcadian, not be explored to create new economic systems? Using the calls of ecofeminists such as Shiva raises new questions, can this be done? Is this way of thinking possible? Are there examples of communities shaping the ecological landscapes by valuing indigenous knowledge and rethinking economics? The answer to many of these questions is yes, and one scholar and activist who provides an example of living sustainably by recognizing indigenous knowledge and redefining value systems is Winona LaDuke.

CHAPTER 3

NO PHILOSOPHY WITHOUT CORN: HOW ANISHINAABEG PRACTICES CAN MAINTAIN A HEALTHY ECONOMY AND ENVIRONMENT.

Winona LaDuke, a graduate of Harvard and Antioch Universities, should be able to draw a lot of wisdom from her education when speaking about economics, philosophy, and environmental issues. While many outside of LaDuke's community might see her formal education as the key to solving economic, social and environmental problems, her Native roots ground her to the Traditional Ecological Knowledge that has made an impact on her work in rural economics and the environment. Traditional Ecological knowledge, or TEK, is defined as the knowledge that "holds the memories, observations, stories, understandings, insights, and practices for how to follow the natural laws of a particular place" (Nelson, "Lighting the Sun of Our Future" 12). Understanding TEK came into play in LaDuke's life when her father told her, "Winona, you are a really smart young woman, but I don't want to hear your philosophy if you can't grow corn" (LaDuke, Intersections Series). This wisdom from her father helped her begin work on examining Traditional Ecological Knowledge, particularly related to seeds and food sovereignty to help tackle issues surrounding sustainability.

Winona LaDuke is an Anishinaabeg woman from North Central Minnesota's White Earth Reservation. She has been recognized as a leader in environmental and women's movements and has been a community organizer and activist for the Anishinaabeg peoples of her reservation. Much of LaDuke's work has focused on the economics surrounding environmental destruction and how economically unstable energy and food production are within Western paradigms. The question LaDuke proposes is, "How can we stick around for another 1,000 years or so?"

(LaDuke, Intersection Series). To find solutions for this question, she has turned to the knowledge of her people both through stories and teachings of her ancestors as well as the advice from her father. Two projects that LaDuke has worked on in the past twenty years relate both to the environment and to her culture, and set out to restore both— fighting the cultivation and patenting of wild rice, and starting a seed bank of Native corn and squash.

Manoomin: Wild Rice, A Gift to the Anishinaabeg from the Creator

Anishinaabeg stories pass knowledge, history, laws, values and culture from generation to generation to aid and guide Anishinaabeg people to understand and make sense of the world (Doerfler 1). For LaDuke, the story of wild rice provides an understanding of the essential grain of the Anishinaabeg people that science or economics cannot understand. According to LaDuke, the oral history of the Anishinaabeg people recounts that, *manoomin*, or wild rice as much of the world knows it, was a gift from the Creator. The story, provided in LaDuke's text, *Recovering the Sacred*, provides insight into the history and culture of this essential grain:

One evening, NanaBoozhoo returned from hunting, but he had no game. As he came towards his fire, he saw a duck sitting on the edge of his kettle of boiling water. After the duck flew away, Nanaboozhoo looked into the kettle and found wild rice floating upon the water, but he did not know what it was. He ate his supper from the kettle, and it was the best soup he had ever tasted. So he followed in the direction the duck had taken and came to a lake full of manoomin. He saw all kinds of duck and geese and mudhens, and all the other water birds eating the grain. After that, when Nanaboozhoo did not kill a deer, he knew where to find food to eat. (LaDuke 168)

This story conveys the importance of this rice to the Anishinaabeg people, as it is not only an essential nutrient, but also is key to the history of their people. LaDuke explains that “in the earliest teachings of the Anishinaabeg history, there is a reference to wild rice, known as the food that grows on the water, the food the ancestors were told to find. The presence of this food, we were told, would signal the end of our migration from the eastern seaboard” (*Recovering the Sacred* 168).

For LaDuke, this story conveys the importance of this grain culturally, spiritually and historically, but what LaDuke also wants others to understand is how important this grain is to the community’s sustenance and health. Wild rice contains many important nutrients such as vitamins, fiber and amino acids, and has been a solid and consistent food source in times of hardship. In addition, it can be a source of income, although the main goal of those who rice is to provide food for their family and community (*Recovering the Sacred* 168-69).

Though the connection between understanding the origins of wild rice for the Anishinaabeg people and examining knowledge production and sustainability might seem unclear, LaDuke claims that understanding the cultural and historical significance of wild rice allows insight into a much larger global debate about “biodiversity, culture and globalization” (*Recovering the Sacred* 169). She states that, “it is this profound and historic relationship that is remembered in the wild rice harvest on the White Earth and other reservations– a food that is uniquely ours, a food used in our daily lives, our ceremonies, and our thanksgiving feasts” (*Recovering the Sacred* 169). For this reason, it is important to turn to LaDuke’s work and research in fighting to keep Anishinaabeg understanding of manoomin central, as outside economic, scientific, and industrial agriculture change the meaning and understanding of wild rice on a global scale.

The Anishinaabeg people have ensured the right to harvest wild rice by including the right to wild rice in every treaty signed. Despite treaty agreements signed in 1837, 1854 and 1855 (Andow 4), outsiders such as the State of Minnesota and the federal government have also valued wild rice, not for its nutrients, history, or cultural value, but for its economic value (LaDuke, *Recovering the Sacred* 170). As these outside agencies began to see the value in wild rice, they also began to study wild rice production and processing, as well as how the Ojibwe people were progressing towards becoming more “civilized” people. According to LaDuke, the University of Minnesota (U of M) began sending out anthropologists in 1906 to get a better understanding of the Ojibwe people. LaDuke highlights the notes from researcher Albert Jenkes, from the University of Minnesota who stated that he was dismayed by the “underproduction of the wild rice harvest,” and referred to the Anishinaabeg people as “primitive Indians” who “do not take production very seriously” as they “spend so much time feasting and dancing every day and night during the time they are here for the purpose of gathering” (qtd. in *Recovering the Sacred* 170). Though this account is dated, it does illustrate the view of outsiders who see the traditions, process and culture of indigenous people as primitive. The repercussions of this viewpoint resulted in reports focused on the “primitive and uncivilized Indians,” where the recommendation was to remove Native Americans from the land and restore the wealth of the land to those who could make something productive out these landscapes (*Recovering the Sacred* 171). These efforts in the early 1900s were the continued attempts to colonize indigenous peoples and gain power and control over the land.

As agencies such as the State of Minnesota, the University of Minnesota, and agricultural industries began to understand the monetary value of wild rice, those same colonizing forces that once forced the Anishinaabeg people to reservation lands, turned their attention to researching,

colonizing and controlling the production and harvest of wild rice. In the 1950s, the state began their efforts to domesticate wild rice and turn it into a crop that could be controlled and industrialized. The goal of the “industrialization of wild rice” was to remove environmental factors that inhibit cultivation of rice by combines, increasing productivity and profit. The issue with this view of wild rice is that, according to LaDuke, wild rice comes from a diverse array of plants varying in size and shape that are found in lakes and streams alike throughout the Great Lakes region. The idea of cultivating a plant that is dependent on the weather and the environmental conditions it lives in (streams and lakebeds), is absurd to the Anishinaabeg people, as it would require severe modifications to the planting, fertilizing, harvesting, and even the creation of the seed itself (*Recovering the Sacred* 171).

Cultivating and harvesting “wild” rice through industrial means requires big changes not only to the environment, but also to the wild rice itself. Because of these modifications the products of cultivated “wild” rice are harmful to the environments where rice is grown. To start, the seeds planted in rice paddies must be of the same species, greatly reducing biodiversity. In addition, because cultivated rice is grown in paddies, chemicals and fertilizers must replace the nutrients and controls that would naturally be found in lakes and streams. And lastly, the creation of paddies requires the use of water as rice paddies are flooded and then drained for combines to harvest the rice in a “timely” manner (LaDuke, *Recovering the Sacred* 171). The end result is a product that can most certainly not be the same as the manoomin harvested on Ice Cracking Lake on Minnesota’s White Earth Reservation by Spud Fineday, a ricer for many years. Rather, what you have is a “wild” rice unrecognizable to those who have been ricing since they were young. (LaDuke, *Recovering the Sacred* 167).

Industrialization of “wild” rice has had devastating consequences on the environment, in addition, industrialized harvest of “wild” rice also have economic consequences. With the production of wild rice thriving on an industrial scale by the 1970s, globalization effects began to take place. It didn’t take long before the cultivated wild rice was being produced across the country, with California leading the nation in wild rice production. Companies such as Uncle Ben’s, Jolly Green Giant, and General Foods began producing a version of the rice altered for their market. The byproduct of this new mass-produced rice was a loss of the market for traditionally-grown lake rice. The traditionally harvested lake rice could not compete economically as the process of industrialization and globalization changed the definition of “wild” rice by flooding the markets with “industrialized wild rice” (LaDuke, *Recovering the Sacred* 171-72).

Another result of the increased interest in higher production of wild rice was the investment and interest of the University of Minnesota, a land grant institution, to create a domesticated version of wild rice and map the genome of wild rice (LaDuke, *Recovering the Sacred* 172). The impacts of this increased interest were heavily felt on the White Earth Reservation, as well as on other Anishinaabeg lands that rely upon manoomin for sustenance. Joe LaGarde, a White Earth Reservation ricer and historian, stated that, “We stand to lose everything, that’s what we’re looking at- the future of our people. If we lose our rice, we won’t exist as people for long. We’ll be done too” (qtd. in LaDuke, *Recovering the Sacred* 174). The threat from the University of Minnesota is a threat of biopiracy, where the gift to the Anishinaabeg people by the Creator is being threatened, and the only beneficiaries will be the institutions and seed companies that stand on the side of science, industrial agriculture, and profits.

The tactic of the University of Minnesota was to map the genome of wild rice in the name of science only, to understand this important grain at a genetic level; however, many, including LaDuke, were not convinced of the motives or intentions of the gene mapping (Andow 5, LaDuke, *Recovering the Sacred* 175). Concerns over biopiracy and genetic engineering are at their core about who is in control over the seeds, plants and future of wild rice, a food given to the Anishinaabeg people by the Creator. This view however was not shared by the University of Minnesota, who claimed the plan to map the genome was for the sake of science only, that they were not interested in genetic engineering. Despite their claims, Native communities knew better, concerned that the product of that knowledge would likely end up in the hands of seed companies or others hoping to gain profit from “owning” the genetic information relating to wild rice. The concerns of the Anishinaabeg included cultural, spiritual, and food security, yet the University of Minnesota admitted that they did not consider cultural or economic impacts when pursuing genetic mapping. In fact, a member of the research team, Professor George Spangler noted that they were “surprised that the Native community had any interest” in their plans to map the genetic makeup of wild rice (LaDuke, *Recovering the Sacred* 179). The perspective of the university illustrates the guise of objective science, which would allow for a neutral and scientific understanding of wild rice. The counterargument offers the Native perspective which includes a knowledge that includes context through culture. This attitude by the University of Minnesota researchers exemplifies the disconnect between gaining scientific knowledge for domination and profit, and the knowledge and traditions and cultural values held by the indigenous communities across the Great Lakes.

The outcry from Native communities, upset over the idea that wild rice should be genetically mapped, engineered or patented by the University of Minnesota, resulted in many

discussions, protests, and political battles. The conflict has recently culminated in a meeting between the two interests. The meetings and documentation discussed serve as an example of how differing value systems can bridge gaps in knowledge in order to find solutions. In 2009 and again in 2011, people from the Anishinaabeg community and the University of Minnesota met to discuss how they might work together in a respectful and productive way relating to the further research and understanding of manoomin. The meetings included tribal and university leaders, Anishinaabeg elders, and university scientists. A product of these meetings was a white paper put together by a committee of Anishinaabeg members asking to preserve the integrity of manoomin in Minnesota. The document detailed options on how to strengthen the relationship between the Anishinaabeg people and the University of Minnesota relating to the study and understanding of manoomin in Minnesota. Despite years of strained communication and cultural barriers in understanding knowledge productions from both sides of the discussion, this document serves as a guide for those on both sides of the debate, on how to maintain respect and gain an understanding of other cultures, while preserving and protecting manoomin (Andow 1-2). In addition, the process of creating the white paper serves as a model of future collaborations and a source of hope on how to move beyond cultural barriers.

From the Anishinaabeg perspective, this document serves as a way to ensure that researchers at the University of Minnesota can begin to understand their culture, concerns, and knowledge relating to manoomin. Essentially, this document outlines the value of Traditional Ecological Knowledge (TEK) as well as the ecological and cultural concerns relating to the scientific project slated by the University of Minnesota. Much of the thirteen-page document provides suggestions about how to best communicate and maintain transparency as work continues, and offers a vision that include reciprocity, collaboration and respect for tribal

concerns. The end of the document provides a clear statement on behalf of the Anishinaabeg people relating to the research done by the University of Minnesota:

Foundational Policies for Wild Rice Research

We request the University of Minnesota acknowledge and agree that:

1. Anishinabaabe nations have the authority to prohibit scientific research about wild rice within their treaty territories. All wild rice research proposed to take place on Tribal lands and ceded territories must be approved by the Anishinaabe nation(s) before it can begin.
2. Genetic engineering of wild rice shall be prohibited. (Andow 10)

Though this clear and bold statement is poignant and fruitful, it is the process in which this document was created that provides hope for the future of bridging knowledge and value systems together. As stated in the conclusion of the white paper, communication, respect and partnerships will provide a hopeful future, not only for manoomin, but for “other areas of shared interest” (12).

In addition to the relationship–building between Native communities and the University of Minnesota, the fight for manoomin has also helped other efforts across the Great Lakes region relating to protecting the environment. Winona LaDuke outlines these initiatives in her chapter on wild rice in *Recovering the Sacred*. Beyond fighting biopiracy, the Anishinaabeg people have fought to protect wild rice by fighting projects that harm waterways essential to wild rice. Waterways in Minnesota, Wisconsin and Canada have all been subject to protests, legislation challenges, and debates surrounding the impact on watersheds critical to sustaining wild rice. Many of the debates surround the placement of dams and other water “management strategies by the U.S. Army Corps of Engineers, logging companies, and energy companies” (184-85). Other

battles came about due to toxins released in the water from paper or mining operations, essentially harming any Anishinaabeg community found downstream. The most effective tactic was using treaty rights in Wisconsin to hold off zinc and copper mining companies from contaminating the rice beds of the Ojibwe and the Wolf River, central to the Menominee Nation. In using treaty rights to protect waterways, the state of Wisconsin was given the lowest ranking possible by mining companies for viability of mining exploration (LaDuke, *Recovering the Sacred* 188).

The battle over maintaining an Anishinaabeg understanding of manoomin goes beyond subsistence for those living in the White Earth Reservation. The story of wild rice serves as an example of how knowing, valuing, and protecting the land through Traditional Ecological Knowledge can bring about change, discussion and dialogue between communities resulting in a more sustainable future. Had the Anishinaabeg people not fought for the rights given to them by the Creator, as stated by Anishinaabeg stories, (and recognized by treaty agreements) it is possible that the world would have lost a source of knowledge, not to mention biodiversity, all while the waters of the Great Lakes region were threatened by industry and capital.

Corn and Really Old Cool Squash: A solution for sustainability and food sovereignty.

In addition to acknowledging the value of Native knowledge about wild rice to protect biodiversity and maintain a healthy environment, Winona LaDuke turns to other knowledge practices surrounding food production to help solve environmental problems. A key focus in LaDuke's work through the *White Earth Land Recovery Project* and *Honor the Earth*, is the ability for Native communities to reclaim Native foods that are both healthy for their community, and sustainable and healthy for Mother Earth. To achieve the goals of sustainable food resources

for the White Earth Nation, LaDuke turns to indigenous seed knowledge and agriculture practices. The knowledge and value passed on through seed banks and through centuries of agricultural practices have sustained Native communities in the past, and for LaDuke, restoring that knowledge is critical for survival for not only Anishinaabeg people but also for the planet.

In a document created to provide resources for Native communities (though not limited to these communities), Honor the Earth recently published, *Sustainable Tribal Economies: A Guide to Restoring Energy and Food Sovereignty in Native America*. This document, accessible through Honor the Earth's website, serves as an example of the work being done by Native communities to turn to Traditional Ecological Knowledge in partnership with technology to ensure sustainable futures. Examples include gardening practices to turning to wind and solar power, and training those in tribal communities to build and maintain such structures (Honor the Earth 27). This online resource highlights specific examples of tribes who have invested and installed solar and wind power on tribal lands, utilizing high tech innovations with sustainability in mind. Beyond simply investing in these high tech energy sources, Honor the Earth encourages local control and maintenance of these new technologies. This requires training programs and an investment in education of Native youth relating to the skills needed to carry these initiatives through. When TEK and technology can be incorporated and valued at the same time, both tribal economies and the environment can benefit. The mission of this document is stated in its introduction: "This booklet is about the process of recovering control of these two economies (energy and food) as a way to ensure the stability of our tribal communities, our environment and our cultures." Honor the Earth does not separate economy, culture, tribal communities or the environment. It is imperative for this organization to connect these interests together to do the work required to live sustainably. An essential component to this work is to recognize the

importance of local economies and local knowledge, as well as understanding the connections between restoring cultural practices and restoring the health of Native people and the Earth (Honor the Earth 3).

For LaDuke and others working with Honor the Earth, it is important to understand the challenges that face Native communities and the environment and then work to provide examples and options for these communities to turn to traditional knowledge and current technology, such as wind and solar power to achieve energy and food sovereignty. According to Honor the Earth, today's ecological challenges are vast and have a direct impact on Native communities. Issues relating to "a warming planet, the depletion of world oil supplies, and an industrial agriculture systems that relies on massive energy inputs," need to be recognized as challenges to be addressed if humans are to survive for centuries to come (Honor the Earth 7). The four challenges documented by Honor the Earth include climate change, peak oil, fuel poverty and food insecurity, and although these challenges face everybody, they have a particularly large impact on Native communities (Honor the Earth 7). The premise of this publication is to inform interested parties, primarily Native tribes, on how to recover control of food and energy production. The purpose of restoring control of these sectors to tribes not only improves the lives of individuals, but also ensures that the culture and environment of at-risk communities can survive and thrive.

The layout of the *Sustainable Tribal Economies: A Guide to Restoring Energy and Food Sovereignty in Native America*, document covers the need for energy and food sovereignty for tribes, the reasons of concern, and ends with examples of ways some Native communities are resolving issues related to food and energy production. To start, the seventy-page publication, addresses the reasons for this publication, stating, "This booklet is about the process of

recovering control of these two economies as a way to ensure the stability of our tribal communities, our environment, and our cultures” (Honor the Earth Introduction). Following the introduction, roughly one third of the document presents scientific and economic research relating to energy and food production and outlines how issues of climate change, oil production and globalized food production are impacting Native communities. Following the challenges outlined in the first section, the proposal turns to solutions and an optimistic future. The remaining two-thirds of the publication outline the ways in which Native communities can become leaders in sustainable living, providing examples of current practices that could be used by other Native or non-Native communities. According to Honor the Earth, “Harnessing our renewable potential, utilizing Indigenous knowledge to build resilient local food economies and increasing efficiency will create meaningful jobs and a community infrastructure that will benefit our tribal members and the coming generations” (25). Restoring traditional foods and agriculture is one of the areas of focus for both Honor the Earth and the White Earth Land Recovery Project. LaDuke understands that the health of the land and her community is at risk if colonized methods of food production continue and that “restoration of our traditional foods is an essential strategy for tribal survival” (Honor the Earth 51). Beyond improving the health of Native people by producing corn, squash, beans, meat and other organic food products that are nutritionally healthier than industrialized foods, turning to organic, local and traditional foods has positive impacts on the environment (Honor the Earth 19-22, 51-52).

Traditional Native agriculture practices provide many beneficial outcomes in comparison to industrialized agriculture. To start, using traditional seeds and planting practices often allows for more drought–and wind–resistant crops. These pre-fossil fuel varieties offer something that modern modified seeds do not: they do not require chemicals, synthetic fertilizers or complex

irrigation systems to survive and thrive. In addition, seeds used in traditional Native agriculture offer biodiversity and variety in planting practices, protecting the crop from being devastated in the way that monoculture crops can be (Honor the Earth 21). Having a food supply that can withstand dramatic shifts in environmental conditions such as drought and wind is of the utmost importance as the planet is undergoing such threats at an increasing rate due to climate change (Honor the Earth 21, 51).

LaDuke's work through Honor the Earth is unique, in that she does more than just educate the public about the value of incorporating TEK into agriculture; she works to actually implement and support others in that task. The booklet created by Honor the Earth provides resources on how to garden, compost, and find seed banks or become a seed saver. These resources allow any individual with interest in sustainable agriculture to get a bit closer to food sovereignty by simply visiting their website and downloading these resources for free. In addition to providing resources to allow any individual or community the ability to pursue traditional agriculture, Honor the Earth features several Native communities across the United States that have begun the work of re-localizing tribal foods and tribal food economies (Honor the Earth 52-55).

One of the examples provided in Honor the Earth's booklet relates to the work LaDuke is doing on the White Earth Reservation in Minnesota. According to this document, "the White Earth Land Recovery Project (WELRP) has been fulfilling its mission to facilitate recovery of the original land use of the White Earth Indian Reservation, while preserving and restoring traditional practices of sound land stewardship, language fluency, community development and strengthening Anishinaabe spiritual and cultural heritage" (57). Part of the work to protect food resources and care for the land comes from turning to traditional knowledge relating to sacred

foods and land practices. For LaDuke, this has meant restoring cultural and spiritual practices relating to foods and “linking past to present” (*Recovering the Sacred* 191).

In order to link the past to the present, LaDuke is turning to elders of both Native and non-Native descent to locate and preserve Native seeds from the past, as well as looking forward and educating Native youth about their culture and traditions relating to food. To preserve and restore Native varieties of crops, LaDuke has been working to track down old corn varieties from farmers across the country. By finding farmers and seed banks that still have old varieties of corn, she can plant, harvest, and preserve the corn that has cultural significance to her people and grows well in Anishinaabeg country (*Intersection Series*). The result of this work ensures that those on the White Earth Reservation can plant the varieties that are healthy for the community and healthy for the lands. In addition to tracking down old varieties of corn, the WELRP also preserves the seeds of squash and beans, allowing traditional Three Sisters Gardens to be grown. Currently, the WELRP has a plot located in Calaway, Minnesota, dedicated to “traditional Three Sisters Gardens featuring corn, beans, and squash” (*Honor the Earth* 58). These gardens not only produce healthy food for the community, but have cultural significance for indigenous people. Three Sisters Gardens are one example of TEK that has been in use for years, long before scientists classified plants as nitrogen fixing. Three Sisters Gardens are a “companion-planting method in which corn, beans and squash thrive together in a symbiotic relationship. The tall corn provides a trellis for the climbing beans, which fix nitrogen in the soil for the corn and squash. Meanwhile, the broad leaves of the squash shade the soil and preserve moisture for all three plants” (Palmer).

In addition to the plot of Three Sisters Gardens, one can find greenhouses, community and individual gardens, restaurants, elder care programs and school lunch programs all focused

on using traditional knowledge and foods (Honor the Earth 58). These other community-based programs all strive for the same thing, to help restore and maintain Native cultures while helping restore and protect a key figure in Native culture, Mother Earth. As the community returns to traditional sources of land management and gains food security, traditions of the past become the education of the future. The WELRP incorporates youth education programs in community gardens and school lunch programs through the Pine Point Farm to School Program to ensure this traditional knowledge that was almost lost will live on in future generations of Anishinaabeg people (Honor the Earth 58).

The next step for Winona LaDuke through her work at the White Earth Land Recovery Program is creating a seed bank and educating the community about how to save and produce seeds looking towards the seventh generation. Currently, the WELRP is in the early stages of creating a seed library called the Anishinaabe Seed Project. This seed library promises to link the past to the future by protected sacred seeds. This library contains many seeds that will allow traditional foods to be grown keeping the land and Anishinaabe people healthy for generations. One seed in particular illustrates the remarkable power of seeds. According to the WELRP website, the people of White Earth “grew our oldest of relatives: an 800 year-old squash which originated in an archeological dig. We grew fifty of them, or so, and now have seeds to share with our Native communities across the North Country. The squash seeds survived for 800 years in a clay pot, and now the squash is served to our elders, to our children, and used for our ceremonies” (WELRP web). This squash, Gete-okosomin, was named by Winona LaDuke, who says Gete-okosomin basically means, “really old cool squash” (Intersections Series). The work by LaDuke and others who protect sacred seeds such as Gete-okosomin, does more than save seeds; they are working to save a culture that like the land, is in danger of being lost to an

economy driven by colonization. As each of these Native seeds is planted, biodiversity and environmental conditions are improved and restored through TEK. Traditional Ecological Knowledge ensures that seeds can thrive and reproduce in the places they came from. In addition, local knowledge and culture is restored to the people and places in which these seeds are saved and planted. All together, this process works against colonizing forces driven by the economy through industrial/monoculture crops, to provide stability in both culture and the environment of Native people.

The commitment and drive by the people of the White Earth Reservation and countless other Native communities provides hope that traditional ecological knowledge can help save culture and traditions while also protecting the environment. The work done by Honor the Earth through the documentation provided in *Sustainable Tribal Economies: A Guide to Restoring Energy and Food Sovereignty in Native America*, provides hope and a starting point for conversations about how others can turn to Native communities such as the White Earth Reservation for advice about how to restore traditional knowledge practices. The knowledge explored through this work, though specifically geared towards Native communities, is open and available to the public to examine how their communities or organizations might look to these models as a guide of how to live more sustainably.

CHAPTER 4

NATIVE SCIENCE AND TRADITIONAL ECOLOGICAL KNOWLEDGE ADD TO WESTERN KNOWLEDGE PRACTICES

Anishinaabeg stories, culture, and practices relating to the environment illustrate what has been referred to as Traditional Ecological Knowledge (TEK) and Native science. These sources of knowledge represent a growing field within science, philosophy, indigenous studies, and cultural studies looking to fill in the gaps within Western knowledge practices. Traditional Western science practices have permeated much of Western culture, leaving Western science as the main producer of knowledge in the Western world. This Western paradigm however, has served capitalist agendas and caused environmental and cultural harm across the globe. For many, Traditional Ecological Knowledge and Native science hold the key to solving the ecological crises that impact the earth. For this reason, it is important to examine the philosophical reasoning behind considering TEK as a valid knowledge practice alongside Western science practices. Although there is a large body of work supporting the value and importance of understanding TEK, there are also scholars who caution against looking to Native cultures as examples of sustainable or ecologically sound communities, claiming that the naiveté and idealism of the “Ecological Indian” is false and harmful. Despite those who critique turning to Native knowledge practices to provide understandings of how to live sustainably, the potential of incorporating other knowledge practices and understandings of the natural world only serves to help make sense of the natural world and provide a more complete foundation of knowledge.

Scholars of Native science, Melissa K. Nelson and Gregory Cajete make the case that Traditional Ecological Knowledge and Native science are valuable components when tasked

with finding solutions to ecological concerns. Both Nelson and Cajete are Native scholars with educational backgrounds in science and cultural studies who work to find intersections between Western science and TEK. Although they come from different Native American Nations, their background in science and Western education, paired with traditional knowledge practices from their cultures offer cohesive insights into why it is so important to value indigenous knowledge systems as much as Western knowledge systems.

The term Native science is often encountered with criticism and cynicism as many educated in Western systems understand that there is only one kind of science. Doubt about the validity surrounding Native science is also attributed to the belief that Native knowledge simply consist of folk tales and stories relevant only to Native communities. Gregory Cajete challenges these claims in his text, *Native Science*, published in 2000. Cajete acknowledges that there is no word for science in Native languages, however that does not mean that there isn't knowledge of value that explains why and how the natural world operates (2). Cajete defines Western science and Native science: "The word "science" is derived from the Greek word for "knowledge". In this book, science is used to have the most inclusive of its meanings, that is, as a story of the world and a practiced way of living it. 'Native science' is used as a metaphor for Native knowledge and creative participation with the natural world in both theory and practice" (14). Essentially, Cajete is challenging the idea that knowledge is only found in Western science and he is proposing a broader and more inclusive view of knowledge (science). Cajete doesn't want to replace scientific knowledge as we know it, saying there is value in logic and rational empiricism. However he warns that science's "modern obsession of being in control . . . must give way to the reality of moving creatively with the flow of events" (16). The goal of Native

science is to “become open to the roles of sensation, perceptions, imagination, emotion, symbols, and spirit as well as that of concept, logic and rational empiricism” (2).

Native science opens doors to other ways of knowing the world, and although there are many ways in which understanding Native cosmology can benefit a vast number of scientific enterprises, the science of ecology seems to be a natural fit to incorporate Native science into its paradigm. According to Cajete, “environmental education integrated with perspectives of Indigenous science must once again become a priority of modern education, as Western society begins to finally realize that it must forge a new ecologically based cosmology, complete with new myths and new expressions and applications of science and technology” (266). Indigenous science and practices include a vast understanding of the natural world through extensive bodies of knowledge of local plants and animals, community use of resources, planting and harvesting, looking toward the seventh generation and understanding complex cycles of life (Cajete 269). For these reasons, it is logical for scientists seeking to find solutions to understanding ecosystems or how to achieve sustainable solutions environmental issues, to include traditional ecological knowledge (TEK), “since a large proportion of this knowledge served to sustain Indigenous communities and ensure their survival within the environmental contexts in which they were situated” (Cajete 268).

Although many traditional knowledge systems are related to nature and maintaining ecological balance, traditional knowledge systems do branch out beyond TEK and include subject areas such as genetic sciences and physics. In *Native Science*, Cajete points out that incorporating traditional knowledge practices has allowed scientists of many fields to gain more from their work. He uses the example of geneticist Barbara McClintock’s work with corn genetics. He states that her work was seen as “unusual in the sense that she wrote about her

relationship with corn” (104). McClintock is quoted in Keller’s *Reflections on Gender and Science*, “I start with the seedling, and I don’t want to leave it. I don’t feel I know the story if I don’t watch plant all the way along. So I know every plant in the field. I know them intimately, and I find it a great pleasure to know them” (qtd. in Keller 164). Cajete says this is an example of Native science at work because her research did not operate under the normal guise of science, where humans are separated from their environment. McClintock’s science was different because of the philosophical approach through which she approached her work. This different approach led to groundbreaking discoveries in genetic transposition because McClintock was able to see a larger, more complete pattern within corn plants (Keller 161-64). Another component of her philosophy was the emotion and care with which she regarded plants. Keller uses terms such as love, empathy, and intimacy to describe McClintock’s relationship to the plants she studied, stating that “her vocabulary is consistently a vocabulary of affection, of kinship, of empathy” (164). This experience is exactly what Cajete calls for in Native science, stating that, “Knowledge must be both a source of joy as well as one of gravity or respect, because responsibility to the life that surrounds us is ignored only at great peril” (104).

McClintock’s work is not the only example of Western science being influenced by traditional knowledge systems. F. David Peat, the author of *Blackfoot Physics*, explains that indigenous knowledge systems are present in the realms of science including, medicine, physics, mathematics, ecology and astronomy (7). According to Peat, “the dialogue between Western and Indigenous science will engender an increasing flexibility in human consciousness, an ability to leave the boundaries of our own egos and worldview and temporarily enter into those of another” (11-12). Those who understand both Native and Western science are advocating for this change in consciousness. There should be no illusion that any human can hold all knowledge, but there

should also be no illusion that one knowledge system alone can provide the answers. The challenge for Western science, including but not limited to ecology, is to find the ways in which other knowledge systems might provide insight and answers that cannot be found with science alone.

CHAPTER 5

THE MYTH OF THE ECOLOGICAL INDIAN

As some scholars look to indigenous communities to provide insight into how other systems of knowledge, in particular traditional ecological knowledge, can help solve issues surrounding the environment, there are others who seriously question the idealism or naiveté of turning to the mythology that Native Americans are essentially natural ecologists. Historian Shepard Krech's work, *The Ecological Indian*, published in 1999, challenged the notion of the "Ecological Indian" and has been subject of much controversy throughout Native communities across North America. In *The Ecological Indian*, Krech sets out to challenge the idea that Native Americans are inherently ecological or somehow better conservationists. Krech's arguments and examples are based on both documented history as well as anthropological studies. What is missing from his text is a thorough investigation of cultural and spiritual knowledge practices of the examples he examines. Krech frames his examples between two strongly worded chapters that draw conclusions where he claims "that by revisiting and newly analyzing some of the most important and roundly argued cases pertaining to conservation and ecology in Native North America, this book will rekindle debate on the fit between one of the most durable images of the American Indian and American Indian behavior" (28). The chapters offer examples of historical Native American practices and events that challenge the idea that, the American Indian is ecological. These examples include questioning the involvement of early Native Americans in extinction seen during the Pleistocene, poor and unsustainable farming practices leading to the destruction or disappearance of the Hohokam people, the use of fire to shape and manipulate the environment for human (Native American) use, and the over-hunting of Bison and other animals.

The conclusion of Krech's work is bold, stating that the idea of the ecological Indian does not exist and that some people use this to place unproved ecological status on a people who use this ideal of the "Ecological Indian" to their advantage. Krech certainly seems to accomplish the goal of raising questions, he purposefully raises doubts about the stereotype of the Ecological Indian. He seems to know that his strong stance is likely to cause controversy and lists the scholars that are likely to oppose his standpoint. There are many take away messages from *The Ecological Indian*, including historical evidence to illustrate how Native Americans are not immune from inflicting human modifications and changes on the environment. Krech's examples of fire, hunting practices, farming and moving villages all illustrate his point without question. What could be questioned is what is missing from his history or perspective, that of cultural and religious perspectives, as well as oral histories of this culture.

These questions are answered indirectly in works relating to traditional ecological knowledge. In Melissa K. Nelson's text, *The Original Instructions: Indigenous Teachings for a Sustainable Future*, Nelson states that in the debate on the "ecologically noble savage," "these questions do not often concern indigenous peoples themselves. The issues of romanticization and exotification seems to be more of a concern and practice from the outside, from Euro-American academia" ("Lighting the Sun of our Future" 13). She goes on to say that the question of whether Native people were environmentalists or ecologists is "irrelevant" and "fragments environmental matters from other issues of daily life and imposes a modern postcolonial concept onto a historical, precolonial context" ("Lighting the Sun of our Future" 13). Other scholars with essays in Nelson's text reiterate this sentiment, including Dennis Martinez, of O'odham\Chicano\Anglo heritage who states, "The words conservation and ecology, as we use them in the Western sense, don't exactly fit what Indian people did or do with the land"

(“Restoring Indigenous History” 93). He goes on to explain the importance of reciprocity to Native people, stating, “the trees were not just seen as trees, they were also seen as relatives...it was a forest of eyes that look at you to see how you were handling the remains of plants and animals... you still had to show respect. That was the agreement, the compact, between the animals and the people. That’s how it worked” (“Restoring Indigenous History” 93-94). This understanding of the spiritual and cultural systems present before colonization is what is missing in the challenges made in *The Ecological Indian*.

Though many scholars feel as though Krech is missing a huge piece of the story of Native Americans and their relationship and history with the environment, there is recognition that being Native doesn’t automatically mean being good stewards of the earth. Nelson recognizes this in her introductory chapter, “Lighting the Sun of our Future,” pointing out that indigenous tribes have made ecological mistakes, “letting a prescribed fire get out of hand, overharvesting an animal, or more recently allowing toxic waste on their lands” (13). She adds that Native people are subject to “the same materialism and greed as any one else and have been conditioned to forget the earth and our nonhuman relatives” (13). Winona LaDuke acknowledges that part of being human is making mistakes and that no culture is perfect, including Native culture, stating that in Anishinaabeg stories given to them by prophets, “they told us what was going to happen to us as Anishinaabee people...they described things we would do to ourselves and things that would happen. I always like to say that, because we Ahnishinaabeg also have some stories where we botched things up. I just want to say that because nobody has the monopoly on botching things up” (Intersections Series). Recognizing and remembering the ways in which indigenous people have had a negative impact on the environment is important in seeing the whole picture; however, what is of value are not the exceptions, but the knowledge systems and cultures that

have subsisted and survived through centuries, and how that knowledge combined with technology and Western science may be the key to surviving for a few centuries more.

CHAPTER 6:

WHY TRADITIONAL ECOLOGICAL KNOWLEDGE?

With so many issues facing societies across the globe relating to climate change, deforestation, toxic agriculture, pollution of waterways, and dependence on fossil fuels, it would be limiting to turn to Western science to seek all the answers. For this reason, it seems imperative to look to other knowledge systems that might offer another view of the world and provide answers to some of the problems that are facing the planet today. Although Western science offers some solutions to the problem of how to live sustainably, with the future of biofuels, wind and solar technology, and innovations in new materials, it cannot be the only source of knowledge. What traditional ecological knowledge provides is a counterperspective to a society that runs on capitalism, patriarchy, and colonial views. Not only can TEK help fill in the gaps that Western science leaves behind, it also challenges problem solvers to question the value system and knowledge system in which many scientists, leaders and scholars have been educated.

Historically, educational systems in the Western world have produced generations of leaders who think and produce knowledge that benefits Western world views of domination, control, patriarchy, and colonization. TEK can provide a framework that challenges this idea, and presents an alternative knowledge system that can perhaps open the door for more growth and understanding of the world in embracing more than one system of knowledge. This, however proves to be a challenge for those, in particular non-native scholars, who haven't been exposed to alternative ways of thinking. Melissa K. Nelson points out that "because local TEK is so foreign to the mindset of modern, western science and the Eurocentric paradigm, it is often

difficult for non-Native outsiders to understand these realities and teachings” (“Lighting the Sun of our Future” 14). What Nelson suggests is that people need to re-indigenize themselves, showing that we must, “decolonize our minds, hearts, bodies, and spirits and revitalize health cultural traditions” (“Lighting the Sun of our Future” 14). While, in the context of this text, this prescription is directed at Native peoples who have had their culture, language and knowledge systems taken from them, it can also go beyond those communities and expand to greater society that can also benefit from de-colonizing knowledge practices.

The idea of de-colonizing knowledge and questioning Western science is a challenge for many within and outside of science; however Native scholars insist that this process is critical to solving many of the problems faced by modern society today. Recognizing the damage done through colonial science of the past and present is important if a shift in thinking is going to take place. Understanding that science has brought technologies and advancements to society, yet has also had a negative impact on ecosystems and Native communities is an important step toward recognizing the reasons to include TEK (Cajete 300). Native science challenges and holds the products and processes of Western science accountable by pointing out that Western science has been taught in “a moral and social vacuum” (Cajete 301). This path of trying to separate one’s self from the environment, hasn’t been fruitful and according to Cajete, is a path that leads to our own destruction. The myth that science, as it stands now, can solve all environmental problems is of concern for Cajete, who states:

In spite of mounting evidence that the cosmology of modernism is not sustainable, we continue to be bombarded by messages from institutions and the media that somehow everything is going to be fine: just keep on supporting your governments, businesses, and educational institutes, keep consuming and everything will be all right (302).

The deep concern in continuing with colonial practices is that it was the colonization of cultures, lands, seeds, and knowledge that created ecological crises to begin with. Why would this be the solution to the problem?

The conclusions that both Cajete, Nelson, and others reach, is that TEK is a required part of any real solution involving environmental problems. The Cartesian and Western way of thinking can only do so much, and certainly leaves much out of the product of knowledge (Cajete 55). Cajete asks for a change in consciousness, one where humans are not separate from the environment, and one where the products of science are no longer “freeze dried...bereft of the water of life and the breath of the human spirit that animates knowledge toward meaning and ecological consciousness” (306). His implicit message is that, “Western science *needs* Native science to examine its prevailing worldview and culture” (307). Nelson agrees with this statement, and as mentioned earlier, suggests a movement to re-indigenize our knowledge and understand that culture, place, stories, and history all have something to teach and add to modern scientific knowledge (“Lighting the Sun of our Future” 12, 14).

This idea of indigenizing knowledge or decolonizing knowledge is a practice that many recognize will not happen overnight. Wendy Genuiz introduces readers to *inaadiziwnn*, an Anishinaabe word meaning, “Anishinaabe way of being, behavior, psychology” and states, that *inaadiziwnn* is important in the process of decolonization (193). Genuiz provides an example of how understanding *inaadiziwnn* leads to decolonization of knowledge: “One of these steps is seeing plants and trees through the perspective of *inaadiziwnn*. We are surrounded daily by plants and trees, beings who can help us. By acknowledging and accepting this help we will have begun the journey back to our teachings and ourselves. We will bring our people and ourselves that much closer to becoming decolonized” (161). This example provided by Genuiz

incorporates traditional language and knowledge that can help scholars decolonize their minds and cultures, in the end opening alternative answers and solutions to today's problems.

The idea of decolonizing knowledge and utilizing TEK has the risk of being considered Native philosophy, with no applicable means, however there are several examples of communities using TEK that illustrate that re-indigenization and TEK is not left to philosophy books. Like the examples given from Honor the Earth listed above, philosophy can be turned into practice. The Honor the Earth publication connects philosophy to practices stating, "Re-localizing food and energy economies means taking responsibility for our future generations. This requires a paradigm shift back to our traditional knowledge systems. We cannot erase the process of economic colonization and the deliberate creation of dependency. But we can join with others and take action to reclaim our future."⁵ This example illustrates how philosophy can be moved into action, and how partnering with others is the only solution to move forward.

Several other examples of using TEK also demonstrate the ability of non-Native cultures to learn from TEK practices of Native communities. In *The Earth's Blanket: Traditional Teachings for Sustainable Living*, Nancy Turner shares three stories of how indigenous practices of First Nations in British Columbia are being used as models or alternatives understanding ecological principles (212). These examples, according to Turner, provide meaning of TEK in a contemporary context. The examples range from forestry to restoration of an ecosystem and culture. The most compelling example brings together TEK of a Nlak'p'mx woman, Verna Miller, who gained much of her TEK from her mother and aunt, and her work in forestry practices and land management. Miller developed the TmixW Research project, which according to Turner, "encourages developers to apply Nlaka'p'mx traditional knowledge in current forest and land management to integrate aboriginal land use with modern, innovative forestry

practices” (212). The partnership of this venture includes teaching ethnobotany at the local technical college, and uses traditional knowledge in its educational system. In addition to incorporating TEK in education systems and land management practices, an advisory panel was created that included biologists, foresters, ethnobotanists, elders and members of local tribes (Turner 212). What is most impressive about this work is that through these collaborative efforts that incorporate scientific and traditional ecological knowledge, Miller is working to develop “best practices in the fields of ecological restoration and conservation biology, which recognizes and incorporates traditional ecological knowledge and traditional land and resource-management systems in to land use history, planning and decision making” (Turner 219). The results of this work will also be documented in scientific journals and given to community organizations and government offices (Turner 215). This example, in addition to the others presented earlier, gives life to much of the discussion and philosophy of Cajete and Nelson. It also provides hope that TEK practices can and should be incorporated into Western science.

CHAPTER 7

CONNECTING TRADITIONAL ECOLOGICAL KNOWLEDGE AND FEMINIST SCIENCE

Feminist science and theory offer insight into knowledge production relating to science and how the world is organized and understood. The principles and ideas that feminist scholars such as Donna Haraway and Carolyn Merchant offer, outline how Western scientific knowledge seeks to reduce the complex world into quantifiable and mechanic processes that are used to control and dominate. These same principles are also understood by scholars of Native science, who use indigenous knowledge practices to understand the world and counter Western ways of thinking to solve problems facing society today. Though Native scholars may not use a feminist paradigm, many of the same components are present, understanding the world through stories and pushing against the idea that the world can be understood through binaries and dualisms.

In examining core principles of feminist theory and philosophy, the work of Donna Haraway must be considered foundational. One of the fundamental components to Haraway's work is her focus on the importance of stories and use of science fiction to understand how knowledge is produced, in particular, in scientific knowledge-making practices. Haraway explains that science is a story, just as fiction is, stating that "scientific practice is above all a story-telling practices in the sense of historically specific practices of interpretation and testimony" (*Primate Visions* 4). In *Primate Visions*, Haraway uses primatology to help readers understand that science is a collection of stories, where the science produced comes out of a particular time, place, and is situated within political and global forces (Schneider 28). Two core components to the story-telling practice of science, relate to language and metaphor. Haraway

believes that any scientific “story” is dependent on the language used and the metaphors presented to help gain understanding of the world. This belief essentially situates any knowledge produced and challenges current Western understandings of knowledge production that rely on the guise that science is objective. This paradigm, of understanding scientific knowledge as situated, can also allow for more complete knowledge production by removing the constraints of Western science’s myth of objectivity. This more expansive way of understanding the world is what Haraway hopes her theory can help produce. She wants to challenge Western thinkers to value and adopt the understanding that science is story, dependent on language and metaphor, and that some stories are better than others. As referenced in earlier chapters, Haraway does not believe that all science should be ignored. She believes that many stories of science are sound and truthful, however, some stories of science should be critiqued and understood to be less objective and truthful than others.

The philosophical importance of story-telling is not unique to feminist theory; it is also an essential component to indigenous cultures’ understanding of the world. The concept of story-telling in Native American cultures is not limited to understanding the natural world. For many, it is understood that stories provide a sense of history and of origin; however, they also provide information from the sacred to the everyday. These stories shape the world and incorporate spiritual, practical, philosophical, and local knowledge in context and as one collective way to understand the world (Nelson, “Lighting the Sun of our Future” 5). On the surface a story can provide limited meaning. However, many Native stories require people to listen to their “learning spirit” and find the deeper meanings, patterns, and connections embedded in the oral traditions and stories passed from generation to generation (Nelson, “Lighting the Sun of Our Future” 5). For Cajete, this involves heightening the ability of the “metaphoric mind” primarily

and not solely focusing on the “rational mind” (Nelson, “Lighting the Sun of our Future” 5-6). The practice of story-telling and learning from stories, such as the story presented by LaDuke’s teaching about wild rice, offers another way of learning, one that includes listening, observing, and understanding spiritual values rather than simply looking at the world through an objective or reductive lens.

The story also offers another paradigm in educational practices. Education in Native cultures, unlike in Western cultures, is meant to be a life-long journey, and one related to place, time, and culture. Indigenous education does not solely reside in a K-12 format or a linear pattern; most often it is presented through stories as people move through life and build relationships to elders and others in a community (Nelson, “Lighting the Sun of our Future” 6). Stories are often presented in “bundles,” passed on through oral traditions that educate about different aspects of life, such as “women’s knowledge, healer’s knowledge, children’s knowledge, hunter’s knowledge and so on” (Nelson, “Lighting the Sun of our Future” 5). These “bundles” are essentially a curriculum used to educate and train generations of Native people throughout their lives and provide insight to all aspects of life. Though story-telling may seem superficial and anecdotal to many outside Native culture, many Native scholars consider stories foundational education tools that not only help understand the past and survive in the present, but also allow insight and information on how to prepare and think to the future, seven generations from now.

In addition to understanding the value of stories, feminist scholar Donna Haraway also finds that much learning can be found by exploring the intersections and metaphors embedded in a story. Haraway’s theory relies on introducing readers to characters and worlds that straddle the symbolic and material to explore what can be learned when we stop limiting knowledge to

binaries such as fact and fiction. One example that provides insight into how science is story is seen in the previously discussed example of “Teddy Bear Patriarchy” where Haraway highlights the creation of nature through the stories presented in the dioramas of a museum. Readers are able to see that fact and fiction are woven together in the creation of dioramas, and that the story of primates and the natural world is situated. Beyond this example, Haraway introduces readers to other characters and symbols such as cyborgs, Onco mouseTM (a genetically modified organism), and companion species. These symbols offer a way to understand that meaning and knowledge come from both the material and semiotic, not one or the other, an idea that Haraway describes as material-semiotic. Essentially, Haraway understands that knowledge consists of “relations that are simultaneously material (between things) and semiotic (between concepts)” (Schneider 17).

This same concept is understood by Native scholars as well, in the form of story-telling practices found in many indigenous cultures. Just as Haraway introduces readers to the concept of material-semiotic, Melissa K. Nelson introduces the idea of the trickster character, a character found in many Native cultures. According to Nelson, “the trickster, the coyote, as an archetype, a person, as a cultural hero in our oral traditions and stories, is a teacher and a reminder of plurality, diversity, paradox, humor, surprise, and humility. Trickster forces us to retain an understanding of all sides of a story by revealing them to be coexisting parts of one greater whole-interconnected and indistinguishable” (“Mending the Split-Head Society with Trickster Consciousness” 292). This character and the stories told featuring the trickster open up the dialog and understanding that the world cannot be seen in binary thinking.

The danger of binary thinking is a concern for both feminist and Native scholars. For Nelson, the concern is that many decisions and thought processes are limited to a “this or that,”

“black or white” concept, that doesn’t allow for many solutions or understandings of the world. Nelson is also concerned that binary thinking has “so thoroughly pervaded our minds that it has become an unconscious reflex in thought” (“Mending the Split-Head Society with Trickster Consciousness” 292). Haraway also warns of the danger related to the automatic nature of binary thinking, stating, “It has seemed all but impossible to avoid the trap of an appropriationist logic of domination built into the nature/culture binarism and its generative lineage, including the sex/gender distinction” (*Primate Visions* 5). The concern behind limiting knowledge to binaries is what is lost in the borderlands, the spaces between the ends of the binary, and the knowledge that doesn’t come from pure fact or fiction. The theory and philosophy of Haraway, calling for the borderlands of binaries to be explored is exactly what is found within Native knowledge production and Native science.

The process of breaking down binary thinking requires a conscious effort to resist the dominant drive to turn to binary ways of thinking, and for Native cultures, that means decolonizing and re-indigenizing the minds of their people. For Nelson, a key component to decolonizing the mind comes from embracing the trickster consciousness to “break out of the binary thinking imposed on us by Eurocentric thinking” (“Mending the Split-Head Society with Trickster Consciousness” 291). The tools that Nelson uses to decolonize the mind rest in learning Native languages and taking part in cultural practices such as story-telling and arts. In embracing the trickster consciousness (a way of thinking that resists a paradigm of singularity and monocultural thinking and embraces the uncertainty and complexities in life) and by learning Native languages and arts, new ways of understanding become possible.

What can be seen in understanding both feminist and Native science is that the current paradigm seen in Western science cannot continue if the goal is to find solutions to current world

problems. In fact, both feminist and Native science scholars have attributed Western science practices and beliefs to the harms felt by women, indigenous people and the natural world alike. The philosophical solutions sought by Haraway and other feminist scholars that aim to challenge patriarchal and colonial mindsets are essentially the practices carried out by Native communities who are looking to re-indigenize themselves. The reincorporation of Native teachings, languages and cultural practices is allowing a colonized mindset to refute the assumptions of binary thinking. By thinking outside of the binary several paradigmatic changes will occur— no longer will men be placed in higher value than women, no longer will Western culture be placed above non-Western cultures, and no longer will humans be placed above nature. These visions of what can come out of decolonizing the mind are the shared vision by two distinct set of scholars and the intersections between these two disciplines hold the secret to finding sustainable solutions in the threat of Western domination of the environment.

CONCLUSION

A SUSTAINABLE FUTURE INCLUDES SCIENCE AND TEK

Ecological imbalance has arisen through years of colonizing forces, not simply the colonization of the lands, but of thought and knowledge as well. Much of the thinking of the past few centuries has involved colonizing cultures, erasing other languages, and limiting knowledge practice to Western thinking, while also removing people from their lands. A result of this loss of culture includes a loss of knowledge of the natural world, and how humans and the natural world are connected. Previous knowledge of the natural world, held by indigenous cultures, has been erased and devalued as the rise of Western science grew with colonial powers. The product of this shift in paradigms has resulted in ecological crises relating to climate change, destruction of the land through mining, forestry and industrial agriculture, and the severe damage to the world's waterways. Scholars of feminist science point to the rise of Western science and Cartesian thought as the root of this problem, and Native science scholars seek to remove these colonizing forces from the mindset of their people (and beyond) by decolonizing the mind.

With the root of many ecological problems established as a product and limitation of Western knowledge practices, the solution lies in incorporating other knowledge practices into current paradigms. Currently, most solutions presented to help live sustainably or fix environmental destruction are born out of Western science, capitalism and industry. These methods of seeking solutions from the source of the problem seem counterintuitive, not to mention unproductive. Though Western science is offering valid and important information to help solve environmental problems, science and Western thinking alone should not be the solution. The solution must come from incorporating Traditional Ecological Knowledge into

Western scientific knowledge. Certainly, all knowledge systems (i.e. medicine, architecture, and education) could benefit from listening to traditional knowledge, however one of the most obvious and logical ways in which traditional knowledge can and should be used relates to the knowledge of the natural world. Indigenous cultures such as the Anishinaabeg of North America have lived on the continent for thousands of years, and offer a proven way of understanding and interacting with the natural world (LaDuke, *Recovering the Sacred* 178). Though it should be clear that mistakes have been made by Native Americans, it is also true that Native practices and culture include a value system that requires a sustainable way of life. The idea to turn to Native cultures is not meant to be a romantic notion; however it does hold valid ways of thinking, of understanding of the natural world as animate, and understanding the place of humans within that world. These Native concepts and TEK systems should no longer be considered primitive, but be revered and examined more closely by many, including practitioners of Western science.

This idea that TEK can and should be incorporated into more mainstream knowledge practices is catching on in some locations, providing evidence that it is a successful model. One organization that supports the idea that we must combine the high-tech with TEK is *Bioneers*, a national non-profit educational organization that is looking for real solutions for the planet and its people (Preface, *The Original Instructions*). This organization seeks scholars from across the globe and across cultures, including scientists, who can provide examples of how TEK and modern sciences can both be incorporated to seek solutions to problems surrounding the planet. Those involved in *Bioneers* argue that the health of the planet relies upon a dramatic paradigm shift in Western culture. Those who consider themselves *Bioneers* understand that a colonized mind produces colonized knowledge, and that, just as feminist scholars have suggested, this limits and constrains the knowledge and answers so desperately sought after.

Neither feminist science nor Native science is calling for science to be thrown out and replaced; however, it does call for the gaps that science leaves behind to be filled with alternate and valid knowledge systems. In particular, ecological sciences cannot ignore the TEK present in cultures across the world that offers insight and solutions that are missing in traditional scientific practices. The key difference as explained in feminist theory is the paradigm in Western science that reduces the natural world to a mechanical process, made of pieces that are studied apart from the whole, while Native sciences understands the natural world as a part of a much larger system that cannot be separated. In restoring Native languages and cultural practices, the mind can traverse new paths and understand the world in a way that Western science does not allow. This journey that often involves the mind, body and spirit, as opposed to the rational logic and objective view of Western science, is the only way that sustainable solutions will be found, and the only way in which humans can hope to survive for centuries to come.

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